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JPRS Report

Nuclear Developments

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JPRS-TND-89-012 *14 JUNE 1989*

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SOUTH AFRICA

Commentary Weighs Space Program, Costs

MB0106052689 Johannesburg Domestic Service in English 0500 GMT 1 Jun 89

[Station commentary]

[Text] South Africa is ready to launch her own space program, when financial resources permit. The dramatic announcement this week that South Africa has the ability and the know-how for a space program is the latest testimony to the high level of technological advancement in South Africa, a level that is remarkable for a small nation that is rooted in a predominantly Third World environment.

The milestones on South Africa's road to hi-tech status are well marked: oil-from-coal and uranium enrichment technology; shaft sinking and deep level mining expertise; the development of major iron and steel industries, as well as extensive electricity and communications infrastructures; spectacular innovations in armaments manufacture and participation in major hydro-electric projects; and, now, Mossgas and a space program capability.

Insofar as space research is concerned, South Africa has been intimately involved in the space age since the launch of the first sputnik. The radio space research station at Hartebeeshoek played a significant part in all the American deep space missions and in the tracking of United States earth satellites. The Hartebeeshoek complex has also provided tracking and command support for the launching of French satellites.

Satellite data received at Hartebeeshoek is routinely relayed to other countries in Africa south of the equator and is used in weather forecasting. Satellites are also used for international communications and for relaying television programs.

It is imperative that South Africa keeps up in the ever accelerating technological race. As it approaches the 21st century, the world is likely to split into two major blocs: a small group of nations forming the premier technological league—the hi-tech league—and the rest. South Africa has the undisputed potential to enter the hi-tech league of the 21st century, but our Third World environment inevitably provides constraints.

The costs of a space program for example, must be weighed up against the need for the socioeconomic development of developing communities. Given our limited financial resources, expenditure on education, health, and other sectors experiencing a backlog in facilities must have priority.

The paramount need is for job creation and training and for the development of depressed sectors of our society. At the same time, however, technological acceleration must not be seen as contradictory to the need for labor intensive workplaces. Experience in the Far East has shown that hi-tech can create jobs and new industries and can stimulate informal sector growth. It is accordingly important that, while socioeconomic development projects continue to be emphasized, hi-tech sectors be encouraged to grow and expand so that South Africa will be ready for the technological demands and challenges of the 21st century.

2d Minireactor Reaches Criticality Safely

HK2205131189 Beijing CEI Database in English 22 May 89

[Text] Beijing (CEI)—According the China State Nuclear Industry Corporation, China's second mini reactor, built by the China Nuclear Energy Science Research Institute, has reached criticality safely recently. The reactor passed the safety examination organized by State Bureau of Nuclear Safety after its installation and testing were completed in Shandong Province and approved operation. In May 3, the reactor reached criticality. China's first mini reactor was developed by China Nuclear Energy Science Research Institute and passed testing in 1984.

Potential Sites for Power Plant Named

51004009 Hong Kong SOUTH CHINA MORNING POST in English 19 Apr 89 p 3

[Article by S. Y. Wai]

[Text] Guangdong authorities have identified Haifeng and Taishan counties as two potential sites for the southern Chinese province's second nuclear power station.

Provincial officials yesterday said the two areas were chosen for their relatively stable seismic structure and proximity to the centre of electricity demand.

A team of Chinese geologists, seismologists, meteorologists and energy experts visited the two sites last month.

Haifeng, comprising mostly of fishing villages, is about 140 kilometres northeast of Lowu and less than 100 km from Dakeng, Daya Bay, where a $28.6 billion atomic station is being developed by a Sino-Hongkong joint venture.

Taishan is about 110 km west of Lantau Island. Both counties are much farther from Hongkong than Daya Bay, which is only 30 km northeast of the border.

A retired deputy chief engineer of the Guangdong Electric Power Bureau, Jiang Zhiping, has been appointed to head the site selection team.

