

JPRS-TND-90-001  
4 JANUARY 1990



**FOREIGN  
BROADCAST  
INFORMATION  
SERVICE**

# ***JPRS Report***

# **Nuclear Developments**

REPRODUCED BY  
U.S. DEPARTMENT OF COMMERCE  
NATIONAL TECHNICAL INFORMATION SERVICE  
SPRINGFIELD, VA. 22161

19981123 081

**DTIC QUALITY INSPECTED 3**

**Reproduced From  
Best Available Copy**

# Nuclear Developments

JPRS-TND-90-001

CONTENTS

4 JANUARY 1990

## SUB-SAHARAN AFRICA

### SOUTH AFRICA

Botha in Vienna for Nuclear Nonproliferation Talks .....	1
Treaty Reviewed [ <i>Johannesburg International</i> ] .....	1
Discusses Vienna Talks [ <i>Johannesburg TV</i> ] .....	1
Notes 'Progress' [ <i>Johannesburg Radio</i> ] .....	2

## CHINA

Nuclear Energy Program Makes Further Progress .....	3
Power Plant Imports Discussed [ <i>CHINA DAILY 14 Dec</i> ] .....	3
Fuel Gear Passes Assessment [ <i>XINHUA</i> ] .....	3
Nuclear Industry Makes Military, Civilian Goods [ <i>XINHUA</i> ] .....	3
Domestically Made Nuclear Reactor Approved [ <i>Beijing Radio</i> ] .....	3
Text of Regulations on Protection Against Radiation [ <i>RENMIN RIBAO 23 Nov</i> ] .....	4
Advanced Radiation Facility Becomes Operational [ <i>XINHUA</i> ] .....	7

## EAST EUROPE

### BULGARIA

Accident in Kozloduy Nuclear Plant Denied .....	8
Radioactivity Data Released [ <i>OTECHESTVEN FRONT 24 Nov</i> ] .....	8
Soviet Safety Chief Visits [ <i>Sofia Radio</i> ] .....	8
Radioactivity Measured [ <i>BTA</i> ] .....	9
Nuclear Chief on Waste Problem [ <i>BTA</i> ] .....	9

## LATIN AMERICA

### ARGENTINA

Talks on Space Research With Brazil Begin [ <i>NOTICIAS ARGENTINAS</i> ] .....	10
Trouble Reported at Embalse Nuclear Plant .....	10
Turbines Shut Down [ <i>NOTICIAS ARGENTINAS</i> ] .....	10
Service Restored [ <i>NOTICIAS ARGENTINAS</i> ] .....	10
Second Shutdown [ <i>TELAM</i> ] .....	10
Plant Resumes Operation [ <i>TELAM</i> ] .....	11
Mining of Uranium Deposit in Cordoba Discontinued [ <i>LA PRENSA 27 Nov</i> ] .....	11

### BRAZIL

Nuclear Reactor Accord Signed With USSR [ <i>FOLHA DE SAO PAULO 24 Nov</i> ] .....	11
Navy To Install PWR Nuclear Reactor in 1995 [ <i>FOLHA DE SAO PAULO 3 Dec</i> ] .....	12

### CHILE

New Nuclear Reactor Installed in Lo Aguirre [ <i>EL MERCURIO 23 Nov</i> ] .....	12
---	----

**NEAR EAST & SOUTH ASIA**

**EGYPT**

- Paper Cited on Local Manufacture of Nuclear Fuel [*Cairo Radio*] ..... 13

**IRAN**

- Official Interviewed on Uranium Discovery [*Tehran Radio*] ..... 13

**ISRAEL**

- Israeli-South African Military Ties Noted [*Cairo Radio*] ..... 13

**PAKISTAN**

- Spokesman Comments on V.P. Singh's Remarks [*Islamabad Radio*] ..... 13

**SOVIET UNION**

- Mishandling of Chernobyl Cleanup Criticized [*LITERATURNAYA ROSSIYA 27 Oct*] ..... 15  
Specialist Dismisses Evidence of Post-Chernobyl Contamination  
[*SOTSIALISTICHESKAYA INDUSTRIYA 29 Nov*] ..... 19  
Chernobyl Fuel Deemed 'Profoundly Subcritical' [*PRAVDA 8 Dec*] ..... 22  
Doubts Persist About Gorkiy Nuclear Station [*SOVETSKAYA ROSSIYA 25 Nov*] ..... 24

**WEST EUROPE**

**CANADA**

- Contaminated Water Spills at Saskatchewan Uranium Mine  
[*THE OTTAWA CITIZEN 25 Nov*] ..... 26

**FINLAND**

- Sabotage Eliminated as Cause for Pipe Contamination [*HELSINGIN SANOMAT 10 Oct*] ..... 26

**IRELAND**

- Minister Says Campaign Against Sellafield To Continue [*IRISH INDEPENDENT 19 Oct*] ..... 27

**SPAIN**

- Vandellos Fire Fuels Energy Debate, Protests ..... 27  
'Antinuclear Psychosis' [*DIARIO 16, 3 Nov*] ..... 27  
Catalan Resolution [*EL INDEPENDIENTE 18 Nov*] ..... 28  
CSN Recommendations [*DIARIO 16, 24 Nov*] ..... 29

**UNITED KINGDOM**

- Atomic Fuel Reprocessing Plant for Dounreay Approved [*THE DAILY TELEGRAPH 26 Oct*] .... 29  
Government Abandons Privatization of Nuclear Power ..... 30  
End of Expansion [*THE DAILY TELEGRAPH 10 Nov*] ..... 30  
Background of Decision [*THE DAILY TELEGRAPH 10 Nov*] ..... 31

## SOUTH AFRICA

### Botha in Vienna for Nuclear Nonproliferation Talks

#### Treaty Reviewed

*MB1112162989 Johannesburg International Service in English 1100 GMT 11 Dec 89*

[From the "Africa South" program]

[Text] South African Foreign Minister Pik Botha is in Vienna for talks with the United States, Britain, and the Soviet Union on the Nuclear Nonproliferation Treaty. Mr Botha is being accompanied by the minister of mineral and energy affairs, Dr Dawie de Villiers. Fritz Greutling reports:

[Begin Greutling recording] The talks with the United States, Britain, and the Soviet Union are in fact a continuation of similar negotiations held by Mr Botha with these countries in the Austrian capital last year. According the South African Department of Foreign Affairs, it is not expected that South Africa will sign the nonproliferation treaty at this stage.

The treaty was drawn up in 1968 and signed in 1970. So far South Africa has refused to join the more than 130 countries who have become signatories to the treaty, apparently because this would give international access to its secret uranium enrichment process. The Nuclear Nonproliferation Treaty provides for non-nuclear-weapons states to forswear the acquisition and development of nuclear weapons in return for assistance from the International Atomic Energy Agency, the IAEA, in their development of their ability to utilize nuclear technology for peaceful purposes.

The treaty allows officials of the IAEA to visit nuclear plants to ensure that nuclear fuel and energy are not diverted to military projects. South Africa already allows representatives of the IAEA to visit a number of nuclear plants, but it has been reluctant about allowing visits to its uranium enrichment plant at Pelindaba.

Two years ago Nigeria led an attempt to have South Africa's membership of the IAEA terminated. The move followed unconfirmed reports that South Africa was working on nuclear weapons. Arab countries tried at the same time to have Israel expelled from the organization. At the time the United States threatened to terminate its membership if South Africa and Israel were expelled.

South Africa's delegates saw their credentials rejected by the IAEA's credentials committee on the eve of the organization's annual conference in 1977. However, the country continues to take part in other activities of the Vienna-based organization. [end recording]

### Discusses Vienna Talks

*MB1212214689 Johannesburg Television Service in English 1800 GMT 12 Dec 89*

[Text] In Vienna, South Africa has begun talks with the United States, the Soviet Union, and Britain on signing a treaty banning the spread of nuclear weapons. Johan Ahlers reports on the negotiations from the Austrian capital:

[Begin video recording] [Ahlers] Mr Pik Botha met early today here in Vienna with Russian representatives of the International Atomic Energy Agency [IAEA]. The meeting took place in the buildings of the permanent mission of the Soviet Union here in Vienna. Similar meetings took place yesterday with a delegation from America and Britain.

This is not the first time that Mr Botha is meeting with the IAEA. In fact, a similar meeting took place in 1987, also here in Vienna. One hundred and three of the member countries of the IAEA are in fact urging South Africa to sign the Nuclear Nonproliferation Treaty, a move which has so far consistently been resisted by South Africa.

Mr Botha also addressed an international press conference in Vienna this afternoon, a conference which was also attended by the director general of foreign affairs, Mr Neil van Heerden, as well as the minister of mineral and natural resources and public affairs, Mr Dawie de Villiers. Also present at the conference was the South African ambassador to Austria, Miss Cecile Smitty. I asked Mr Botha after the conference why South Africa is still not prepared to sign the proliferation [as heard] treaty.

[Botha] There are two sides to it. I think, in general, the international community harbors a severe suspicion that South Africa, while it has the capability of producing, should she want to, with the explosives, would perhaps do so, and this is being used in an emotional campaign against South Africa. Very much like apartheid used to be and is still in certain quarters used against us. So we will have to take this into account.

We are concerned mainly about the privileges which the treaty accords to all states acceding to it. And we would like to be sure that our scientists will be allowed to work freely in terms of the treaty in the work of the International Atomic Energy Agency, and also in the international conferences and congresses on this whole issue of nuclear power. Yes, that is very important to us, and we are concerned about the interpretation of the treaty provisions and how this will be applied to South Africa. And this is as far as we are concerned one of the main purposes of our negotiations or rather discussions with the United Kingdom and the United States of America and the Soviet Union, who are the three depository states of the treaty.

[Ahlers] And after your discussions, Minister, what are your feelings; in which direction are you moving?

[Botha] These were very useful and substantial. Matters were raised during each discussion, and I can say that progress has been made and that we will be in touch with each other and exchange further views early in the next new year. [end video recording]

**Notes 'Progress'**

*MB1312082089 Johannesburg Domestic Service in English 0600 GMT 13 Dec 89*

[Text] The minister of foreign affairs, Mr Pik Botha, says South Africa has made progress at the 2-day talks in Vienna with the Soviet Union, the United States, and Britain on signing the 1969 Nuclear Nonproliferation Treaty. At a news conference in Vienna, Mr Botha said the four delegations would meet again in 2 months time, but refused to say whether the South African Government would sign the treaty.

In terms of the treaty, signatories opened their nuclear facilities to inspection by experts of the International

Atomic Energy Agency. The treaty has not been signed by two known nuclear powers, France and China, nor by a number of other countries believed to have the capability to produce nuclear weapons.

Mr Botha denied that South Africa had produced a nuclear bomb, saying it was committed to the peaceful application of nuclear energy. He said South Africa had not signed the treaty because it wanted to be sure of the advantages of signing and that the treaty would be applied to South Africa as it was applied to other nations. He denied recent media reports that South Africa had received nuclear missile technology from Israel. Israel has also denied the reports.

Turning to the recent changes in Eastern Europe, Mr Botha told the news conference that the changes would have a tremendous effect on African countries. He said that in the light of the failure of Marxism in Eastern Europe, Marxist-oriented African countries would be foolish to continue to pursue such a system.

## Nuclear Energy Program Makes Further Progress

### Power Plant Imports Discussed

*HK1512035889 Beijing CHINA DAILY in English  
14 Dec 89 p 1*

[By staff reporter Chang Hong]

[Text] Negotiations are well underway to import two nuclear reactors with individual capacities of one million kilowatts to be installed in Northeast China's Liaoning Province, the country's key heavy industry base.

Fourteen top nuclear experts attended a seminar yesterday to discuss the future use of nuclear energy in China. The seminar was sponsored by an academic committee under the China Nuclear Industry Corporation.

Pressurized water reactors generating 600,000 kilowatts of electricity will be the main option for China's nuclear power plants, CHINA DAILY has learned at the seminar.

The nuclear experts said that the pressurized water reactor is safe and economical and China's experience in the past few years with this kind of equipment has been good.

This is the model likely to be used for China's nuclear power stations in the foreseeable future.

By the year 2000, nuclear power plants here will probably be generating 6 million kilowatts of electricity a year.

The first phase of the Chinese-designed Qinshan nuclear power plant will be equipped with a 300,000-kilowatt pressurized water reactor. The second phase will use two reactors of the same type but with a capacity of 600,000 kilowatts each.

The other nuclear plant under construction in China is on Daya Bay, Guangdong Province. The plant is expected to operate with two reactors each with a generating capacity of 900,000 kilowatts.

More nuclear power plants are under consideration.

The experts attending the seminar said China can run its nuclear power plants on domestic fuels.

### Fuel Gear Passes Assessment

*OW0912030789 Beijing XINHUA in English  
0200 GMT 9 Dec 89*

[Text] Chengdu, 9 Dec (XINHUA)—The fuel equipment for the 300,000 kilowatt Qinshan Nuclear Power Station passed state assessment today at the Yibin Nuclear Fuel Component Plant in southwest China's Sichuan Province.

The high-tech equipment are a first in China and the assessment shows that the quality is good.

After several years of efforts, Chinese scientists from a dozen research and production units solved over 170 technical issues in making the equipment. All the materials used are made in China.

Chinese scientists have brought the equipment up to international standards, which will be installed next year in the Qinshan Nuclear Power Station.

There are only a few countries in the world which are able to produce such nuclear fuel equipment.

## Nuclear Industry Makes Military, Civilian Goods

*OW0612164889 Beijing XINHUA in English  
1042 GMT 6 Dec 89*

[Text] Chengdu, 6 Dec (XINHUA)—China's nuclear industry has started developing both military and civilian products after ten years of readjustment and reform, said Jiang Xinxiong, general manager of the China National Nuclear Corporation (CNNC).

He said that in the past the scientific research and production of the Chinese nuclear industry was solely in the military field, but now it has been transferred to mainly serve civilian so as to make full use of technologies and equipment.

China has made great progress in developing its nuclear industry. Nuclear enterprises have helped civilians build hydraulic and thermal power stations, develop the non-ferrous metal, rare earth, metallurgy, building materials and chemical industries.

Since 1985, the industry has undertaken 114 items of civilian product development with nuclear technology. Among them, 90 have been completed, and 18 have been listed as key technology projects of the country. Also, more than 1,000 new products including isotopes and fine chemical products, and instruments and meters have been developed.

The Chinese nuclear industry has exported technologies to a dozen countries for the peaceful utilization of nuclear energy.

This year the total production value of civilian products in this sector is predicted to hit 600 million yuan, accounting for 40 percent of the nuclear industry's total output value.

## Domestically Made Nuclear Reactor Approved

*OW1212002089 Beijing Domestic Service in Mandarin  
2230 GMT 10 Dec 89*

[From the "News and Press Review" program]

[Text] A low-temperature thermal-heat nuclear reactor [as heard], the first of its kind that was wholly designed and built in China, was checked and accepted at Beijing's Qinghua University on 8 December. The completion of this nuclear reactor marks the entrance of China into the ranks of the world's advanced nations in the area of low-temperature thermal-heat nuclear devices.

**Text of Regulations on Protection Against Radiation**  
*HK1212083589 Beijing RENMIN RIBAO in Chinese*  
23 Nov 89 p 6

[Decree by Li Peng (2621 7720): "Regulations Governing the Protection Against Radiation From Radioisotopes and Beam Installations"]

[Text] CHAPTER 1. GENERAL

Article 1. These regulations have been drawn up in order to step up supervision and management over protection against radioisotopes and radiation from beam installations, to ensure the health and safety of those whose work involves radiation as well as that of the public, to protect the environment, and to promote the application and development of radioisotopes and beam technology.

Article 2. The regulations are applicable within the territory of the People's Republic of China to the units or individuals who make, use, or sell radioisotopes and/or beam installations.

Article 3. The health, environmental protection, and public security departments of the State Council, in accordance with their duties and functions and with the stipulations in the regulations, supervise and manage radiation protection work in the making, using, or selling of radioisotopes and/or beam installations (hereinafter referred to as radioactive work).

Article 4. All units and individuals have the right to report to a state organ or to file charges with a court, concerning any behavior that breaches the regulations.

CHAPTER 2. REGISTRATION AND LICENSING

Article 5. The state has established a license registration system. License certificates are to be handled by the health and public security departments.

Article 6. All radiation workplaces either newly built, renovated, or expanded must have their radiation protection facilities designed, examined, approved, constructed, inspected, accepted, and put into production simultaneously with the principal part of the project.

The design of radiation protection facilities must go through the health administrative department, joined by the public security department, of the province, autonomous region, or municipality directly under the central government where the construction site is located, for examination and consent. After completion, the facilities must go through health, environmental protection, public security, and other departments concerned to be checked and accepted and to obtain license registration certificates before opening for use.

Those engineering projects involving the treatment of radioactive waste liquids, exhaust gas, and solid trash must submit, at the time of applying for examination, a document approved by the Environmental Protection Department on the assessment of the impact on the environment. After completion, the projects must go

through health, public security, environmental protection, and other departments for inspection, acceptance, and approval.

Article 7. Before making, using, or selling beam installations, all units must apply to the health administrative department of the province, autonomous region or municipality directly under the central government, for permission; and before making, using, or selling radioisotopes and/or beam installations with radioactive sources, all units must apply to the health administrative department of the province, autonomous region, or municipality directly under the central government and to the public security department at the same level for permission and registration. Those who are involved in storing or disposing radioactive waste liquids, exhaust gas, or solid trash, must hand in environmental impact report forms (or documents) to the environmental protection department of the province, autonomous region, or municipality directly under the central government for approval before applying for license registration. Only after obtaining license registration certificates, may the radioactive work within the scope under registration begin.

Article 8. Those units applying for license and registration must meet the following basic requirements:

- 1) They must be provided with places, facilities, and equipment suitable for the radioactive work to be undertaken. Relevant information is to be submitted in this regard.
- 2) They must be staffed with personnel for radioactive work who have appropriate specialization, sufficient protection knowledge, and good health. Relevant documents of proof are to be provided in this regard.
- 3) They must have specially assigned or ad hoc radiation protection management units or full-time or part-time staff, and they must have the necessary protective gear and monitoring instruments. Personnel namelists and complete equipment lists are to be forwarded in this regard.
- 4) They must have relevant official documents on safety protection management systems and regulations, and these are to be supplied.

Article 9. License registration certificates are to be rechecked within 1 or 2 year intervals, and the results of rechecking are to be recorded with the original departments who examined and approved the work.

Those units who undertake radioactive work and who are desirous of changing license registrations must go to the original departments with the license registration documents to apply for any changes. In the case of discontinuing radioactive work, the responsible units must go through the procedures of deregistration with the original departments who examined and approved their registration.

### CHAPTER 3. MANAGEMENT OF RADIATION PROTECTION

Article 10. Administrative departments on a level higher than the units undertaking radioactive work are responsible for managing the radiation protection work within their own departments and should periodically check the units to see that they are implementing radiation protection on the basis of state regulations and standards.

The persons responsible for the units undertaking radioactive work should adopt effective measures to bring the units' radiation protection work up to the requirements stipulated in the state's relevant regulations and standards.

Article 11. The places where radioisotopes are made, used, or stored, as well as the places where beam installations are manufactured or operated, must be equipped with protective facilities. The entrance to these places must put up radiation signs and install the necessary protection interlocking mechanism, alarm systems, and work-in-progress signal lights.

Outdoor or field radioactive work must delimit the areas for safety protection, put up danger signs, and assign patrol staff as necessary.

Experiments in open waters or in underground waters using radioisotopes, must get approval on the provincial level from environmental protection and health administrative departments.

Article 12. Radioisotopes must not be placed alongside inflammables, explosives, or erosives. Storerooms must be protected by fire extinguishers, burglar alarms, and leak-proof security measures, and a person should be specifically designated to safekeep the radioisotopes. Storing, taking out, using, and returning radioisotopes must be registered, and checked, to have book figures accurately reflect the actual storage.

Article 13. The units or individuals who purchase, sell, transfer, allocate, or loan out radioisotopes must have a license registration certificate, and must restrict their activities within the limits of the license registration. They must also report to health and public security departments of the same levels for record filing. To conduct activities without a certificate or beyond the limits of the registration is strictly forbidden.

Article 14. The units or individuals who import instruments incorporating radioisotopes must file reports with health, public security, and environmental protection departments for record. Those units or individuals importing minerals, products, or consumer goods, with radiation emission in excess of the exempt amount, should apply at the port of arrival to a health administrative department of provincial level for a monitoring check.

The units or individuals working on imported materials of radioactive nature, when being involved in the storage and disposal of radioactive waste liquid, exhaust gas, or

solid trash, must hand in beforehand, environmental impact report forms (or documents) to the environmental protection departments of the province, autonomous region, or municipality directly under the central government; and after obtaining approval, may proceed to a health administrative department on or above the county level, to apply for license certificates, and also report to public security departments for registration.

Article 15. The radioisotopes consigned, shipped, or carried by the owner, and the empty containers having been used for radioisotopes, must be packed and checked for radiation dosage according to relevant national transportation regulations; and they must be examined by the transport and health departments on or above the county level before transportation.

Article 16. The manufacture of equipment incorporating radio isotopes, beam installations, and devices for protection against radiation, must comply with the requirements of radiation protection. Products below standards are not allowed to leave their factories.

Article 17. The manufacture of consumer goods, articles, and materials that contain radioactive substances, and of electrical products with X-ray emission, must comply with the requirements of radiation protection. Products below standards can not be put on the market.

Article 18. The application of radioisotopes and beam installations for radiating food, medicine, cosmetics, and in medical equipment, and to make other products to be used on human bodies, must comply with national health regulations and standards.

Article 19. The application of radioisotopes and beam installations in diagnosis and in curing patients, and in medical checkups, must have the illumination dosage strictly controlled to avoid excessive radiation.

Article 20. The units undertaking radioactive work must strictly observe the state's regulations regarding the personnel participating in radioactive work, in particular regarding monitoring radiation dosage on individuals and management of health for the individuals.

Article 21. Personnel already participating or about to participate in radioactive work must go through a health check, and must acquire knowledge of radiation protection and of regulations through training. Only qualified people are allowed to do radioactive work.

### CHAPTER 4. MANAGEMENT OF RADIOACTIVE ACCIDENTS

Article 22. The state manages radioisotope and beam accidents (hereinafter referred to as radioactive accidents) by a system of management on levels, reporting, and case documentation.

Article 23. A unit which meets with a radioactive accident must take immediate protective measures to minimize the consequences, to protect the site of the accident, and to report to health and public security

departments on or above the county level. Those accidents that may likely pollute the environment must be reported to local environmental protection departments as well.

Article 24. The units or individuals who meet with a radiation accident should compensate those who suffer from the accident for economic loss, and for medical checkups and treatment charges, and should pay for the various expenses in dealing with the accident. However, if it can be proved that the damage is caused by the sufferer himself purposely, then the units or individuals are not responsible for compensation.

#### CHAPTER 5. SUPERVISION OF PROTECTION AGAINST RADIATION

Article 25. Health departments on or above the county level are responsible for supervising the radiation protection from radioisotopes and beam installations in the area under their jurisdiction. Their main duties are:

- 1) To be responsible for supervising and inspecting radioactive works;
- 2) To coordinate the implementation of radiation protection regulations;
- 3) Jointly with the other departments concerned, to conduct investigations and to handle radioactive accidents;
- 4) To publicize and to disseminate radiation protection knowledge and to organize training and education in respect of law and regulations;
- 5) To deal with arguments arising from radiation supervision and protection.

Article 26. The environmental protection departments of the province, autonomous region, and municipality directly under the central government supervise the storage and disposal of radioactive waste liquid, exhaust gas, and solid trash in the application of radioisotopes and of beam installations that have sources of radiation. Their main duties are:

- 1) To examine and approve environmental impact report forms (documents);
- 2) To inspect waste liquid, exhaust gas and solid trash, and to accept the ways of disposal;
- 3) To implement supervision and monitoring of storage and disposal of waste liquid, exhaust gas and solid trash;
- 4) Jointly with other departments concerned, to deal with accidents that cause radiation pollution.

Article 27. The public security departments on or above the county level supervise and manage the safety and security in the application of radioisotopes. Their main duties are:

- 1) To implement the registration of radioisotopes and sources of radiation;

- 2) To inspect for safety and security the storage of radioisotopes and radiation sources;

- 3) To participate in dealing with radioactive accidents.

Article 28. In the health administrative departments on or above the county level, positions of radiation protection supervisor are to be filled by people with certain specialized qualifications and experience in radiation protection work, and are to be appointed by health administrative departments on the provincial level.

Article 29. Radiation protection supervisors enforce legal supervision and inspection of the radioactive work under their jurisdiction, and, in accordance with stipulations, are to collect samples and demand relevant information. In so doing the units concerned must not refuse or cover up the truth. Secret information should be handled according to national security regulations, and the supervisor should be responsible for keeping the secrets.

Article 30. The radiation protection supervisor must strictly observe law and discipline, enforce law impartially, and must not neglect duty or behave fraudulently for his own or his family's benefit.

#### CHAPTER 6. PENALTIES

Article 31. For those units or individuals who breach these regulations, the health administrative departments on or above the county level, may, according to the degree of seriousness, either issue a warning demanding correction within a reasonable time frame, or suspend work operation pending satisfactory rectification, or impose a fine and confiscate illegal gains, or in the most serious cases penalize administratively and notify the public security departments to revoke licence registration.

The units or individuals causing environmental pollution accidents due to improper storage or disposal of radioactive waste liquid, exhaust gas, or solid trash are to be punished by the environmental protection departments of the province, autonomous region, or municipality directly under the central government, in accordance with the stipulations in the national environmental protection law.

Article 32. The units or individuals who refuse to accept the penalty ruling of a health department or environmental protection department may appeal within 15 days after the receipt of notification of the penalty to the administrative department, of one level higher than the penalty-ruling administrative department, for reconsideration. However, the decision on radiation protection control measures must be implemented without delay. Those who refuse to accept the result of reconsideration may appeal again to the People's Court within 15 days after receiving the notification of the results of the reconsideration. For those who do not implement the administrative penalty and do not file an appeal within the specified period of time, the departments who make

the decision may apply to the People's Court for enforcing the penalty clause.

Article 33. In the case of the regulations being breached, causing a radioactive accident with only minor consequences, public security organs may penalize the offender according to the Public Security Management and Punishment Act. In the case where grave consequences occur, constituting a crime, judicial organs may investigate and affix criminal responsibility according to law.

For those who make use of radioisotopes or beam installations in sabotage activities, or in damaging other people intentionally, so as to constitute a crime, judicial organs may investigate and affix criminal responsibility according to law.

#### CHAPTER 7. APPENDIXES

Article 34. The regulations adopt the following terminology: Radioisotope—radioactive substance excluding nuclear fuel, raw nuclear ore, and nuclear material.

Beam Installation—X-ray machine, accelerator, and neutron generator.

Electrical Products with X-ray Emission—electrical products not for X-ray generation, but with X-rays generated in the course of their production or operation process.

Article 35. The Health Administrative Department of the State Council, jointly with the Environmental Protection Department and Public Security Department, draft bylaws, in accordance with these regulations, on implementation details.

Article 36. The regulations are to be interpreted by the Health Administrative Department of the State Council, jointly with the Environmental Protection Department and Public Security Department.

Article 37. The regulations come into force upon promulgation. The "Regulations Governing Health Protection Management in Connection with Radioisotope Tasks", promulgated on 24 February 1979 by the Ministry of Public Health, Ministry of Public Security, and National Commission for Science and Technology, is now superseded.

#### **Advanced Radiation Facility Becomes Operational**

*OW0812150389 Beijing XINHUA in English  
1439 GMT 8 Dec 89*

[Text] Chinese scientists have succeeded in realizing the synchrotron operation of a radiation facility related to the Beijing electron-positron collider (BECP), a new achievement in the field of high energy physical research.

The synchrotron radiation facility is the first large system for applied experiments of the BECP. BECP is one of the state's major scientific research projects.

Wang Ganchang, a famous Chinese nuclear physicist, said that the facility is state-of-the-art.

It can be used in basic and applied research in biochemistry, biophysics, materials science and other fields, Wang said.

In tests on crystals, the new facility proved to be far more efficient than normal equipment. Some new phenomena have been discovered.

The facility will also have industrial applications, Wang said.

## BULGARIA

### Accident in Kozloduy Nuclear Plant Denied

#### Radioactivity Data Released

*AU2811141789 Sofia OTECHSTVEN FRONT in Bulgarian 24 Nov 89 p 2*

[Unattributed report: "Voice of Nature"]

[Text] The Committee for Peaceful Uses of Atomic Energy has provided the following data on the radiation situation in the country:

The following mean, daily specific-activity figures for the environment were established for the months of September and October 1989 at the country's testing stations, based on daily analyses made in the laboratories for "Measurement of the Radioactivity of Air, Water, and Atmospheric Precipitation" [atmosferni otlaganiya] in the system of the "Hydrology and Meteorology" Main Administration under the Bulgarian Academy of Sciences.

Testing Station	Sep 89	Oct 89	1983-85
Air at Ground Level			
(microbecquerels per cubic meter)			
Sofia	2.9	2.8	1.0-3.0
Plovdiv	7.3	9.7	0.1-7.2
Varna	5.6	4.8	0.1-13.4
Burgas	2.7	2.5	0.0-4.8
Pleven	2.7	2.4	1.0-7.2
Atmospheric Deposits			
(becquerels per square meter)			
Sofia	1.4	1.3	0.4-1.3
Plovdiv	1.0	1.2	0.1-1.2
Varna	0.9	0.6	0.1-0.2
Burgas	0.9	0.8	0.1-0.9
Pleven	0.3	0.3	0.1-1.3
Precipitation			
(becquerels per liter)			
Sofia	1.1	1.0	0.1-2.0
Plovdiv	8.7	2.1	0.2-1.4
Varna	0.5	0.7	0.1-1.1
Burgas	0.1	0.2	0.0-0.4
Pleven	0.4	0.2	0.0-2.0

The base used for comparison was the period from 1 January 1983 through 31 December 1985, for which the ranges of the mean annual values of the relevant quantities are shown.

In response to readers' inquiries, scientific worker Angel Antonov of the Hydrology and Meteorology Main Administration explains that the monthly data published in OTCHSTVEN FRONT includes figures for some of

the largest towns in Bulgaria. The specialized laboratories produce several thousand sets of figures annually, and their publication in the mass media produces no positive result and is impossible in practice. For this reason, only that portion of the full volume of information has been selected that gives a most representative picture of the radioactive pollution in the regions where the bulk of our population live. The tables show the mean monthly values for radioactive pollution of technical origin, obtained after eliminating the contribution from natural radionuclides.

Against the background of the other values, one notices a marked increase in the figure for the activity in precipitated water from the town of Plovdiv. The rise was caused by the precipitation recorded on 28 September 1989, which had a specific activity of 9.8 becquerels per liter, and the fact that rainfall occurred on only 2 days in September.

Such an occurrence may be regarded as normal, because after a prolonged dry period the atmosphere becomes saturated with dust particles, which are effectively washed out of the air with the first rain. These dust particles are produced by being detached from the ground surface and becoming suspended in the atmosphere, in which they may travel for considerable distances before they are washed out of the air by the next rain.

For the time being, pollution from a local source is excluded, since on the same date most of the stations in southern Bulgaria recorded a slight rise in activity in rainwater, and there are no reports of accidents being recorded.

As the table shows, during October the specific activity values returned to normal and are close to the values in the period selected for comparison.

### Soviet Safety Chief Visits

*AU2911200489 Sofia Domestic Service in Bulgarian 1830 GMT 29 Nov 89*

[Text] Council of Ministers Chairman Georgi Atanasov today received Vadim Malyshev, chairman of the USSR State Committee for Safety in Industry and Atomic Power Industry.