The site selection study, which began in December, was jointly ordered last year by the Guangdong Provincial Government and Planning Commission.

Mr Jiang said experts from the Guangdong Electric Power Bureau and the Guangdong Electric Power Design Institute were assessing the seismological and geological characteristics of the two counties.

He expected the assessment to be complete by the end of the year.

Mr Jiang yesterday said the Guangdong province had experienced a lot of earthquakes and it was difficult to locate seismologically stable places.

He declined to reveal the exact locations of the sites but said one Haifeng site had recently been dropped because of the discovery of several faults.

He Jiang said Taishan had a clean record as far as earthquakes were concerned and it had not had any major tremors in recent decades.

"Haifeng is also pretty stable. The last major earthquake was recorded several decades ago off the coast at Honghai Bay (northeast of Daya Bay)," he said.

Mr Jiang said their study did not cover Daya Bay because the relevant data for the area was available from previous site selection studies for the first plant.

Meanwhile, a China News Agency report said Guangdong power experts had cancelled a planned field trip to Daya Bay, following a Ministry of Energy Resources announcement this month that the province's second atomic station would not be built there.

Prototype of Element for Nuclear Power Station Developed

OW2705090789 Beijing XINHUA Domestic Service in Chinese 1138 GMT 13 May 89

["Local Broadcast News Service"]

[Excerpt] Beijing, 13 May (XINHUA)—The following new achievement has been scored during new construction:

The prototype of an element for a nuclear power station with a capacity of 300,000 kilowatts, designed and built by China for the first time, passed verification and appraisal at the ministerial level recently. Relevant experts believe that their various functions have met the specifications of design parameters, and that they may be put into mass production. The successful development of the prototype of an element for a nuclear power station will provide an up-to-standard element for the Qinshan Nuclear Power Station. [passage omitted]

Zhejiang Nuclear Power Station Construction

HK2905031289 Beijing CHINA DAILY (Business Weekly Supplement) in English 29 May 89 p 1

[Text] Installation of key equipment at a Chinese designed and built nuclear power station in Qinshan, Zhejiang Province, is well under way and the plant is expected to start operation next year.

A major capital construction project, the plant was started in 1983. Its first phase of construction provides for a generating capacity of 300,000 kilowatts.

The safety shell of the reactor has been sealed and various workshops and a water system have been completed.

A recent inspection has proved that the design, construction and equipment at the plant are all up to the required standards.

Preparation of the second phase of construction, which will provide an extra 1.2-million-kilowatt generating capacity, is under way.

JAPAN

Police Investigate Firm's Exports to GDR

OW2405040989 Tokyo KYODO in English
0233 GMT 24 May 89

[Text] Tokyo, May 24 KYODO—Executives of an electrical machinery manufacturing company in Tokyo face arrest on suspicion of illegally exporting nuclear material to East Germany, sources in the Metropolitan Police Department said Wednesday.

The company, Prometron Technics Ltd., is suspected of exporting hafnium, a metallic element occuring in zirconium minerals which can be used to control neutron releases from nuclear reactions, in violation of the rules of the Paris-based Coordinating Committee for [Multilateral] Export Control (COCOM), the sources said.

COCOM controls the export of strategically sensitive goods to communist countries.

Police have raided the company's offices and homes of its executives, including its president, Hirokuni Matsuda, and seized documents as evidence, the sources said.

The executives, who are being questioned by the police, will be arrested and charged with violation of the Customs Law which prohibits such exports without notification, the sources said.

Executives of the company were not available for comment when telephoned by a reporter.

According to the police sources, Prometron Technics employees are believed to have carried the material to East Germany on several occasions between 1986 and 1987, taking 3 to 5 kilograms there each time.

The sources said hafnium can be used to make control rods for small reactors used in nuclear submarines.