They exchanged information on the general inspection being carried out in Bulgaria on the nuclear safety of the No. 5 Power Unit at the Kozloduy Nuclear Power Plant. A number of problems were touched upon relating to the safety of the nuclear power industry of Bulgaria and the Soviet Union, such as radioactive waste, the turnover in cadres, and the standard of their professional training.

During the conversation, special attention was paid to intensifying the joint activity of the two countries' control organs, as well as to the prospects for developing the atomic power industry.

### Radioactivity Measured

AU3011132289 Sofia BTA in English  
1156 GMT 30 Nov 89

["Nuclear Power and the Social Risk"—BTA headline]

[Text] Today's OTECHESTVEN FRONT raises a number of questions in connection with the monitoring of the radiation level in this country, the control over this monitoring and the safety guarantees concerning nuclear power plants.

The occasion is a letter by the Ecoglasnost independent organization of November 14, this year, which reads that according to unconfirmed reports between November 3 and November 5, 1989, there has been a failure in one of the Kozloduy Nuclear Power Plant reactors and radioactive substances have been released into the atmosphere. Several days later, between November 10 and November 13, claims Ecoglasnost, the monitoring stations of the Committee for Environment Preservation have measured increased radioactivity. Further on the letter sets the question about the timely informing of the population in similar cases.

According to the investigation carried out by the newspaper the first tests of rain-water have really shown higher values (4-7 times) but toward the fifth day there have not been any increase in the values.

Apart from that, the Committee for Use of Nuclear Power for Peaceful Purposes which provided the data for the monitoring, has not received information from the Kozloduy Power Plant about exploitation changes or some accident related to radiation safety, points out the daily.

In spite of the fact that the data in the letter of Ecoglasnost have not been confirmed during the investigation OTECHESTVEN FRONT notes that this letter "gives an expression of the increased interest of the public in the radiation safety". The daily shares the opinion of Ecoglasnost that the informing of the public about these questions has long been a ripe necessity.

The author of the article thinks that the system which has been established for monitoring of the radioactive situation in this country, as well as the modern equipment for measurement and analysis, guarantee that there cannot be a radioactive pollution dangerous for the health of the people that could remain unnoticed. Boris Georgiev, deputy chairman of the Committee for Use of Nuclear Power for Peaceful Aims, says that in the case of worsened radioactive situation or some leakage from Kozloduy, the public will be immediately informed.

The article pays also attention to the demands of the independent civic group for protection from nuclear accidents for the provision of a "real and high safety" of the equipments and the people working at the Kozloduy Nuclear Power Plant or people living close to it.

The daily offers to revise the system of departmental control over the sources of ionizing radiation, nuclear plants included. It also raises a request for publication of the report on the influence of the Chernobyl mishap in Bulgaria.

Not long ago in an interview for VECHERNI NOVINI (of November 21) the chairman of the Energetics Association Prof. Nikola Todoriev, corresponding member of the Bulgarian Academy of Sciences, expressed the opinion that the development of the nuclear power supply in Bulgaria is necessary due to economic and ecological considerations, and even for the preservation of the independence in energy respect because this country does not have enough primary power supply resources of its own (about two-thirds of the energy resources are imported).

The Energetics Association will be closed as of January 1, 1990. With a decree of the State Council (November 22, 1989) a Committee for Energetics with the Council of Ministers has been established. Prof. Nikola Todoriev has been assigned its chairman.

### Nuclear Chief on Waste Problem

AU0212171589 Sofia BTA in English  
1436 GMT 2 Dec 89

[Text] Kozloduy, 2 Dec (BTA)—Having in mind the limited natural resources in Bulgaria, the development of nuclear power generation has no other alternative, but the safety of the stations should be guaranteed and reliable, the specialists say. Speaking about the nuclear power station in Kozloduy, Engineer Kiril Nikolov, chairman of the Nuclear Power Generation Association, stated that the station in Kozloduy (on the bank of the Danube) has never been the cause for any radioactivity increase.

Samples, tests, surveillance and control show that the radioactive concentration is far below the admissible limit. In order to guarantee safe work in future, some serious problems will have to be solved. They are related to the qualification of the personnel and the technical condition of the equipment. The danger of accident will not lessened if the power generation units are not brought in line with present-day standards of nuclear and radioactive safety. Unit Five for example was put into operation with 170 remarks.

To the question how radioactive waste and nuclear fuel are stored, Mr Nikolov replied that according to the design special depositories for keeping radioactive waste for no more than five years were built, but now 15 years have passed since that time and no other depositories have been built. At the request of the Soviet Union nuclear fuel should be kept here for five years, that is why we had to construct a buffer depository and we can build others, but they will pose a threat to ecology, he said. An all-round concept should be worked out for the solution of this problem.

**ARGENTINA****Talks on Space Research With Brazil Begin**

*PY2911193889 Buenos Aires NOTICIAS  
ARGENTINAS in Spanish 1625 GMT 29 Nov 89*

[Text] It was officially disclosed that Argentina and Brazil have established a "political framework" in which to select cooperation projects for the peaceful use of outer space.

According to a communique issued by the Argentine Foreign Ministry, this decision was made during the first meeting of the Argentine-Brazilian work group that was created through the joint declaration signed by Argentine President Carlos Menem and Brazilian President Jose Sarney last 23 August.

The communique states that "during the meeting there was a good exchange of information on the respective space research programs and the individual degree of development that has been achieved."

The meeting was presided over by deputy Foreign Minister Mario Campora and Minister Valle [not further identified] of the Brazilian Foreign Ministry.

**Trouble Reported at Embalse Nuclear Plant****Turbines Shut Down**

*PY0512150789 Buenos Aires NOTICIAS  
ARGENTINAS in Spanish 2300 GMT 4 Dec 89*

[Text] The Energy Secretariat has reported that the turbines at the Embalse nuclear plant, which generate nearly 13 percent of the country's daily energy demand, went down at 1330 today. The secretariat has noted that closing down the nuclear plant will create a "noticeable deficit" in the supply of electric energy.

The report was initiated at the National Atomic Energy Commission. It says that the Embalse nuclear plant will resume service on the morning of 6 December and that the shortage will be covered by operational and extraordinary measures. Meantime, the system is under control.

The prospects for the rest of the month are reasonably optimistic, especially if the turbines at San Nicolas Cinco, Piedra Buena Uno, and Puerto Nuevo Ocho plants are activated in the next few days.

The Embalse nuclear plant has the most important turbine complex of all the electricity generating system, supplying 10 percent of the peak demand and approximately 13 percent of the daily demand.

Officials from the secretariat have asked consumers to economize as much as possible as their contribution to overcome this emergency.

**Service Restored**

*PY0712114889 Buenos Aires NOTICIAS  
ARGENTINAS in Spanish 2210 GMT 6 Dec 89*

[Text] Energy Secretary Julio Cesar Araoz has reported that the Embalse nuclear plant, which went down 4 December, resumed operations at 1300 today and that, thanks to this event, the "electric emergency has been overcome."

"Nevertheless, the electric situation can become complicated as December goes by because this is the most critical period of the year, a period during which the system will be vulnerable," Araoz admitted.

Araoz pointed out that, for the time being, the energy system is "under control." He said that if the users help by curbing their demand and by rationally using electricity, "we will have no problem guaranteeing the supply."

"In sum, the system is still experiencing a deficit basically due to the high thermic unavailability, although the situation is under control," Araoz said.

The energy secretary asked consumers to use electricity "in a rational way and to avoid all nonessential consumption, such as air conditioning."

Araoz also stressed that the power grid received a vital boost following the activation of the Puerto Nuevo No 8 unit, which supplies 194 megawatts, permitting the generation of the maximum thermoelectricity possible."

The energy secretary said that now that the Embalse nuclear plant has resumed operations, it will be possible to reallocate the operational reserves that, over the past 24 hours, replaced the nuclear power supply."

**Second Shutdown**

*PY0812175089 Buenos Aires TELAM in Spanish  
2352 GMT 7 Dec 89*

[Text] The crisis that is affecting the national power system suddenly worsened when the Embalse nuclear power plant went out of service.

This 650-megawatt power plant in the city of Rio Tercero, Cordoba Province, went out of service today at 1100 due to a electronic equipment failure which automatically turned on the protection systems.

According to Luis Caruso, national energy director, everything is ready to bring the Embalse power plant on line 9 December at dawn.

It must be recalled that this power plant went out of service on 4 December, and it started full operations at 1900 yesterday.

The San Nicolas V power plant (350 megawatts) is scheduled to begin operating this week, while the Puerto Nuevo VIII turbine (?group) began working yesterday although it has not yet reached full power.

The first 300-megawatt turbine of the Piedrabuena power plant of D.E.B.A. [Buenos Aires Electric Power Administration] also began operating.

Caruso said that for the time being the failure of the Embalse power plant is being offset with the reserves from the Alicura plant [word indistinct] (?in) an operation that with the incident of 4 December made the water level drop by 2 meters after a long period of recovery.

However, once the Embalse nuclear plant resumes service, SEGBA [Greater Buenos Aires Electrical Services] will have to stop the Costanera VI turbine (?group) which has a serious water loss problem and which will be out of service for a week.

Caruso reiterated: "It is important for the population to understand that the national power system is in an emergency situation so people must make a rational use of energy."

#### Plant Resumes Operation

*PY0912171289 Buenos Aires TELAM in Spanish  
1522 GMT 9 Dec 89*

[Text] The Energy Secretariat has reported that the Embalse and San Nicolas V plants went on line again this morning, thus permitting an increase in the energy operational reserves. The report indicates that the Embalse plant, located 110 km southwest of Cordoba City, is once again operational after a 48-hour stoppage and that "the temporary emergency has now been brought under control."

The report states that although "the energy situation is under control, it has not been completely resolved. Consumers are therefore asked to be rational and to use electricity moderately."

The San Nicolas V plant once again went into operation today at 0900, generating 52 megawatts. The report also indicates that "other important units will be added to the system, thus permitting maximum thermal generation while the water level of the Embalse plant is recuperating."

#### Mining of Uranium Deposit in Cordoba Discontinued

*PY3011192489 Buenos Aires LA PRENSA in Spanish  
27 Nov 89 p 8*

[Text] Cordoba—Manuel Mondino, the chairman of the National Commission for Atomic Energy (CNEA), has reported that the mining of the Los Gigantes uranium deposit has been discontinued. He made his report to Architect Jose Luis Ramos, the Cordoba Province public works and services minister. Mondino also assumed the responsibility for achieving the ecologic recovery of the Los Gigantes area, which has been contaminated by spills of liquids from the Los Gigantes mine.

Operations in the mine were discontinued because of the low profitability arising from the "low ore grade" of the mineral extracted from the mine. Sanchez Granel S.C., the contracting company, and the CNEA have agreed to discontinue the operations for 3 months, with the option to extend this period for another 3 months.

The contract states that the Sanchez Granel company will be in charge of the ecologic reclamation of the mining area, a clause that applies in case of the termination of the contract. This project involves both removing polluting waste and reducing the level of chemical elements in the storage pools.

Mondino also indicated that in the agreement, the Sanchez Granel company has agreed to keep a 20-man crew to maintain and protect the facilities. It was also reported that during the next few days CNEA technicians will inspect the Los Gigantes plant to prevent any future accident.

It is noteworthy that the spills of polluting liquids from the plant have contaminated the neighboring rivers and creeks whose waters then flow into the San Roque Lake, which supplies drinking water to the estimated 1.3 million inhabitants of Cordoba.

Minister Ramos has announced that in late November 1989 an agreement will be signed in Cordoba between the Cordoba provincial government and the CNEA to form a mixed company, including private capital, that will be in charge of the construction of the pools and reservoirs of a future Cobalt-60 processing plant in the Embalse Rio Tercero area. This plant was planned by the previous government.

## BRAZIL

#### Nuclear Reactor Accord Signed With USSR

*PY3011215489 Sao Paulo FOLHA DE SAO PAULO in Portuguese 24 Nov 89 p A-5*

[Text] The Brazilian Government has imported two VAX-8600 computers (one of the most sophisticated computers on the market) and 14 minicomputers that will detect, in less than 1 second, any abnormal condition in the Angra 1 nuclear plant, in Angra dos Reis, (154 km from Rio de Janeiro). The plant directorate reported that the computers cost approximately \$2.5 million (16.5 million new cruzados at the official exchange rate). Each VAX cost \$800,000 (some 5.2 million new cruzados). The nuclear plant went down 55 days ago for the replacement of fuel (enriched uranium). The replacement was completed 10 days ago, but Angra I may remain closed because of a pending court order, which demands tighter safety measures before the plant can be reopened.

The computers are part of the Angra 1 computer system, which is called Sica. The system was developed by the coordinating board of postgraduate engineering courses (COPPE) of the Rio de Janeiro Federal University (UFRJ), in northern Fundao Island. The plant's directorate reported that the computers receive data from

Angra 1 every 2 seconds, and provide a general picture of the plant's operational conditions. The plant operators used to receive the data through the plant's control room.

According to the plant's directorate, the COPPE began working on the Sica system 2 years ago, and it was implemented in the plant 10 days ago. Soviet physicists Andrei Gagarinskiy, Armen Amagiam, and Nikolay Babaev are members of a Soviet delegation which is visiting Brazil. They visited the plant yesterday. Gagarinskiy said that generally Brazil has good prospects in this sector.

The Soviet delegation was not aware that there is a pending court order banning the reopening of Angra 1 until it improves its safety conditions. The closure order on the plant was filed 2 years ago by Deputy Carlos Minc (PV [Green Party]—Rio de Janeiro) and by journalist Fernando Gabeira, who is the PV president. Furnas Centrais Eletricas, which is responsible for the plant, has appealed the decision before the regional appellate court of Rio de Janeiro, which has not yet made a decision on the subject.

Physicist Alexander Protsenko, president of the Soviet State Committee for the Peaceful Use of Nuclear Energy is among the Soviet delegation. Yesterday he visited the Foreign Ministry in Brasilia to arrange the final details of a technical and scientific cooperation accord that will be signed with Brazil. The accord provides for the supply of information on fast breeder [two preceding words in English] reactors. Brazil and Argentina are doing research on this type of reactor. Argentina will also participate in the accord with the Soviets. The Soviet physicists also signed a protocol of intent for doing research on small reactors and on emergency plans for nuclear facilities.

#### **Navy To Install PWR Nuclear Reactor in 1995**

*PY0512181089 Sao Paulo FOLHA DE SAO PAULO in Portuguese 3 Dec 89 p A-4*

[Text] The Aramar Experimental Center [Centro Experimental Aramar—CEA], in Ipero (125 km west of Sao Paulo), will install a PWR (pressurized water reactor) nuclear reactor in 1991. The reactor is scheduled to go live in 1995. This was reported yesterday during a news conference by Rear Admiral Othon Luis Pinheiro da Silva, the president of the Special Projects Coordinating Board (COPEP), which is dependent on the Navy. The COPEP is responsible for the project.

Nuclear reactors produce energy from the reactions that occur among atom nuclei. When the nuclei of uranium atoms break up, a lot of energy in the form of heat is released. The reactor uses this heat to produce steam, which is used to drive electricity generators. The PWR reactor uses the heat of the reaction to make the pressurized water cool the uranium.

According to studies by the COPEP, by mid-1990 Aramar will supply fuel for the nuclear reactor of the Institute for Nuclear and Energy Research (IPEN), the

only institute in the country which produces radioisotopes (radioactive material) for medical use. The IPEN nuclear reactor is not working at full capacity because of the lack of enriched uranium. In 1989 Aramar processed 400 kg of uranium, compared to 4 tons (4,000 kg) foreseen for 1990.

Pinheiro da Silva said that he "is working with a tight budget" and with funds mainly provided by the Navy Ministry. A \$50 million (717 million new cruzados) budget has been requested for 1990, of which 70 percent will be invested in equipment and reactor components. Since 1979, the Brazilian nuclear program has spent \$279 million (3.9 billion new cruzados), Pinheiro da Silva said.

According to the rear admiral, the uranium is being enriched to 20 percent and "there is no need for more than that." He added that the process does not produce radioactive waste (atomic waste), but when the reactor begins to work, the spent uranium will be placed in a storage pool.

The rear admiral said he does not believe that Luis Inacio Lula da Silva (People's Front of Brazil) will stop the research projects that are being carried out if he becomes president.

## CHILE

#### **New Nuclear Reactor Installed in Lo Aguirre**

*PY0112170289 Santiago EL MERCURIO in Spanish 23 Nov 89 p B1*

[Text] The president of the Republic, Augusto Pinochet, visited the "Lo Aguirre" Nuclear Research Center on 21 November. There the head of state, along with Defense Minister Vice Admiral Patricio Carvajal and Economy Minister Pedro Larrondo, gained insight into the operation of the experimental nuclear reactor and the various systems associated with it.

This reactor, the second one installed in our country, became operational without foreign advisers, and the state did not appropriate any special financial resources for it. In its initial stage, the reactor will operate with fuels of low enrichment.

This technological achievement, involving advanced technology, has aroused strong interest among the nuclear officials of some countries, such as the presidents of the nuclear commissions of Argentina, Peru, Uruguay, and Iraq, who will visit the facilities in the near future.

The "Lo Aguirre" Nuclear Research Center reactor and its systems will be oriented to the peaceful uses of nuclear energy, with the goal of supporting the country's socioeconomic development. It was also reported that this reactor, as well as the one in "La Reina," will be available to universities and to scientific and technical organizations who want to conduct research work with the National Nuclear Energy Commission professionals.

## EGYPT

### **Paper Cited on Local Manufacture of Nuclear Fuel**

*NC3011082189 Cairo Domestic Service in Arabic  
0435 GMT 30 Nov 89*

[Text] The newspaper AL-AHRAM reports that Egypt has begun to manufacture nuclear fuel from local nuclear raw materials with the aim of self-sufficiency in providing fuel for nuclear reactors. Manufacturing processes have begun at a nuclear fuel plant built in cooperation with the FRG. The paper notes that the manufacturing of nuclear fuel from local nuclear raw materials is designed to emphasize the transfer of nuclear fuel manufacturing technology to Egypt for the first time. It is very advanced technology.

## IRAN

### **Official Interviewed on Uranium Discovery**

*NC0112132889 Tehran Domestic Service in Persian  
0430 GMT 1 Dec 89*

[Text] Mr Ayatollahi, deputy for raw materials and fuel in the Atomic Energy Organization of Iran, spoke to our correspondent on the work underway to discover uranium in the country. He said that these activities were concentrated in 10 areas. In the first stage, 3,200 tons of uranium and 4,200 tons of molybdenum were discovered. Your attention is drawn to this interview:

[Begin recording] [Unidentified correspondent] Mr Ayatollahi, in your capacity as deputy for raw materials and fuel of the Atomic Energy Organization of Iran, could you please tell us what the latest figures are on the discovery of uranium in the country?

[Ayatollahi] In the name of God, the merciful, the compassionate. The prospecting activities of the Iranian Atomic Energy Organization have been concentrated in 10 of the (?100 areas) which have been reported to be emitting radiation and are being given priority for uranium prospecting operations. At present, the quantity which has been definitely reported to exist in the initial stage of intensive prospecting is 3,200 tons of uranium and more than 4,000 tons of molybdenum. In addition, minerals such as (itrium), (sirium), and (lantonium) which are extremely rare and valuable for the production of super conductors have been identified in this mineral group.

In general, we are also prospecting in Azarbayjan, Khorasan, Yazd, Sistan va Baluchestan, and Hormozgan Provinces. Furthermore, our research operations on our (?high bleaching) project have reached the final stage and one of the mines which has a large quantity of reserves for this stage of operations will, God willing, begin operating in the last part of the current year. It is expected that this project will precede our actual project which will be implemented, God willing, next year.

[Correspondent] Have any new reserves been discovered other than those we have in hand already?

[Ayatollahi] In the five provinces I mentioned, there are 10 areas where we have prospecting operations in progress. The work of (?high bleaching) will also take place in Bandar-e 'Abbas and Bandar-e Lengeh. This is one of the areas where we attained some definite results.

[Correspondent] Thank you very much.

[Ayatollahi] You are welcome. [end recording]

## ISRAEL

### **Israeli-South African Military Ties Noted**

*NC0212073989 Cairo Domestic Service in Arabic  
0500 GMT 2 Dec 89*

[From the "Listeners' Questions" program]

[Text] To listener Ahmad Muhammad Subhi, from the College of Economics, and Rushdi 'Abd-al-Hamid Khidr, from al-'Ajuzah:

Israel, with the help of South Africa, has made tangible progress in improving its missile technology. South Africa has refused to sign the nuclear nonproliferation treaty as has Israel, which sees South Africa's vast area as offering enormous potential for carrying out nuclear experiments that cannot be conducted in the current territory controlled or occupied by Israel. Also, South Africa has ample deposits of uranium, including the radioactive uranium used in making nuclear bombs. In return, Israel assists South Africa in designing nuclear bombs.

## PAKISTAN

### **Spokesman Comments on V.P. Singh's Remarks**

*BK0512151489 Islamabad Domestic Service in Urdu  
1400 GMT 5 Dec 89*

[Text] Pakistan has always expressed the desire to hold a meaningful dialogue with India on all bilateral issues, including the nuclear issue. This was stated by a Foreign Office spokesman in Islamabad today while commenting on a reported statement by new Indian Prime Minister V.P. Singh on negotiations with Pakistan on the nuclear issue. He said Pakistan does not believe there should be a nuclear race in South Asia. He categorically stated that Pakistan does not possess any nuclear weapons, nor does it intend to produce any.

Referring to the Indian prime minister's remarks that Pakistan should start negotiations, the spokesman said Pakistan has made several proposals to India for an understanding on the issue since early 1974. But India failed to respond to any of these proposals.

In reply to another question, the spokesman recalled Prime Minister Benazir Bhutto's statement that Pakistan's nuclear research program is not intended for military purposes, but

for completely peaceful objectives. Pakistan hopes the new Indian government will cooperate in keeping the region free from nuclear weapons.

### Mishandling of Chernobyl Cleanup Criticized

90UN0325N Moscow LITERATURNAYA ROSSIYA in Russian 27 Oct 89 43 pp 6-7

[Article by Vasil Yakovenko, member of the Commission on Ecology of the Belorussian Communist Party Central Committee and the Council of Ministers of the Belorussian Soviet Socialist Republic, member of the Governing Presidium of the Belorussian Ecological Union, and chairman of the Belorussian Union of Writers journalists' section: "Land of Nuclear Fear: Belorussia"]

[Text] The accident at the Chernobyl nuclear power station [AES] resulted in the greatest (after the Great Patriotic War) misfortune for the Belorussian people, and equally for the inhabitants of a number of regions in Russia and the Ukraine. The real danger required protective measures and the evacuation of the population from a 30-kilometer zone, as the result of which a mass resettlement of radiation victims started and refugees appeared—one reason for comparing this tragic event of life with war. But the "front" was indistinct and was sensed locally only by a metallic taste in the mouth.

The fact that there has been a constant concealment of the unprecedented, insidious, and universal misfortune from the people themselves and neglect of their health has been seen quite clearly from the first days of the tragedy.

Fearing that the uncompromising and explosive truth at the time of the accident at the Chernobyl AES would be bad for the spirit of the people, the Ministry of Health of the BSSR [Belorussian Soviet Socialist Republic] and the Minsk city executive council [gorispolkom] in the person of their leaders and sanitation physicians did nothing to guard the population of the capital against the effects of the radioactive cloud.

The secrecy in this irreparable misfortune is increasing the misfortune many times over.

In March 1987 a group of specialists from the USSR State Agroindustrial Committee, the Belorussian State Agroindustrial Committee, and the BSSR Ministry of Health submitted a proposal to the USSR Council of Ministers to halt agricultural production and resettle the people from zones with a level of contamination greater than 40 curies per square kilometer. These proposals, however, were rejected by the chairman of the government commission for the cleanup after the Chernobyl accident, B.Ye. Shcherbina. He classified as secret information about the levels of radioactive contamination at particular populated points where maximum permissible levels were being exceeded.

The "secrecy" made it possible even for some high-ranking officials to remain uninformed. "I know nothing" was a convenient way to exist. But existing in ignorance, like inaction, becomes a crime for particular individuals who thus relieve themselves of the trust of the people.

In 1989, for example, when he was chairman of the BSSR Supreme Soviet Presidium, G.S. Tarazevich visited Krasnopol'skiy, Cherikovskiy, and certain other rayons in Mogilev Oblast. With his pockets stuffed with memoranda, requests, and appeals, Tarazevich promised to investigate the situation within two weeks and to help; he swears this. However, he did nothing. He answered none of the numerous applications.

The instructions issued by the USSR Ministry of Health Main Administration on 26 June 1986 and published in the weekly NEDELYA (No 30, 1989) testify to the policy of inhuman and maleficent concealment of key information by the medical people. Evidently it is thanks just to similar instructions, orders, and arrangements reflecting the "policy" of the leading center that today workers in the apparatus of the USSR Ministry of Health and the BSSR Ministry of Health are able to deny the obvious. As, for example, the Deputy Minister of health and USSR chief state sanitation medical officer, A.I. Kondrusev; the Vice President of the USSR Academy of Medical Sciences and Director of the USSR Ministry of Health's Institute of Biophysics, L.A. Ilin, and his former deputy, Doctor of Technical Sciences K.I. Gordeyev; the Chief of the USSR Ministry of Health's Department of Radiation Medicine, V. Redkin; the Director of the BSSR Ministry of Health's Institute of Radiation Medicine, Academician of the USSR Academy of Medical Sciences V.A. Matyukhin; and the former chief state sanitation physician of the BSSR, V.N. Buryak, who have repeatedly, verbally, and in writing, publicly claimed that work on the cleanup of the accident at the Chernobyl AES, just like living and working in a zone contaminated with radionuclides, is a threat to no one. "Analysis of the data obtained as a result of medical examinations and outpatient observation of people living in these regions conducted by the USSR Ministry of Health," reports the First Deputy Chairman of the USSR Council of Ministers Bureau and member of the government commission, V. Maryn, in answer to an inquiry from a deputy, "indicates that no diseases associated with the effects of radiation have been recorded among the population of in the monitored areas." Let me quote from another document: "The BSSR Ministry of Health reports that according to its information, and also according to data from world scientific literature and experience, the levels of radiation being recorded in a number of rayons in Gomel and Mogilev Oblasts cannot affect people's health" (a letter from V.N. Buryak to the BSSR Ministry of Education dated 4 April 1989). This opinion of a man who occupies an official post and is giving his blessing to children—schoolchildren and students—and who is engaged in field work in a contaminated zone, agrees neither with world experience nor with the data provided by Soviet specialists. The facts indicate otherwise.

The Director of the USSR Academy of Medical Sciences All-Union Hematology Scientific Center, A.I. Vorobyev, reports to the Gomel Oblispolkom [oblast executive committee] that "of four patients with acute leukemia

who were admitted to the center's clinic from Gomel and Mogilev Oblasts (one adult and three children), in two the radiation dose was, according to chromosome analysis, 50 and 30 rads respectively. Moreover, in a woman who died from acute leukemia, the leukemic cells contained the chromosomal marker typical of radiation damage. Here we have a certificate from the Kiev Oblispolkom Internal Affairs Department, published by the newspaper MOSKOVSKIYE NOVOSTI (No 31 dated 30 July 1989): "Fifty-seven associates have suffered from radiation sickness, and 4,750 from autonomic vascular dystonia, and in 1,500 there has been an exacerbation of chronic diseases of the respiratory organs, the cardiovascular system, and the gastrointestinal tract."

The damage that has been done to the population of Belorussia by radiation is described just as eloquently in a certificate issued and passed to the Belorussian Communist Party Central Committee by scientific leaders from dozens of scientific research institutes in the republic (dated 24 April 1989). Let me quote some excerpts from it:

"Studies of the overall incidence of disease have established that in most regions being observed there has typically been a general increase in the incidence of somatic disease among the adult population and children during the period since 1986.... In 1988, compared to the period before the accident, the average incidence of disease among the adult population in the monitored rayons of Gomel Oblast has risen by a factor of 2.4 to 2.8; for Mogilev Oblast the figure is a factor of 1.8 to 2.2; the figures for the incidence of disease among children are an increase by a factor of 4.1 to 4.9 in the rayons being monitored in Gomel Oblast, and a factor of 3.5 to 4 in Mogilev Oblast."

"In studies of the immune system, in a significant proportion of those investigated a change was found in the indicators of immunity, testifying to a lowering of the indicators and the emergence of the preconditions for the formation of autonomic pathologies. Significant changes have been found in the genetic apparatus of lymphocytes and bone marrow in the adult population and in children."

It has been established that the indicators for primary disability in workers and employees in the 11 rayons of Gomel Oblast where the level of contamination is being monitored rose from 40.3 per 10,000 workers and employees in 1985 to 47.7 in 1988."

Practice shows the catastrophic changes in the physical conditions and sense of well-being in the population living in contaminated territories, and the dynamics of the increase in pathological deviations from the norm, primarily in children, of which physicians in the local treatment centers are becoming increasingly convinced. According to reports from Narodichskiy Rayon in Zhitomir Oblast, "there has been a sharp increase in the number of diseases of the eye in adults and children.

Whereas in 1984 a total of 24 people suffered from cataracts, in the first quarter of this year alone there have been 195. A steady increase is being observed of anemia in children." (NEDELYA No 30, 1989). In general, in the contaminated oblasts of Belorussia there is a deterioration in the qualitative hematologic values, the genetic system is suffering, and the number of malformed fetuses is increasing, which must all lead to a weakening of intellectual and physical powers, mass "radiation AIDS," and degradation of the entire people, particularly if one takes into account the dispersal in various ways, deliberate and unintentional, of dangerous radionuclide dust throughout the republic.

For just with the connivance and encouragement of the sanitation service these kinds of things can happen:

- construction and commissioning of decontamination stations along the roads in the Gomel area, in which millions of rubles have been invested, have been frozen;
- equipment (tractors, cars, combine harvesters, and so forth) written off because of serious contamination and earmarked for destruction, have been taken piecemeal from Braginskii, Khoynikskii, and other contaminated rayons to relatively clean or clean areas adjacent to them;
- to this day the refrigeration rooms at meat combines have been stuffed with "dirty" 1986-vintage carcasses, and tens of thousands of tons of this dangerous meat has been put in food as an additive;
- dirty fodder, including concentrated feeds and hay, has been taken from the resettlement zones to neighboring villages and rayons in Gomel Oblast;
- instructions from the BSSR State Agroindustrial Committee notwithstanding, on orders from the Gomel Oblast agroindustrial committee (No 138 dated 23 April 1987), land in the resettlement zone in Braginskii, Khoynikskii, and Narovlyanskiy Rayons withdrawn and given over to the Goszemzapas [state fallow land authorities] has been sown with crops using the shift method using resources from virtually all rayons in the oblast; farm specialists have been receiving fabulous bonuses for the harvests from this land—up to six or eight months of their salaries;
- the rayon procurement offices have enclosed themselves in barbed-wire entanglements and waving rags, thanks to which the procurement plans have been doubled, and the administration is warming its hands on this;
- "dirty" cattle are being grazed and fattened in clean areas, and because of this more and more land is becoming contaminated through their dung;
- "dirty" milk is returned from processing to the farms to feed calves;

- radionuclide-contaminated produce, and also turf blocks, firewood, lumber, and timber materials, are still being massed produced and processed, and marketed both within the republic and beyond;
- schoolchildren are being recruited for the forest plantations in the resettlement zone;
- the "Guide for Carrying on Agriculture under Conditions of Radioactive Contamination" approved by the USSR State Agroindustrial Committee (1988) is not being observed both with respect to the section banning agricultural production on territories with a radiation level greater than 80 curies per square kilometer (for example, agriculture was still being carried on in 1989 in Krasnopol'skiy and other rayons), and with respect to the withdrawal of arable land with a radiation level of more than 40 curies per square kilometer from the crop rotation; in Vetkovskiy Rayon, for example, according to local radiologists the "guide" was received only a year after it was adopted.