Prometron Technics is a leading manufacturer of air plasma steel cutters as well as of electronics products and has branch offices in East Berlin, Chicago, and Singapore. It has had relations with East Germany since the company was founded in 1973, the sources said.

The company expanded the bilateral business relations after concluding a contract with an East German electronics import and export corporation 10 years ago, the sources said.

According to the sources, the police suspect that East Germany may have pressed Prometron Technics to illegally reexport the material, which was imported from the United States.

NORTH KOREA

Czech Nuclear Delegation Discusses Cooperation

Meeting With Vice Premier

SK2205103589 Pyongyang KCNA in English
1022 GMT 22 May 89

[Text] Pyongyang May 22 (KCNA)—Vice-Premier Hong Song-nam today met and conversed with the delegation of the Czechoslovak Nuclear Energy Commission led by its chairman Stanislav Havel in a friendly atmosphere at the Mansudae Assembly Hall.

Choe Hak-kun, minister of atomic power industry, and Vaclav Herman, Czechoslovak ambassador to Korea, were present.

Atomic Energy Protocol Signed

SK2305101289 Pyongyang KCNA in English
1010 GMT 23 May 89

[Text] Pyongyang May 23 (KCNA)—A protocol on cooperation in the field of atomic energy for a peaceful purpose between the Ministry of Atomic Power Industry of the Democratic People's Republic of Korea and the Czechoslovak nuclear Energy Commission was signed in Pyongyang on May 22.

It was signed by Choe Hak-kun, minister of atomic power industry and Stanislav Havel, chairman of the Czechoslovak Nuclear Energy Commission.

Meanwhile, the 1989-1990 working plan between the ministry of the DPRK and the Czechoslovak commission was signed on the same day.

INTRABLOC AFFAIRS

CEMA Nuclear Program Described

AU2005165289 Prague RUDE PRAVO in Czech 18 May 89 p 3

[Interview with Engineer Vaclav Pantucek, deputy director of a department at the CSSR Ministry of Metallurgy, Engineering, and Electrotechnical Industry, by Evzen Stanek: "Prospects of Nuclear Engineering"; date and place not given; first paragraph is RUDE PRAVO introduction]

[Text] The CEMA Committee for Cooperation in Engineering met in Prague in March. One of the items on its agenda was the implementation and further development of the CEMA countries' joint nuclear program. In response to the wish which one of our readers conveyed to us in a letter, we have asked Engineering Vaclav Pantucek, deputy director of a Federal Ministry of Metallurgy, Engineering, and Electrotechnical Industry Department, a member of our delegation in the committee, about the present state of this program and about its prospects after the Prague meeting.

[RUDE PRAVO] What has, in your opinion, caused the slowing down of the development of nuclear power engineering in the CEMA countries, compared with the intentions of the program?

[Pantucek] The slowing down occurred in the years of the Seventh 5-Year Plan, particularly in the years 1986-88. It is possible to say that it reflects the lower-than-planned generation of national income in the socialist countries, which resulted in there being less money for the construction of expensive nuclear power stations. There are also specific reasons in individual countries. The GDR, for example, did at a certain time give preference to the construction of some ecological projects, such as the reconstruction of boiler rooms, but now it is accelerating its nuclear construction again. The construction of nuclear power stations in Bulgaria has fallen 2 years behind the plan; in the Seventh 5-Year Plan, Bulgaria drew up a rather ambitious program for the construction of two 1,000-megawatt units at the Kozloduy power station and construction start at Belene was delayed. The situation in the Soviet Union has become complicated after the accident of Chernobyl. Many regulations, particularly decisions about the selection of localities, are being reconsidered and construction in this 5-year plan has slowed down substantially. A similar situation is to be expected in the next 5-year plan. Hungary, on the other hand, wants to speed up the construction of two VVER-1,000 units at Paks, where we will supply our equipment.

[RUDE PRAVO] What is the impact of the slowing down of the nuclear program on our economy?