Incidentally, as far back as 29 August 1987 the Belorussian SSR State Agroindustrial Committee issued order No 28, which strictly banned "the planning of crop production for food on land with a level of more than 40 curies per square kilometer of cesium 137." The order has been ignored by specialists in the oblasts and rayons.

In some areas the local leadership is getting not unsubstantial bonuses for "decontamination," thus astonishing the people since decontamination is being done mainly by the military. To the point, account padding is widespread in carrying out decontamination; it takes little to do but costs dearly. The monthly payments for each serviceman alone come to R500. Total spending on this generally empty business will amount to hundreds of millions, if not billions of rubles.

Since the accident, government "decisions" have repeatedly been issued about the resettlement of the inhabitants of Lomachi in Khoynikskiy Rayon located on territory with a contamination level of 63 curies per square kilometer for cesium, and 2.63 curies for strontium. But people are still living there. Four years later inhabitants have not been resettled from villages where the radiation level is as high as the level in the 30-kilometer zone or even above it for nuclides of cesium, strontium, and plutonium in the soil, thus grossly and malefficiently violating the rules for radiation protection of the population. The republic government commission has essentially limited itself to a statement (protocol No 17/7 of 15 July 1987) that "four rural populated points have been found (Chudyany and Malinovka in Cherikovskiy Rayon and Gatskovichi and Novoyelnya in Krasnopol'skiy Rayon) where the content of cesium 137 in the soil from the average sample exceeds 100 curies per square kilometer, while in nine rural populated points (Gorodok, Gotovets, Zavodok, and Dubrovka in Krasnopol'skiy Rayon, Osovets, Novomalinovka, and Kamenka in Cherikovskiy Rayon, Aleksandrovka in

Klimovichskiy Rayon, and the settlement of Leninskii in Kostyukovichskiy Rayon) samples have exceeded that level."

Moreover, at populated points known to hold out no prospects for people living there, new construction has been started and opened as, for example, a major livestock complex and residential settlement near the village of Vysokiy Borok in Krasnopol'skiy Rayon, the Mayskiy residential settlement in Cherikovskiy Rayon, a land improvement system in the village of Bartoomeyevka in Vetkovskiy Rayon, and social and cultural projects in the village of Strelchevo in Khoynikskiy Rayon.

Construction has continued on some projects even after the belated ban on this construction issued by the BSSR Council of Ministers. There is obvious irresponsibility and inattention to people and to concern for the radiation protection of the population. In one oblast alone—Mogilev Oblast—more than R200 million have been invested in construction in the zone where contamination is greater than 40 curies per square kilometer. Among others, the projects built include schools (as proof of the great concern of the fathers of the fatherland for their children), but the children just cannot go there. For Gomel Oblast the figures for spending on worthless construction will probably be even more impressive. It is the same for contaminated areas in the Ukraine and Russia. In Narodichskiy Rayon alone R105 million have been invested in new construction, mainly in the zone of strict monitoring. Many new residential settlements for those resettled in Gomel Oblast, as, incidentally, in Bryansk and Chernigov Oblasts, have again been built in contaminated localities; the blame here lies primarily with the sanitation service and the USSR chief state sanitation medical officer, A.I. Kondrusev.

A letter from Belorussian SSR Minister of Health V.S. Ulashchik addressed to V.G. Yevtuk in the Belorussian SSR Council of Ministers (No 1095/04-4 of 13 July 1989) contains curious recommendations. Verbatim:

"1. Resettlement of inhabitants to new places to live should ensure compliance with one of the basic principles of radiation protection (Radiation Safety Standards 76/87)—lowering the received dose of radiation to the lowest possible level.

"2. Conditions should be created at the new place of residence allowing the lifting of all restrictions on the normal tenor of life for the rural inhabitant introduced in connection with the radiation factor (diet, regime for labor and leisure, and so forth).

"3. Foodstuffs produced on private subsidiary plots (particularly milk and meat) should meet sanitation standards.

"The level of contamination of a territory at which these requirements can be met should be less than one curie per square kilometer."

Question: Where were the previous and present ministers and their deputies—Savchenko, Ulashchik, Kondrusev, Buryak, and others—before June 1989, since the Radiation Safety Standards existed even earlier, since before 1987 the radiation standards were even stricter; why were they not used?

Here other questions arise: What guided the USSR Ministry of Health when in 1987 it issued an instruction according to which the population of our country found itself virtually in the same position as specialists in the nuclear profession with respect to radiation standards? It was precisely this sleight of hand that enabled the USSR Ministry of Health to transfer the population of contaminated areas in Gomel, Mogilev, Brest, and Minsk Oblasts in the BSSR, Bryansk, Orel, and other oblasts in the RSFSR [Russian Soviet Federated Socialist Republic], and Kiev and Zhitomir Oblasts in the Ukrainian SSR to a position of the so-called limited part of the population (category B). The changes in the Radiation Safety Standards were made in an offhand manner as if they were not significant. But the insidiousness of these changes lies in the fact that the radiation standard is now applied to the entire population. In accordance with the 35-REM "concept of living without restrictions on contaminated land" drawn up under the leadership of Academician Ilin, a blow is struck at future generations. For people who remain in contaminated areas and constantly eat foodstuffs that are subject to radioactive contamination find themselves in conditions that are worse than specialists or "individual persons in the population" during short-term radiation.

Academician Ilin and his associates drew up, and on 22 November 1988 USSR Chief State Sanitation Medical Officer A.I. Kondrusev approved the "Maximum Individual Lifetime Dose," while, according to the ideas of world science there can in general be no harmless limits for irradiation. According to the logic of the thing, and according to my conviction, the "limit" invented by cunning people from science is inhuman and unacceptable and at variance with radiation protection. It permits hundreds of thousands, if not millions of people in the BSSR, RSFSR, and Ukrainian SSR to be unjustifiably irradiated with impunity. Suffice it to say that the "limit" proposed by a politicized pro-Ilin science and supported by the chief state sanitation medical officer of the USSR, A.I. Kondrusev, has enabled the latter (a letter of 18 August 1989 to the chairman of the BSSR Council of Ministers, M.V. Kovalev) to give permission to resettle the village of Soboli in Braginskiy Rayon where radioactive contamination is high: 25 curies per square kilometers for cesium, 2.4 curies for strontium, and at least 0.01 curies for plutonium!

The people's misfortune arising from the Chernobyl catastrophe is being made worse by the deliberate actions and tricks of those who should be acting directly and uncompromisingly to protect their interests. As Academician Vorobyev remarked in that same letter to the Gomel Oblispolkom, the resettlement of people from contaminated territory three or four years after the

catastrophe "reflects only one thing; namely, that no matter what words may be said or what explanations may be offered, the initial calculations of possible doses were wrong."

There is another factor. Despite the instructions of the USSR Ministry of Health (1986), no unified register of persons receiving doses of external and internal radiation as a result of the accident at the Chernobyl AES has been compiled for the country. For this reason alone, information on the medical and biological consequences of the Chernobyl catastrophe has been eroded and mixed in every possible way and is too fragmented to use.

Everyone knows how patient the Belorussians are, but in the last 3 and ½ years their vote of confidence for highly placed persons responsible for the "cleanup" following the explosion of the radioactive volcano has dried up. A bureaucratic administration has been thinking not so much about protecting people from the radiation, but rather about how to protect and even increase production on the unfortunate land, and it still is.

By the third anniversary of the Chernobyl accident the commission led first by A.A. Petrov and then by V.G. Yevtukh and N.I. Demente has reached an impasse in the matter of radiation protection for the people: By then, outside the boundaries of the 30-kilometer zone not one key question concerning the further life of the people had been resolved. It must be said that much of the responsibility for the state of affairs in the contaminated zones of the three republics was born by the government commission led formerly by B.Ye. Scherbina. In June, at the 11th Session of the BSSR Supreme Soviet, V.G. Yevtukh stated in his report that the main result of three years of work on the "cleanup" was that "it has been possible to protect people's health and guaranteed them against disease." These words are pharisaism of the first water.

A new stage in the "cleanup" in Belorussia started in the spring of 1989—with alarming statements from the public and from journalists and writers and scientists who had undertaken at their own initiative to unmask the hypocrisy in matters concerning Chernobyl and establish a more radical approach to providing radiation protection for the population.

Documents issued since the accident that have come to my attention enable me to assert that in all the complicated years of the age of Chernobyl, the real defenders of our people have been primarily the Belorussian scientists. True, not all of them, like Nesterenko, have been able to leap immediately to the defense because many of them started their investigation of this great misfortune from scratch. But still, the Belorussian SSR Academy of Sciences under the leadership of V.P. Platonov has been able in a short time to rally honest and uncompromising researchers who are concerned for the fate of the people and nation. They include specialists in various disciplines and of various rank, including A.V. Stepanenko, Ye.F. Konoplya, E.I. Zborovskiy, I.N. Nikitchenko, I.I.

Lishtvan, Ye.P. Petrayev, M.V. Pavlova.... The civic stance assumed by the Deputy Chairman of the Belorussian SSR State Agroindustrial Committee (and leader of the agroindustrial commission for Chernobyl), Ye.F. Sukhoruk, evokes profound respect. But here it is necessary to note that the correct actions taken by the Belorussian SSR State Agroindustrial Committee have often been slurred over by individual workers in the party apparatus. A pity!

Nevertheless, the secretary of the Mogilev party obkom [oblast committee], V.S. Leonov, and the oblispolkom deputy chairman, V.M. Ivanov, have during the last year made great efforts to correct the situation in the Mogilev area, and the oblispolkom chairman in Gomel Oblast, A.A. Grakhovskiy, has carried a great burden in organizing evacuation work and other work since the accident. But, of course, their possibilities have been limited, and there is much that they have been unable to do. They have been unable to determine the course of events at other levels and in other spheres. As a result, time has been lost in resettling people to clean areas. Four years of delays have brought the population many sad disillusionments in their lives and in the activity of the state apparatus, and have caused mass sickness, even if it is not radiation sickness. These are the real results of the barbed wire!

Because of their negligent attitude toward their obligations by titled physicians at the time when the radioactive cloud formed above the Chernobyl AES and was spread by the wind, not even iodine preventive steps were taken for the population of adjacent regions. This is the result: 1.5 million people (including 160,000 young children) received an internal dose of radiation in the thyroid, and for 50,000 children the dose was 30 to 100 REM, and for 27,000 the dose was 100 REM and higher. As a result 37 thyroid diseases have now been recorded in 37 percent of the children. This is the price of the leaders' negligence and the trusteeship of sanitation medicine. It is probable that, under the burden of the facts—that is, the constantly growing amount of information about the baneful effects of radiation among the population in the affected areas—already in 1987 the results of scientific studies conducted by the Institute of Biophysics in the zone of radioactive contamination were classified, and—it must be said, by evil intent—part of the very important studies by the institute on the effects of ionizing radiation on children's health was halted.

I believe the time has now come for the people and their law enforcement organs to hold the persons involved in the "cleanup following the Chernobyl accident" responsible, to hold them responsible for the continued and deliberate concealment of the real situation in the areas of radiation damage, for their indifference and negligence in protecting what is most valuable—the health of citizens—and for having thus harmed the people, for the pseudoscientific compilations and "concepts" with elements of juggling and dirty tricks about being able to live freely in contaminated territory, and for the abuse of

official positions and the waste of hundreds of millions of state assets on construction in places where it was absurd right from the start.

The people and the nation cannot flourish without action by the institutions of justice.

#### From the Editor

V. Yakovenko's article is based on the open letter he wrote and sent to USSR Procurator General A.Ya. Sukharev and Belorussian SSR Procurator General G.S. Tarnavskiy demanding that criminal proceedings be instituted against officials whose actions during the "cleanup after the Chernobyl accident" have been and are criminal and capable of resulting in serious consequences for the people. The submission made by the well-known Belorussian political commentator to the procuracy is supported by a large group of USSR people's deputies, including writers A. Adamovich, Ch. Aytmatov, V. Belov, V. Bykov, I. Drutse, Ya. Peters, V. Rasputin, Yu. Chernicheno, Yu. Shcherbak, and V. Yavorivskiy.

#### Specialist Dismisses Evidence of Post-Chernobyl Contamination

904E0032Z Moscow SOTSIALISTICHESKAYA  
INDUSTRIYA in Russian 29 Nov 89 p 3

[Interview with Dmitriy Konstantinovich Popov, radiation chemist, by E. Mokhorov, in Bryansk Oblast: "After Chernobyl"; date of interview not given]

[Text] Dmitriy Konstantinovich Popov is 65 years old. In the past, his fate was bound up with the testing of nuclear weapons. He is said to have been the first man who went down into the crater immediately after an atomic bomb was exploded. From the standpoint of everyday common sense, there was no need to take that risk. The young radiochemist was drawn by scientific curiosity: he wanted to verify the correctness of one of his theoretical computations.

D. Popov is now a major authority in the country and abroad on the problems of global radioactive fallout. After the Chernobyl accident, he and Prof P. Ramzayev and other volunteers immediately took a dose of cesium in order to calibrate on themselves an instrument for measuring the level of radiation. Since that time, Popov, who is from Leningrad, has lived with his family in the city of Novozybkov in Bryansk Oblast. It is from there that a laboratory of the Leningrad Radiation Hygiene Institute makes observations of the state of health of the population in the zone of radioactive fallout.

Until recently, it was not the custom to mention in the central press the disaster area, which includes Bryansk Oblast, which has a population of 180,000.

In practice, this took the form of silence about an acute problem of vital importance to the population and had the result that 3 years after the Chernobyl accident a

sensation occurred that was like a scandal in the amount of noise it created, and many millions of rubles were simply thrown to the wind.

Today, the taboo has been removed from the secret topic. A government commission recently created to repair the damage of the accident at the Chernobyl AES, headed by V. Doguzhiyev, deputy chairman of the USSR Council of Ministers, has studied the situation on the spot and outlined radical steps to extend assistance to the western rayons of Bryansk Oblast which were affected.

The chairman of the commission uttered an assessment of the situation in which there was no room, as it has been remarked, for "excessively optimistic attitudes."

Yet Dmitriy Konstantinovich preaches nothing but optimism. I remember one of his sentences: "The only special medical treatment the population here is in need of is psychotherapy."

I naturally thought of things I wanted to ask D. Popov.

[SOTSIALISTICHESKAYA INDUSTRIYA] I would like to remind you, Dmitriy Konstantinovich, that immediately before the arrival of the government commission you categorically stated in a conversation with me that nothing bad related to Chernobyl had happened in Bryansk Oblast at all, that this, you said, was an invention of dilettantes. I would also like to remind you of your assertion that in the rayons of Bryansk Oblast affected by radioactive fallout beneficial conditions as of a health resort have essentially been created in which people are receiving for free therapeutic doses of cesium, which is equivalent to the radon baths prescribed by physicians. I myself am a dilettante in these matters. I believe what I am told by an authoritative scientist, and for that reason my questions to you will be based solely on the rumors that are widespread among the local population. Although, to be honest, after the conclusion arrived at by the government commission, even I have had certain incipient doubts. The commission, whose members included competent specialists from USSR Minzdrav, the State Committee for Hydrometeorology, and scientists from your institute, came to the conclusion that 24 settlements in Bryansk Oblast have to be evacuated. What can you tell us concerning the decisions taken?

[Popov] I am absolutely convinced: the radiation in Bryansk Oblast does not represent even the slightest danger to human health. I consider the evacuation decision scientifically unsound. The atmosphere that came about because of the ignorant actions of the local medical service played a role here. People are extremely frightened.

[SOTSIALISTICHESKAYA INDUSTRIYA] What were the physicians guilty of?

[Popov] They instituted a great number of absurd bans, above all concerning so-called contaminated foodstuffs. Milk was rejected if the cesium concentration in it

exceeded the temporary permissible conditions. Even though there were no dangerous doses at all.

[SOTSIALISTICHESKAYA INDUSTRIYA] How, then, are we to understand the recent articles in the local press reporting that they were accepting for processing at the Bryansk Meat Combine carcasses with a cesium content exceeding the maximum permissible concentrations tenfold? Sometimes, if they don't manage to sell this meat on the sly to some remote area of the country, they intentionally let it spoil only so that they can write it off afterward.

[Popov] That is a crime. The people have nothing to eat, and here they are deliberately letting meat spoil, whereas it could be processed according to the recommended technology, diluted with clean meat and components, and put on the worker's table.

[SOTSIALISTICHESKAYA INDUSTRIYA] But then how do you explain that in Bryansk Oblast there has been a sharp rise in the number of cases of disease in the last 3 years, including oncological cases?

[Popov] Yes, as a matter of fact, there has been a rise in many diseases, including diseases of the digestive organs, the thyroid gland, and the cardiovascular and nervous systems. There is one diagnosis here—mass radiophobia. They have frightened the people, they have forbidden them to drink milk, to eat meat, vegetables, and fruit, to gather wild berries and mushrooms. Here is a typical case. In the settlement of Vyshkov, the local inhabitants put this question to me: They write in the newspaper, they said, that we need to eat more lemons; this helps to drive the cesium out of the organism more rapidly. But why do they not deliver lemons to the store?

I answered them: "Friends, why don't you eat apples and pears from your own orchard? The harm from negligible doses of cesium simply cannot be compared to the immense benefit from those vitamins which are contained in fruit and berries. You should eat everything you have and not wait for lemons and oranges to come from Africa. Believe me, fruit from overseas is not a bit more beneficial than our own!"

When you constantly tell a man: "The milk and meat are contaminated, the honey cannot be eaten, do not go into the woods, do not gather mushrooms," then he involuntarily succumbs to panic. People limit themselves in all respects, including their food rich in vitamins, the organism gets weak, avitaminosis ensues, and as a consequence you have widespread disease. And that means more fear and uncertainty.... The first thing that should be done is to remove all the bans. The temporary permissible conditions for foodstuffs established by Minzdrav should be rescinded. Public health physicians should be forbidden to reject food without our institute's consent.

[SOTSIALISTICHESKAYA INDUSTRIYA] Before Chernobyl, Bryansk Oblast was one of the major suppliers of meat, milk, potatoes, and vegetables to the

capital. Leningrad also consumed potatoes from Bryansk. But now the deliveries have been cut back sharply. This has been extremely disturbing to the local population. In meetings with the government commission, this question was frequently heard: "Why is Moscow not accepting products from the contaminated regions, and yet we eat them? Are we second-class people?"

[Popov] I explain things like that in terms of the incompetence of the public health service in Moscow. The mere name "Bryansk Oblast" affects the officials like a red cloth affects a bull. For example, a freight train of potatoes arrived. There was, of course, dirt on them. The dosimetrists did not take this into account. They lowered their instrument into the car, the indicator went off scale: Aha! Contaminated, it has to be rejected! And they rejected it. Until last year, the capital went without potatoes because of ignorance. And it took no small effort on our part to prove that the cesium content in the potatoes themselves was practically zero. The dirt simply has to be washed off, as every housewife does, before peeling the potato. I think that in these 3 years the esteemed physicians had a simple duty to look at the literature on radiology available to everyone, and study the subject so as to have an opinion of their own. But it was simpler to act in accordance with the instruction. Although at some points it is illiterate. I am convinced that in the near future the people of Moscow will again be getting their Bryansk cheeses, cottage cheese, butter milk, and sour cream. Let them eat to their heart's content! The temporary permissible conditions established by USSR Minzdrav should be retained only for the western rayons of Bryansk Oblast, where there is an external radiation background. In Moscow and Leningrad, however, there is no external radiation at all, and if the inhabitants of these cities drink milk and eat meat containing cesium that is twice as high as the standard, the Muscovite's annual dose of radiation will be within limits which cannot by any means have an effect on the way he feels and his health.

The unwarranted bans on milk—was that thrifty? It would be simpler to issue the order today to do away with the livestock in the contaminated areas. And tomorrow we will be biting our elbows. People have anyway lost the habit of working, they don't want to raise cows or keep a garden. And why, if in accordance with the instruction, all farm products, including meat and milk, are brought directly from the "clean" areas to the store, and this is moreover done in cellophane wrapping?

[SOTSIALISTICHESKAYA INDUSTRIYA] The inhabitants of the contaminated rayons of Bryansk Oblast regularly watch the programs of Belorussian Television and learn about the immense effort being made in the neighboring republic to repair the damage of Chernobyl. The population is broadly informed about the radiation situation, the newspapers have been printing maps indicating radiation levels. In our case, all of that was kept strictly secret for a long time. In the neighboring republic, research into the problems related to radiation is being carried on by 38 scientific research institutions,

headed by the republic academy of sciences. In Bryansk Oblast, there is a monopoly held by your institute, or more accurately—by the scientific school headed by Prof P. Ramzayev. The problem of radiation in Bryansk Oblast has essentially been covered up for 3 years. Isn't that the reason for much of the trouble we are talking about now?

[Popov] There are only two scientific institutions in the country competent in problems of radiology—our institute in Leningrad and the Moscow Institute of Biophysics. The authority of these scientific schools is recognized all over the world. The conclusions we drew concerning the consequences of the Chernobyl accident have been confirmed by representatives of international organizations. At the same time, foreign scientists were shocked at the ignorance of radiology of scientists at the Belorussian Academy of Sciences. There seems to be more political marketing, more of a drive to gain the authority of the crowd in a rally, than real science. The medical institutions? Yes, there is a place for them, but in the situation that has come about there is nothing for them to do. The large-scale influx of physicians has been something that frightened the already extremely disturbed inhabitants. This is grist for the mill of radiophobia.

[SOTSIALISTICHESKAYA INDUSTRIYA] Charges have also been addressed to Professor Ramzayev. Your school was formed back in the fifties and early sixties at the height of the nuclear weapons tests. Did the historical circumstances of that time, the atomic euphoria, not leave an imprint on the views and principles of the Ramzayev school? Amidst the dust raised by the debate, certain hotheads have called the professor a representative of situational science. There is a widespread rumor in the population: The state, it is said, does not have the money to move the affected cities and villages, which is why the decision was made to save billions on lives and health with Ramzayev's help.

[Popov] As far as investments running into the millions are concerned, along with the large and useful effort that has been made here, resources are as a matter of fact being thrown to the winds. And as for Pavel Vasilyevich Ramzayev, he is a serious scientist whose opinion is heeded the world over. Unfortunately, the pages of many popular publications have been turned over to rampant ignorance. It has become far more difficult for men of science to express themselves. Almost all the newspapers refuse to print Professor Ramzayev's article.

[SOTSIALISTICHESKAYA INDUSTRIYA] Are there specialists and scientists in the country who hold views of the Chernobyl problem different from the followers of the Ramzayev school?

[Popov] Our views are not shared by all, of course, not even in the institute itself. Different positions are taken, for example, by Professor Gusev. These scientists believe that it is better to be overinsured than underinsured.

But if the rumors attribute to us the "crime" of wanting to return to society valuable foodstuffs, millions of

rubles lost because of ignorance and indifference (for example, removing the fertile layer of the soil around settlements), then those rumors correspond fully to reality. We are standing watch over people's health and their interests.

#### Note From the Editors

Let us be frank, the position firmly held by the scientists is unusual for us. What is more, it evokes an inner protest. Which is natural; Chernobyl was too unexpected and terrible, we were too unprepared for anything of the kind, including even morally; we lost too much and we experienced too much in the disaster that befell us. How difficult it is for us to get to the truth....

In the city of Novozybkov, which is where the Leningrad laboratory is located, plants have in a short time lost one-fourth of their skilled workers and specialists. People are leaving behind their jobs, home, their native area, and they are rushing into the unknown. Often the occasion for flight is the absurd instruction prescribing that potatoes not be allowed to come into contact with the soil when they had been dug out of that same soil, or it was even the fact that meat products have regularly appeared on the shelves of local stores, which previously, before Chernobyl, had never been the case here.

People who have been suffering from rumors, from uncertainty, have an acute need for competent information. The taboo has now been removed from the prohibited topic. But even the one-sided glasnost, when only journalists and writers appear in the press, and the specialists are silent, which has replaced the dead silence, does not satisfy anyone. Professor Ramzayev, a scientist with a world name, cannot present his position and views in a single popular Soviet newspaper. This is just as bad as the fact that his opponents, who have a differing point of view, are not appearing in the press.

Whatever the truth may be—bitter or encouraging—we will never get closer to it through discussions that have a rally flavor. In publishing the interview with Popov, we are inviting other competent scientists and specialists to talk about the problems of the affected rayons.

#### Chernobyl Fuel Deemed 'Profoundly Subcritical'

*PM1212172589 Moscow PRAVDA (Second Edition) in Russian 8 Dec 89 p 4*

[Report by Academician S. Belyayev, Doctor of Physical Mathematical Sciences A. Borovoy, and Doctor of Physical Mathematical Sciences A. Gagarinskiy under the rubric "Science in the Modern World: What Are People Doing in the 'Sarcophagus'?"]

[Text] Since the beginning of May 1986 up to the present day dozens of staffers from scientific institutes in Moscow, Leningrad, Kiev, and other cities have been sent to Chernobyl every month to take part in the work

of eliminating the consequences of the accident. Many of them work as part of the integrated expedition sent by the I.V. Kurchatov Atomic Energy Institute, which was officially registered at the end of 1987 (it was previously described as an operations group).

The expedition was set up to accomplish many tasks, of them the most crucial and important being to ensure the controllability and safe condition of the nuclear fuel within the "sarcophagus" or, as technical literature usually describes it, within the "encasement" [ukrytiye] around the fourth power unit at the Chernobyl nuclear electric power station."

What is inside this vast gloomy structure that is as high as a 20-story apartment block? The ruins of the reactor, several hundred destroyed, semidestroyed, and virtually intact compartments [pomeshcheniya], into some of which "fresh" concrete used in the construction of the "encasement" has found its way. According to estimates, there are still 185 tonnes of nuclear fuel remaining there (or 96 percent of the quantity prior to the accident), every gram of which is still emitting billions of radioactive particles per second.

Since there are differing opinions—including speculative and simply unscrupulous opinions—of the quantity of fuel ejected into the outside environment during the explosion, we would like to clarify this question once again. It came up on the agenda straight after the explosion at the fourth power unit.

Work began in two areas. First, an endeavor was made to obtain data as to how much radioactivity was being discharged from the damaged reactor and in what form. It was extremely difficult to obtain full and accurate data here. Huge radiation fields hampered surveys above and in direct proximity to the wreckage. It proved possible only with great difficulty to take the requisite samples and determine the parameters of the airstream transporting the radioactive aerosols away from the reactor.

The second way involved determining how much radioactivity had already settled onto the soil.

The first estimates of the discharge that had occurred over the radiation sampling areas were made at the Atomic Energy Institute on the night of 15 May; the result was obtained by morning—3-4 percent of the original charge of fuel had been discharged from the devastated power unit. By mid-July 1986 Ministry of Medium Machine Building, State Committee for Hydrometeorology and Environmental Control, and Defense Ministry institutes had concluded as the result of independent calculations that 2-6 percent, that is 4-12 tonnes, of fuel had been discharged.

The information regarding the amount of discharge was first brought to the attention of the world community in a report prepared by the State Committee for the Utilization of Atomic Energy and delivered by Academician V.A. Legasov in Vienna in August 1986.

The report's main conclusions are as follows:

- Inert radioactive gases were practically entirely discharged from the reactor and a considerable quantity of iodine was discharged;
- 13 percent of the cesium was discharged (with an error factor of plus or minus 7 percent);
- some 3 percent (plus or minus 1.5 percent) of the nuclear fuel containing nonvolatile fission products and transuranic elements was discharged.

In the period August-November 1986, after diagnostic apparatus had been successfully lowered into the reactor shaft, first by helicopter and then with a crane, a heat measurement program was carried out on the surface of the wreckage and around the edge of the devastated reactor. By making a comparison of the heat being released against calculations, it proved possible to establish that at least 90 percent of the fuel was in the "encasement" (it only proved possible to give a minimum figure for this evaluation). In the last few years the estimate of the fallout has been elaborated. Thus, in 1988 the fuel discharged during the accident was calculated using a data bank set up at the Atomic Energy Institute containing full reports on tens of thousands of soil samples taken on USSR territory and foreign research data. The following value was obtained: 3.5 plus or minus 0.5 percent.

But let us return to the "encasement." What was known about the distribution and form of the main mass of the fuel in the compartments of the "encasement?"

The information obtained by truly heroic efforts in 1986 was rather general all the same: The main masses of fuel (ejected during the explosion) were at the top—in the central reactor room, under the stepped wall [kaskadnaya stena] that was erected; in the spent fuel pond, in the reactor shaft itself (what remained of the reactor core), and lastly in the lower locations beneath the reactor shaft (it found its way there as a result of the accident). Five or six areas in all.

It was also well known that there are three forms of fuel-bearing mass inside the "encasement" First, fragments of the core: Whole assemblies and individual fuel elements, splinters of them, and so on. Second, finely divided fuel in the form of highly active dust with particles ranging in size from fractions of a micron to tens of microns. This dust, which formed during the explosion, ended up virtually in every compartment of the "encasement." It entered the walls, floors, and ceilings. It was in the air in the form of aerosols. The slightest breath of air made clouds of it surge up into the air and then very slowly (possibly because it was charged) settle. When it found its way into respiratory tracts, the dust caused an agonizing cough. Virtually all those involved in the work of eliminating the consequences of the accident in 1986 when the dust was particularly active experienced coughing fits to a greater or lesser degree, sometimes of similar severity to asthma attacks. It was the dust rather than the external radiation

that was the main enemy to research as and when the crucial incursion began—that is in May 1988—into the devastated reactor. But the new processes and methods used to combat it ought to be recounted in another article.

No one expected to encounter the third form of fuel-bearing materials. It was first discovered in one of the galleries under the reactor. It consisted of black lava in the form of a gigantic (several cubic meters) solidified droplet split at its lower end, and hence dubbed the "elephant's foot." The radiation level near it was approximately 8,000 roentgens per hour in 1986. Even five minutes spent near the "foot" would have killed a man. Thus, it was only possible to operate at long range. The first attempts to detach lumps of the "elephant's foot" for examination proved unsuccessful. Displaying surprising hardness, the substance failed to yield to a drill mounted on a special remote-control truck. Physicists then proposed employing small arms.

A skilled marksman—a militia captain—was put at our disposal. He went down to the "elephant's foot" by the physicists' customary route and, without losing his composure, fired armor-piercing bullets into it, one after the other. Analysis of the fragments obtained in this way showed that they consisted of 70-90 percent silicon dioxide (fused sand), 2-10 percent fuel particles, and, in addition, contained graphite (hence the black color), metal alloys, and so on.

Did the fuel left in the "encasement" present any danger? It was primarily a question of nuclear danger—the fact that a spontaneous nuclear chain reaction can develop when there is a large concentration of such fuel. The following question arose straight after the accident: Is a chain reaction going on in the devastated power unit? There was unequivocal proof that it was not.

The 6-month experience acquired during the construction of the "encasement" also indicated that there was no spontaneous nuclear chain reaction. Radioactive radiation was observed, temperatures were monitored, and analyses were made for the presence of short-lived radioactive gases, which occur during a nuclear chain reaction. It must be said that alarm flared up from time to time, spreading rapidly through rumors far beyond the 30 km zone. Suddenly neutrons or radioactive iodine—a sure concomitant of a chain reaction—"were discovered." Specialists rapidly found mistakes in measurements and discovered equipment failures and quashed the false "signals."