[Pantucek] In this 5-year plan, we were to supply, among other things, two 1,000 megawatt nuclear reactors to Romania. The Romanian side backed away from these plans in the middle of the 5-year plan, at a time when work on both reactors was in progress. This has caused losses because the reactors are still among the inventories of the Skoda concern's Power Engineering plant.

[RUDE PRAVO] Is there still a realistic chance of all the capacities—and, more specifically, Skoda's reactor hall—that we have built, with a view to international specialization, being fully utilized?

[Pantucek] In 1987 the CEMA governments signed a protocol extending until the year 2000 the agreement on specialization and cooperation in manufacturing equipment for nuclear power stations. Deliveries up to the year 1995 were specified in such a way that member countries would not run up any excessive stocks of manufactured equipment and manufacturers would be able to effect timely supplies to new projects. In the next 5-year plan, we should deliver seven 1,000-megawatt reactors—two each to Bulgaria and Hungary and another three to the Czechoslovak nuclear power plant at Temelin. Simultaneously, three VVER-440 reactors will be completed to be exported to Poland.

[RUDE PRAVO] Still, how will the problems in Skoda Plzen be dealt with?

[Pantucek] Work on five nuclear reactors is in progress in the Skoda plant, of which two will be used in this 5-year plan. One has already been dispatched to Bulgaria, for the first unit of the Belene power station, and the other one, to be delivered in 1990, is for the first unit of the Temelin power station. The remaining three 1,000 megawatt units account for formidable difficulties in the financial situation of the enterprise. These inventories should be regulated [zregulovany] by 1991. We anticipate that an alternative production of turbines will have to be found for about 20 percent of the reactor hall's annual capacity. Various alternatives have, of course, been considered. However, any other traditional alternative production would cause economic difficulties comparable with those existing today.

[RUDE PRAVO] Given the present difficulties of all CEMA countries, is there any prospect at all for the nuclear program being developed in its original form, which foresaw that Czechoslovakia, together with the Soviet Union, would be CEMA's largest supplier of reactors?

[Pantucek] We firmly believe that preference will be returned to the nuclear program again. Other countries, such as the United States, are also considering the resumption of the construction of nuclear power stations, because of the pollution caused by the burning of fossil fuels. All CEMA countries are grappling with this type of pollution. The possibilities of generating electricity from other sources have been considered but all solutions devised so far indicate that one has to stick to

nuclear power stations, equipped, of course, with elements that will be modern even after the year 2000.

[RUDE PRAVO] But what would happen if, for economic reasons, we would have to replace current production by other production programs? Would the CEMA countries be able to procure the equipment elsewhere?

[Pantucek] They would. At least two countries are specializing in the production of each nuclear component. Czechoslovakia and the Soviet Union, for example, specialize in nuclear reactors and Czechoslovakia, the Soviet Union, and Poland specialize in steam generators. However, winding down the production of components such as reactors, steam generators, and special fixtures and pipes would cause a severe delay in new production. We spent the entire Sixth 5-Year Plan preparing for today's production. We have invested immense resources in specialist workplaces and training specialist cadres—designers and technicians, welders, assembly workers, control staff, and operators of control equipment. The dovetailing of the production teams in the Skoda and Vitkovice concerns and in five enterprises of the Sigma concern required great efforts. A winding down of production would mean the loss of the qualifications of these specialists. The renewal of production at a later stage would lead to formidable material difficulties.

[RUDE PRAVO] What will be the impact on further cooperation and specialization of Bulgaria's view, which it expressed at the last session of the CEMA Committee for Engineering, that one should abandon the practice of fixed appropriations [vazane odbery] and move toward direct contractual ties between individual countries?

[Pantucek] The governments consistently control the sharing out of specialization. This is an administrative measure, whose effect in the last 10 years has been generally positive. Manufacturers were compelled to produce in good time and quality and to meet deadlines. Bulgaria has now proposed that the importer should have the opportunity of choosing the supplier according to certain criteria, such as price. To be specific: Czechoslovak deliveries represent for Bulgaria a major item in the mutual trade balance, which Bulgaria cannot offset by its deliveries.