Despite the fact that the power unit compartments and, consequently, the fuel therein were subjected to active external influences—by vibration when various materials were being dropped from helicopters onto the reactor wreckage and the intrusion of concrete and water during the construction of the "encasement"—there were no dangerous developments in the behavior of the fuel. It was in subcritical state.

Thus, two possible paths emerged. One was to leave everything as it was, seal the "doors" of the "encasement," and continue to keep an eye on its status on the

basis of readings from dozens of temperature and gamma-radiation sensors, neutron detectors, and a host of other equipment installed in those areas that were accessible to people by walking, running, or crawling. Mainly on the edge of the locations affected by the accident. To use medical terminology, that way involves only carrying out an external examination of the "sick" reactor, without resorting to surgical intervention. Many specialists favored this action program. Others had misgivings about this method. After all a building ravaged by the explosion and fires and containing 185 tonnes of decaying fuel was left in the "encasement." The fuel may change its geometry in three, five, or 10 years as a result of the uncontrollable collapse of the constructional structures and the danger of a spontaneous nuclear chain reaction may increase. Although the likelihood of such process is small, with our knowledge in 1987 it was impossible to say that it was strictly zero. This inevitably compelled us to choose another way—direct penetration to the accumulated fuel to actively monitor it.

The distance between adopting this decision in principle and technically implementing it was extremely long and difficult. Although the government commission hurried physicists along, it was only in fall 1987 that the research collective's strategic plan for penetrating within the damaged reactor was ready.

The first major successes were achieved in mid-1988 when special holes were bored from decontaminated compartments on the west side of the "encasement" through concrete walls many meters thick, through the sand fill, and through steel structures into the reactor shaft. The boreholes emerged virtually simultaneously in compartments under the reactor at lower elevations.

Using special periscopes and television equipment researchers could now look inside the reactor. Measuring apparatus was introduced into the reactor on rods approximately 20-meters long. Precautions were taken, particularly against radioactive dust filtering into working premises via the boreholes.

After a tremendous amount of work, it proved possible by late 1988 to, as it were, expose the internal sections of the reactor and reveal the following picture. There was great devastation within the reactor. Its upper "cover" [kryshka] weighing more than 2,000 tonnes and situated above the core zone had moved so as to be standing vertically on end, having torn hundreds of pipes out of the system. Under the force of the explosion the lower "cover" crushed a massive metal cross supporting it and dropped four meters below its normal position. There was no core in the usual sense of the word (a well ordered arrangement of graphite and uranium). Fragments of it encased in concrete lay chaotically on the lower "cover" of the reactor in a layer up to five meters thick. A considerable quantity of the fuel is under this "cover" in a compartment that is flooded with concrete. The lower the boreholes went, the more frequently the researchers encountered the "lava." Forming under the influence of the high temperatures during the accident, it flowed into

the compartments under the reactor, along galleries, and pipes and traveled dozens of meters from the core, forming tongues and "elephant's feet" (four of them have now been discovered). The lowest point where a "tongue" of fuel has been found is the first level of the so-called bubbler pond. A few meters separate it from the meltdown "trap", a concrete slab with a heat exchanger especially constructed under the power unit's foundations. Researchers also encountered a feature of the accident that was forecast in May 1986—the disintegration and degradation of concrete on coming into contact with the hot fuel. The floor of the compartment under the reactor (a concrete slab 1.8 meters thick), which took the brunt of the heat shock and protected the ceiling of the lower compartments from it, was partially destroyed.

What about the nuclear danger?

Labor-intensive experimental studies and a large amount of theoretical calculations were needed to answer this question. Most varied methods, including active and passive ones, and using steady and pulsed neutron sources, were used to determine the subcriticality of the accumulations of fuel that had been discovered. In the latter case, researchers acted like geological prospectors; "they bombarded" the remaining fuel with rapid neutron pulses using generators introduced into the boreholes. The response from that medium provided reliable information about its properties and, what is most important, its subcriticality.

In March 1989, 18 months after the work began, the government commission reported that the fuel in the "encasement" was in a profoundly subcritical state. Potential collapse of structures within the "encasement" will not bring about a spontaneous chain reaction.

However, studies are continuing. They are necessary not only to amplify the picture of the accident, but also to solve the question of the future of the "encasement."

#### **Doubts Persist About Gorkiy Nuclear Station**

*PM2811103589 Moscow SOVETSKAYA ROSSIYA (Second Edition) in Russian 25 Nov 89 p 2*

[O. Plakhotnikova report: "Appraisal Ended—Problems Remain"]

[Text] The appraisal of the Gorkiy nuclear heat-supply station by specialists from the International Atomic Energy Authority [IAEA] has ended. A sitting of the I. Kurchatov Atomic Energy Institute open discussion club was devoted to its results.

"A reactor with increased reliability will operate at the Gorkiy heat-supply station," M. Rozen, leader of the IAEA safety subdivision, stated. "It can work at a lower temperature and pressure than an ordinary nuclear power station. This significantly reduces the potential scale of an accident. Equipment used in the design has been tested at other facilities. Another definite "plus point" of the design is that in the event of an accident,

special measures have been included—for example, an additional safety vessel. The design incorporates the ability to rectify an operator's actions if he has made a mistake. In our opinion, the release of radioactive substances is ruled out in any situation."

As for compliance with demands regarding construction quality, in foreign specialists' opinion, all the construction work is being conducted at an "internationally acceptable standard."

So the appraisal has ended with an unconditional "yes" to the Gorkiy nuclear power station. Its results are set out in a bulky 300-page report by IAEA specialists which also contains a number of specific recommendations to improve the station's work. But does this mean that after the international check, which was undoubtedly a positive step, all debate regarding the station's future fate must be ended? I think not.

With all due respect to the foreign specialists' experience and qualifications, it has to be said that many questions

still remain on the agenda today. Radioactive waste from the Gorkiy nuclear heat-supply station is to be kept not on the territory of the station itself, which, incidentally, is the usual practice at nuclear power stations, but in a special storage facility. Do the people of Gorkiy want to have yet another unsafe facility in their oblast? Hardly.

The IAEA representatives also noted that there is a certain risk in any nuclear facility. If worse came to worse, where could the city of 1.5 million people just some five km from the station be evacuated to?

One last point. In September there was a seminar on nuclear power problems in which CPSU representatives and delegations from the "Green" party (FRG) and the Soviet ecological public took part and which spoke of the extremely poor quality of construction at the Gorkiy nuclear power station. I do not presume to judge who is right here, the meeting's participants or the IAEA experts. One thing is clear: The issue is too serious to call a halt to discussion.

## CANADA

**Contaminated Water Spills at Saskatchewan Uranium Mine**

51200005 Ottawa *THE OTTAWA CITIZEN in English*  
25 Nov 89 p A20

[Text] Saskatoon (CP)—There are too few Atomic Energy Control Board inspectors to check every detail at uranium mines, says a board official.

And because of the staff shortage, radioactive water spills such as the one at Cameco's Rabbit Lake uranium mine can't always be detected, said George Jack, board manager of waste disposal.

The board inspects Cameco's mines every six weeks, but a failed computerized alarm system went unnoticed for years, even though it formed part of an operating licence application.

"Hindsight is wonderful," said Jack. "Obviously if somebody had asked a specific question we would probably have found out. We didn't know that it wasn't working."

The 6 November pipeline spill of two million litres of contaminated water from Cameco's northern Saskatchewan uranium mine has sparked calls for a federal public inquiry, including the effectiveness of the board's inspection procedures.

While the levels of radium, arsenic and nickel in the water that broke from a faulty valve have been deemed to be of no environmental concern, Cameco's operating procedures have been questioned.

Grant Hodgins, Saskatchewan's minister of environment will decide next week whether charges should be laid or changes made to Cameco's operating licence.

"Based on the information that I've got available at this point in time, I would say there is a strong case for charges to be laid," he said.

His recommendations will go to the provincial Justice Department for a final decision.

The board said the computerized spill detection system should have been in place all along.

But Cameco said it regarded the system as an experiment that failed and was abandoned in the early 1980s.

The company is trying again to make such an alarm system work, but in the meantime has been relying on volume and pressure gauges to detect line spills.

Jack said those and other safeguards should have been enough for early spill detection but they didn't work in this case.

The board doesn't have the time to check every detail at uranium mines, he said. That would require a full-time inspector at each mine and "the taxpayer doesn't have

the time and money to give us to do that sort of thing and we don't have the resources."

A spokesman for federal Energy Minister Jake Epp said he won't respond to calls for a public inquiry until a full report is in from the board.

## FINLAND

**Sabotage Eliminated as Cause for Pipe Contamination**

90WP0016A Helsinki *HELSINGIN SANOMAT in Finnish* 10 Oct 89 p 12

[Article: "Olkiluoto Foreman on Metal Dust: 'Nuclear Power Plant Pipes Not Properly Cleaned'"]

[Text] Turku, HS—"The pipes at the Olkiluoto nuclear power plant were not cleaned thoroughly enough, which is why metal dust was found in them. At the Industrial Power Company (TVO) suction blowing is used to clean the pipes, which is not nearly adequate," the Ostrobothnian foreman who has been working at Olkiluoto near Eurajoki for two summers maintained.

"In large industrial plants the pipes are generally always blown out after welding and installation operations. This means that hot steam under high pressure is forced through the pipes first and after that, in addition, they are flushed with water. With this method the pipes are 100-percent cleaned," the foreman claimed.

He fears that they will not admit to neglect at TVO. "I don't know what the source of the metal dust is, but certainly anything from fur caps to monkey wrenches might be found in the bends of the pipes."

The foreman said that he had installed and sealed pipes at Olkiluoto with a 10-man team. "Our gang decided that last summer would also be the last time [we would work there]."

"I don't want to work there any more because of the radiation. I myself was exposed to 700 microsievers in 1 week and 35,000 microsievers accumulated in [the bodies of] two fellow workers in a month's time. Since then they've had to have blood tests taken.

"And we certainly didn't like the police's coming after us all the way from Turku to ask questions either. We're not criminals, just honest foremen."

**'Alternative Considered'**

The Central Criminal Police, who have been investigating the mysterious metal dust in the control-rod mechanism of the number-one reactor at Olkiluoto, have been very silent throughout the entire investigation.

Criminal Inspector Tapio Toivonen did not say whether the police knew about the possibility suggested by the foreman before. He said that this alternative would now be considered too.

"We've decided not to comment or report on the intermediate stages of the investigation," he said.

#### 'Many Different Kinds of Cleaning Methods'

Mauno Paavola, the head of the TVO Technical Department, said that suction, steam, and water cleaning are used on the pipes at Olkiluoto, with the particular method entirely dependent on each case. "I cannot, however, comment on which cleaning method was used on the machinery in which the metal dust was found."

All 121 control-rod mechanisms of the number-one reactor have now been cleaned and cleaning inspections are at present being made. On Tuesday they will start loading the reactor core with fuel and electricity will apparently be fed into the national network early next week.

Paavola assured us that radiation limits at Olkiluoto were under no circumstances exceeded and that they are particularly careful about them.

"We have two limits which we absolutely stick to and radiation levels in excess of these are not tolerated. The permissible annual limit is 50,000 microsievers and the permissible quarterly limit is 25,000 microsievers."

After examining the published figures, Paavola said that the radiation levels attained during a 3-month period last summer were well under the permissible readings at Olkiluoto. The maximum levels were under 20,000 microsievers and the average radiation levels were even much lower than that.

"The claim that a level of 35,000 microsievers was reached doesn't hold water," Paavola said.

### IRELAND

#### Minister Says Campaign Against Sellafield To Continue

51500051 Dublin IRISH INDEPENDENT in English  
19 Oct 89 p 12

[Text] The Sellafield nuclear plant in Cumbria poses the biggest threat to the health of the Irish Sea and the Government intends continuing the campaign to have it closed. Environment Minister Padraig Flynn, has pledged, writes Tony O'Brien.

While an international study had, on the whole, given the Irish Sea a clean bill of health, he said it pointed out a number of localised problems relating specifically to urbanised bays, estuaries and dumping grounds.

"If we look at weaknesses and threats, Sellafield has to lead the field," the Minister said. "The Irish Sea is the most radioactive in the world. This is not just my judgment, it is also the considered verdict of a UK House of Commons Committee."

Mr Flynn stressed the Government's long-standing campaign against the operations at Sellafield.

The Minister introduced a book—"The Irish Sea—A Resource at Risk"—published by the Geographical Society of Ireland and edited by Dr John Sweeney of the Department of Geography, St. Patrick's College, Maynooth.

### SPAIN

#### Vandellos Fire Fuels Energy Debate, Protests

##### 'Antinuclear Psychosis'

90WP0015A Madrid DIARIO 16 in Spanish  
3 Nov 89 p 3

[Editorial: "Shadow of Chernobyl"]

[Text] Occasionally banished by the emotions aroused during elections, the fateful shadow of Chernobyl hovered over Vandellos (Tarragona) last 19 October. On that day the worst nuclear accident that Spain has suffered occurred there. As the details of the incident are revealed, one gets the impression that the danger was very great and that the safety provisions were on the point of being overwhelmed by what had happened at the power plant.

The lack of candor on the part the plant officials and agencies responsible for plant safety—here everything was reported late and in concealed fashion—contributed to an intensification of the antinuclear psychosis, perhaps out of proportion to the actual danger, not only in the province of Tarragona, but throughout all of Spain.

The antinuclear groups are exploiting the accident at Vandellos I to relaunch their campaign against this form of energy that is shrouded in an apocalyptic cloak. Just yesterday one of these groups demonstrated in downtown Madrid waving the banner of Vandellos.

But this is an issue which should not remain solely in the hands of radical groups. It is too important to be detracted from because of street protests. Citizens are beginning to demand responsibility. There is no other way of interpreting the decision reached by the Municipal Council of Tarragona, controlled by Convergents, Centrists and Conservatives who are petitioning that the province's four nuclear power plants be shut down until PENTA (Tarragona Nuclear Emergency Plan) is in a position to absolutely guarantee safety.

The protest movement has spread through this province whose nuclear—two plants in Vandellos and two others in Asco—and petrochemical complexes miraculously coexist with one of Spain's biggest ecological preserves, located in the Ebro Delta.

In view of this wave of antinuclear protest, which the most radical groups will not fail to exploit, the series of indifferent responses evinced by officials at Vandellos I from the very day it was hit by the tragedy and some public officials' eagerness to evade the storm of protest and hide their heads in the sand are surprising.

This has increased people's uncertainty and panic. People will not be reassured by the cloak of silence with which the burning and flooding of a nuclear power plant was concealed, but by promptly informing them and imposing severe disciplinary measures on those officials who were incapable of dealing with the situation.

The Vandellos incident must serve to make us reconsider the future of nuclear energy with neither hysteria nor exploitation by interested parties. While these plants have to remain open because they are necessary to the national economy, they do not have to be so at any cost. The public must not be exposed to unnecessary risks. Safety and openness, in addition to the assumption of responsibility for what has happened, are what are required today of the managers of the companies that own the plants and, failing this, of the government's supervisory agencies.

### Catalan Resolution

90WP0015B Madrid *EL INDEPENDIENTE* in Spanish  
18 Nov 89 p 28

[Article: "Catalan Parliament Asks for Unanimity on Closing Down Vandellos I Nuclear Power Plant"; first paragraph is *EL INDEPENDIENTE* introduction]

[Text] Barcelona—The Municipal Council of Vitoria is asking for the dismantling of three nuclear power plants.

Yesterday a plenary session of the Catalan Parliament unanimously passed a resolution proposed by Catalan PSC [Socialist Party of Catalonia] Socialists in which it is requested that the Vandellos I nuclear power plant "not be restored to operation." In the wording of the resolution, the plenary session of the Catalan Chamber recommends to the government of the General Council that, "in view of the characteristics of the Vandellos I nuclear power plant, which make it very difficult for it to meet technical and safety standards equivalent to the present level of technology in the latest generation of nuclear power plants, the desirability of not restoring the Vandellos I nuclear plant to operation is obvious to the authorizing institutions."

However, Socialist spokesman Higini Clotas linked the resolution with the view that the Nuclear Safety Council (CSN) should issue a public statement as to whether it is desirable or not to restore the Vandellos I plant to operation. The nuclear power plant suffered a fire and subsequent to it flooding in a turbogenerator last 19 October, which was the reason for the shutdown. The accident was described as the most serious one that has occurred in a Spanish nuclear complex, an assertion that has been confirmed by the CSN.

### Pujol Wants Nuclear Plants

Moreover, the Vitoria Municipal Council has passed a resolution in which it asks for the closing down of all Spanish first-generation power plants: Jose Cabrera (Zorita) in Guadalajara, Vandellos I, and Santa Maria de Garona,

located a few dozen kilometers from Vitoria in the province of Burgos. Javier Vigalondo informed us that Garona and Zorita have been operating for over 20 years and are increasingly subject to problems attributable to their outdated design and the obsolescence of the plants.

The Catalan parliamentarians' resolution was made because of "the importance and social and economic repercussions of this accident in Catalonia." The Catalan Parliament recommends to the Executive Council that, "in view of the characteristics of the Vandellos I nuclear power plant, which make it very difficult for it to meet technical and safety standards equivalent to the present level of technological development of the latest generation of nuclear power plants, the desirability of not restoring the Vandellos I nuclear power plant to operation is obvious to the authorizing institutions," according to the actual wording of the unanimous resolution.

In the course of the 3 days of debate on general policy during which the proposal was voted on, the president of the General Council made clear its position on the matter and the Executive Council of the General Council's, namely in favor of nuclear energy. In a statement of his position in the national debate, Jordi Pujol expressed his pride in having been the only politician who, as early as 1977, did not promise the dismantlement of the nuclear power plants.

"We need nuclear energy." The president of the General Council uttered these words, stipulating that whether or not we are to continue operating the Vandellos I nuclear power plant is another matter which, according to Pujol, will be a decision that is ultimately made by the CSN, which has jurisdiction over the matter.

With the exception of Socialist Raimon Obiols and Con-  
vergent Antoni Subira, all of the parliamentary spokesmen made reference to Vandellos in their speeches on the subject. So, it may seem strange that all the groups, including the CiU [Convergence and Union], voted in favor of a Socialist resolution, but the vote count is clear: Dismantlement of the nuclear power plant is not being asked for, rather a shutdown in the event that safety provisions that may be required cannot be guaranteed. Therefore, this resolution does not contradict the principles of Pujol when he stated that he was in favor of nuclear energy and the counterbalances to it that are required should be maximally negotiated, and the fact is that he had already determined what these should be in a speech he made before the Catalan Parliament: "Don't take any note of those who say that they are going to dismantle the nuclear plants," Joan Turro informed us.

The Socialist resolution passed by the Catalan Parliament has been viewed as a "goal" that Jordi Pujol set the Socialists, who saw how other parts of his proposal were rejected, only the section that made reference to the closing down of the plant being passed. Parliamentary experts attribute the passage of the resolution to an error by the PSC-PSOE since they permitted only part of the proposal to be passed. It is maintained in the preamble,

which was rejected, that the resolution should be dealt with taking into account the report that is being drafted by the CSN.

Now, the Pujol government is forced to turn to the authorizing institutions to request a possible shutdown of Vandellos I, something that is considered to be a political advantage for the CiU among its voters in the towns in the nuclear zone of Vandellos.

#### Basque Motion

Concerned over the shortcomings of the first-generation nuclear power plants, the councilmen of the Vitoria Municipal Council, who are members of Basque Solidarity, Basque Left, PNV [Basque Nationalist Party], CDS [Social and Democratic Center], and HB [Herri Batasuna], yesterday passed a motion against nuclear energy. Moreover, they urge the Gonzalez government to proceed to a shutdown of the nuclear power plants, those of Garona, Zorita, and Vandellos Number One at once. The PSE-PSOE [Basque Socialist Party] and the PP [People's Party] councilmen abstained. Most of the delegates at the plenum indicated their "profound concern over the use of nuclear energy" and called for a peaceful mobilization of citizens.

#### CSN Recommendations

90WP0015C Madrid DIARIO 16 in Spanish  
24 Nov 89 p 13

[Article by A. Valverde: "Rough Draft of Report Recommends Strong Improvements in Safety; CSN Will Not Recommend Permanent Shutdown of Vandellos Plant"]

[Text] The CSN will not recommend a shutdown of the Vandellos I nuclear power plant, although it does advise the companies that own it to adopt a number of safety improvements that will allow the electric power plant that has been shut down for a period of over 2 years to continue to operate, according to the preliminary report which the agency's investigators are to submit to the Ministry of Industry and Energy this very week.

Reliable sources who have had access to the drafts of the report stated that "there will be no explicit recommendation to proceed to the closing down of the plant." That seems to be ruled out, according to these sources, although the final report is still dependent on an important meeting to be held today between the CSN, representatives of the Ministry of Industry, and the party that represents the companies that own the plant.

The CSN report will, in all probability, be submitted to the Ministry of Industry and Energy, the sole agency with the legal authority to force the permanent closing down of a nuclear power plant, tomorrow, Friday. In connection with this, there is already a preliminary draft of the report which is in the hands of the president of the CSN, Donato Fuejo, but the report has not yet assumed its final form since it is awaiting final discussions at the entrepreneurial and political levels.

Sources close to the technicians who collaborated in the drafting of the report assured us that "it is therefore very likely that there may be some last-minute modification, but changes in its basic content seem to be ruled out."

The same sources asserted that, contrary to the opinion expressed in the first memorandum from the CSN itself on the incident, the draft dedramatizes the "alleged very serious nature" of the accident that occurred at the nuclear plant last October and also takes note of the opinions of the investigators that "the fire could have been extinguished even with hoses in the unlikely event that all of the fire-fighting systems built into the plant itself had failed."

At present shut down to repair the damage caused by the fire, the Vandellos I plant is the only one of the seven nuclear power generating plants operating in Spain that has received final authorization from the CSN to begin operating. The rest of the plants, which with their different sets of generators number over a dozen, are operating with temporary authorization.

In the 17 years it has been in operation it has been one of the Spanish nuclear power plants that has been of major industrial use in this country. It is practically amortized and is at present the property of the Hifresa consortium in which the French Electric Power Company, the ENDESA [National Electric Power Enterprise] public consortium, and the private firms, FECSA [Electric Power of Catalonia, Inc.] and Hidruna, own shares.

The power plant's technology is French and the most striking thing about its cooling system is that it operates with gas instead of water, as the other systems installed in Spain, which come from the United States and Germany. In France over a half dozen plants with the same technological design are in operation and none of them, despite their frequency of operation, has had an accident involving release of nuclear contaminants.

## UNITED KINGDOM

#### Atomic Fuel Reprocessing Plant for Dounreay Approved

51500049 London THE DAILY TELEGRAPH in  
English 26 Oct 89 p 40

[Article by Roger Highfield]

[Text] Planning permission for the construction of the world's largest plant for reprocessing spent fuel from fast reactors at Dounreay in Scotland was given by Mr Rifkind, Scottish Secretary, yesterday. But the 350 million scheme, the subject of Scotland's longest public inquiry in 1986, will not necessarily go ahead.

Yesterday's announcement clears the way for Dounreay, Caithness, to host a demonstration plant to handle spent fuel from a European fast reactor programme after an

application was made in 1985 by British Nuclear Fuels and AEA Technology, then the Atomic Energy Authority.

Objectors now have six weeks to appeal.

However, there is no guarantee that the plant, known by its initials EDRP, will move from the drawing board. France is also bidding to build the European reprocessing plant.

The final decision could be years away. The European programme to build a European Fast Reactor has been pushed back, delaying the proposed date for the construction of the demonstration plant from 1997 to 2005 at the earliest.

EDRP was originally designed to handle 80 tonnes of spent reactor fuel a year from three large fast reactors in Europe. Now that the scale of the European programme has been reduced from four reactors to only one in the near future, the plant will be smaller than originally proposed.

This has placed the economics of the plant in doubt. According to a report in Nuclear Engineering International, the industry concluded that a fast reactor could be commercially attractive without the EDRP. Existing reprocessing facilities could suffice as could a new purpose-built plant, smaller than the EDRP, sited alongside a commercial fast reactor, though AEA Technology disputes this.

Mr Rifkind's report did not find a link between the plant's activities and a childhood leukaemia cluster found near Dounreay at West Thurso.

Scottish nationalists denounced the timing of the announcement as a "blatant" attempt to influence the outcome of a local referendum now under way on proposals to store nuclear waste underground at Dounreay.

## Government Abandons Privatization of Nuclear Power

### End of Expansion

51500040N London THE DAILY TELEGRAPH in English 10 Nov 89 p 4

[Article by Roland Gribben]

[Text] The Government's decision to abandon the sale of the nuclear power business effectively spells the end of the expansion, at least for the foreseeable future, of an industry which promised an era of cheap, clean energy.

No more nuclear power stations are likely to be started before the 21st century as a result of the nuclear about-turn and the cancellation of plans for three third-generation pressurised water reactor stations.

Huge cost increases for fuel re-processing and waste disposal, higher bills for closing and de-commissioning old stations, and strong warnings that nuclear power

represents an electricity privatisation liability combined to force the Government to retain nuclear plant in the public sector and reduce the risk of further damage to the flotation programme.

The Government had already withdrawn the first generation Magnox stations from the privatisation package before yesterday's announcement but the calls, both inside and outside Whitehall, for a total withdrawal of nuclear power from the privatisation line-up, have been almost deafening.

The Prime Minister, committed politically and emotionally to nuclear power, has held out but has been persuaded finally that the risks of privatising the business with a substantial liability are too great for either the City or investors to stomach.

Three key elements have contributed to the nuclear U-turn:

- The costs of re-processing nuclear fuel and waste disposal have jumped substantially as a result of extra safety measures forced on British Nuclear Fuels, the State agency which handles the business. The company has passed them straight through to the Central Electricity Generating Board, which runs the nuclear stations.
- The cost of closing and stripping nuclear plants over a 100-year period after the end of their working lives has also shown a significant jump.
- Area electricity boards, due to be privatised first in a year's time as distribution companies, have balked at acting as "bankers" for the 7 billion pressurised water nuclear programme and forced the Government to limit development to the 2 billion Sizewell B plant in Suffolk.

There was the inevitable search for scapegoats yesterday, with the Government laying the blame at the door of the Generating Board and National Power, the subsidiary which would have had responsibility for nuclear plant after privatisation for providing misleading information.

The board was shifting the blame to British Nuclear Fuels, while area boards breathed a sigh of relief that their nuclear liabilities would be containable.

But the catalogue of nuclear problems has only served to add another nail in the coffin of an industry that has promised so much and delivered so little, apart from the period of the miners' strike when nuclear power kept the lights burning.

For the first time, nuclear power economics have been open to full scrutiny during the privatisation debate. Generation costs are now shown to be considerably higher than suspected, and at least twice the comparable price of producing power from coal after taking the increased fuel re-processing costs into account.

The upshot is that a nuclear "cover-up" stretching back over decades has been exposed to public view for the first time. Industry arguments that nuclear fuel offered a stable and cheap source of supply have been undermined and credibility damaged in the process.

Nuclear power costs have been buried away in customers bills and the accounts of the Central Electricity Generating Board, and never identified in detail until the Government decided they had to be separately stripped out as part of the post-privatisation regime.

The result has been an eye-opener and a hostile atmosphere between the Government and the Generating Board hierarchy. The Government feels it has been misled, while board officials say enough early warnings were given to make Ministers and civil servants well aware of the nuclear realities.

But the acrimonious debate is another sad episode in the industry's history. Britain led the world with the development of civil nuclear power, but an inability to build stations to time and cost, as well as extra costs tied to safety, has shackled the industry.

The efficiency of the British plants has been abysmal. None has figured prominently in the world league tables of nuclear power performance. Engineers have struggled to remedy defects and in the process the reputation of the engineering industry has been tarnished, often unfairly.

#### Background of Decision

51500040N London THE DAILY TELEGRAPH in  
English 10 Nov 89 p 4

[Article by Roger Highfield]

[Text] The case for privatisation was broken by concern over the "back-end" costs of nuclear power—waste disposal and decommissioning.

It was the soaring cost of nuclear waste reprocessing and the decommissioning of old reactors that led to Mr Parkinson announcing, just before he left the Department of Energy, that Britain's first-generation of nuclear reactors, the Magnox stations, would not be sold off.

The seeds of this decision were sown as long ago as 1976, when the Royal Commission on Environmental Pollution pointed out that a solution to the problem of nuclear waste disposal had to be found urgently.

Since then, successive governments have ducked the nuclear waste issue as public opposition has hardened in the wake of accidents at Chernobyl and Three Mile Island to all but the most elaborate and expensive waste disposal methods. These include the 1.8 billion deep nuclear waste repository planned either for Sellafield in Cumbria or Dounreay, Scotland.

Yesterday the soaring back end costs, highlighted through realistic accounting estimates used for privatisation frightened off the City and put paid to privatising the rest of the nuclear power programme.

The problem is not dismantling old stations, whose cost estimates have broadly followed inflation, but of what to do with the resulting waste and the costs of reprocessing.

The result was that nuclear electricity from Sizewell would, even taking into account the uncertainties over the back end, cost three times as much as that from a fossil fuel station.

Reprocessing costs have soared by at least 100 per cent over 10 years as British Nuclear Fuels brought on line a series of high-tech waste treatment and storage plants at a cost of more than a billion.

Estimates of decommissioning Sellafield have recently risen from 400 million to 4.6 billion, according to Mr Gordon Mackerron, senior fellow of the Science Policy Research Unit of Sussex University.

Now no-one knows the eventual cost of disposing of the radioactive wastes produced as Britain's nuclear power stations are decommissioned. "It is no wonder that given the wide variation of estimates the City has backed off," said Dr Andrew Cruickshank of Nuclear Engineering International.

The Central Electricity Generating Board revealed for the first time the detailed breakdown of the cost of decommissioning a nuclear power station in April at the official closure of the Berkeley Magnox station in Gloucestershire.

Lord Marshall, CEGB chairman, said then that the board had set aside 350 million to pay for the demolition of the two reactors. That meant a bill for the eight Magnox stations of around 2.8 billion. Later the provisions for decommissioning Magnox alone rose from 2.8 billion to 6.6 billion.

In another analysis, the magazine, *Power in Europe*, estimated that the bill cannot be less than 15 billion and could be higher, though a National Power spokesman said yesterday this was "complete nonsense."

National Power is adamant that the bill for decommissioning the Advanced Gas Cooled reactors would be much less. *Power in Europe* puts the cost at 3 billion for the seven AGRs. More than a century will elapse between the closure of a reactor and the final removal of all the buildings and radioactive materials that will enable the site to return to a green-field condition. According to National Power, decommissioning will proceed in three stages: the first and most expensive is removing the radioactive fuel from the reactors, reprocessing the spent fuel, and disposing of the wastes generated.

This was estimated to make up about two thirds of the cost and take between five and seven years, removing 99 per cent of the radioactivity.

The board then intends to dismantle the non-radioactive buildings on the site, detach the external boilers, and place them in a concrete vault, a process that will take about 10 years.

The reactors will be sealed for up to 100 years, a move that will not only allow radioactivity to fall but interest to gather on capital set aside for decommissioning.

The final stage involves cutting and dismantling the steel reactor vessels, removing the radioactive graphite from the core, and demolishing the concrete biological shield.

Reprocessing at British Nuclear Fuels' Sellafield plant makes the most sense if it produces plutonium and

uranium for recycling as fuel for fast reactors or in "mixed oxide" fuel for light water reactors, like the one being built for Sizewell.

Remove the commitment to fast reactors, as the Government has done, and you remove part of the rationale for reprocessing.