In our opinion, this situation needs to be dealt with at the level of national planning agencies with a lead time of at least 5 years. A way to proceed will have to be found so that everyone benefits from specialization, which has been created not only in our country.

[RUDE PRAVO] Are sanctions being applied if deadlines are not complied with?

[Pantucek] Yes, it is possible to claim punitive damages in the event of the nonfulfillment of mutual deliveries. There are agreements on prices and various markups and markdowns, which we consistently apply against partners who do not honor their obligations. They, too, apply them against us.

[RUDE PRAVO] What is the situation with respect to the deliveries of equipment for our own nuclear power stations?

[Pantucek] Deliveries for the Mochovce power station, which will have four 440 megawatt nuclear units, are being worked out. In line with a CSSR Government resolution of 1985, the first unit is to be commissioned in 1989. The launching of the first unit at Temelin will be possible around the year 1992 or 1993 at the latest, which is commensurate with the difficulty and novelty of problems involved in the construction of a project with four 1,000 megawatt units. Another difficulty is that in some years the investors lack the resources to purchase deliveries. This concerns, for example, the Skoda state enterprise and the Vitkovice economic production unit, which have prepared a number of installations, which, however, have not been invoiced so that Skoda and Vitkovice are getting into the red, through no fault of their own.

[RUDE PRAVO] Are the delays in the nuclear program accounted for, apart from internal difficulties, also by bad deliveries by foreign partners?

[Pantucek] The production of new types of pumps in the Soviet Union did not start in time—with some deliveries being up to half a year behind schedule—which causes us certain difficulties during assembly work at the Mochovce nuclear power station. Other deliveries, coming from Bulgaria and the GDR, are being fulfilled.

[RUDE PRAVO] What do we owe the other CEMA countries? Some time ago, for example, it was claimed in the Bulgarian press that we are to blame for the slowing down of construction at the Belene nuclear power station.

[Pantucek] I do not remember any problems on our part with the fulfillment of contracts concerning the Belene nuclear power station. We have recently dispatched the pressure vessel of the nuclear reactor. It is not yet needed at the building site and the Bulgarian side itself is having difficulties with premises for its unloading and with additional equipment for it. We have also concluded with the Bulgarian People's Republic contracts for various special fixtures, which we are fulfilling. However, the Bulgarian partners want to have some deliveries that are not manufactured within the framework of specialization. This concerns the production of pipes and shaped parts in the Chepos and Sigma Modrany enterprises from materials which the Bulgarian partners delivered with a delay. They have also ordered, beyond and above the agreement's framework, other equipment, such as construction machinery, and demand its expeditious delivery. We will do our best to accommodate them. However, our capacities are not such that we can accomplish everything.

[RUDE PRAVO] Thank you for the interview.

CZECHOSLOVAKIA

Details of CSSR Nuclear Program Provided

AU2605121689 Prague MLADA FRONTA in Czech 23 May 89 p 3

[Interview with Eng Jiri Koller, director of the nuclear program of the Skoda concern of Plzen, by Jan Cech: "The Crucial Sore Spot of Our Nuclear Power Engineering: Producing Expensively and Slowly; Atom Deprived of Mystery"; date and place not given]

[Excerpts] [Passage omitted]

[Koller] Thus far, we have manufactured 21 reactors of the VVER-440 type, of which 15 have been completed and expedited. Four of our "440's" are in Hungary, two in the GDR, two in the V-2 nuclear power plant in Jaslovske Bohunice, four in Dukovany, two in Mochovce, and one in Poland. And we also have customers for the remaining reactors. Right now, we are preparing to expedite three remaining blocs to Poland and two to Mochovce. Work is proceeing on five nuclear reactors of the VVER-1000 type. We have begun expediting the first of them to Bulgaria, next year we will deliver the second to Temelin, which will receive yet another bloc in 1991.... In total, we must manufacture four 1,000 MW reactors for Temelin and, by 1994, also two each for Bulgaria and Hungary.

[Cech] Nothing is definite regarding the VVER-1000 reactors for Bulgaria and Hungary?

[Koller] Thus far, the delivery of the first bloc for the Bulgarian Belene power plant has been contracted for, and at present we are negotiating technical conditions with Hungary with a view to a contract for two reactors being concluded in the third quarter of this year. During the meeting of chairmen of the CEMA member countries' State Planning Commissions in Moscow last February, of the customers allocated to us in CEMA, the Hungarians and Bulgarians have confirmed their orders, only the Poles requested at that time the postponement of deliveries by about 3 years, which meant that they wanted the first VVER-1000 pressure vessel in 1996.... However, recently we were informed that the preparatory work on the Warta nuclear power plant had been suspended, which was to have six CSSR-manufactured "1000's." Thus, we are waiting for the final decision on construction of the aforementioned power plant. The decision will be made by the Economic Committee of the Council of Ministers of the Polish People's Republic, which will assess various variants of the state's energy policy through the year 2000.

Of course, we must admit that the situation as a whole is complex, and will be strongly influenced by the current political developments in the individual countries.

[Cech] We will no longer be delivering to the GDR? And what about Romania? At one time Romania used be mentioned as a market for Skoda's nuclear power engineering equipment.

[Koller] The GDR was our customer only for the lower-performance reactors of the VVER-440 type. The Socialist Republic of Romania was the only one that backed away from its orders. For they are capable of manufacturing quite a few things themselves and purchase only some parts abroad. They are delivered—as far as I know—by Canada.

[Cech] Have our nuclear plans been somewhat changed?

[Koller] No, the construction of nuclear power plants remains the fundamental strategy in the CSSR's economic development, and the development of our nuclear power engineering has been planned through the year 2005. After the conclusion of the construction in Mochovce and Temelin, we will continue in Kecerovce in eastern Slovakia, in Blahutovice in northern Moravia, and in Tetov in eastern Bohemia. Each one of these newly planned power plants will have two 1,000-MW blocs. [passage omitted]

[Cech] From what you have been saying, one could get the impression that the nuclear program is completely free of problems....

[Koller] Problems do, of course, exist, and I see the most fundamental of them in the fact that we are producing things too expensively, they cost us twice and even three times more, compared with the most developed world. This, of course, is a result of the design and the matter can be solved. Another sore point involves the considerable shortfalls in the construction of nuclear power plants in the CSSR as well as lags on the part of our customers.

[Cech] This brings us to the economic aspect of the matter. The CSSR has invested considerable sums in the nuclear program. Is that right?

[Koller] The Skoda concern has invested a little over Kcs1 billion in its nuclear program, and further resources have been earmarked in this connection for the modernization of other Skoda enterprises—for Hute [metallurgy works], Kovarny [forging shops], and Turbiny [turbines], thus investing roughly a total of Kcs2,5 billion. One reactor of the VVER-440 type costs Kcs380 million, and the VVER-1000 reactor costs Kcs750 million. They are some of the most profitable lines we manufacture. [passage omitted]

[Cech] Are the customers able to pay us without problems?

[Koller] Thus far, there have been no big problems with payments for nuclear power engineering equipment. Certain discussions have arisen only in connection with the first VVER 1000-pressure vessel, which we recently expedited for Bulgaria.

[Cech] This is what I had in mind. I escorted the vessel on its complicated journey from Plzen to Bratislava and was surprised when, under way, I found out that the giant will not be transported any further and, approximately to the end of the year, will remain stored in Palenisko port in Bratislava.

[Koller] The Bulgarian customer still has not readied the lifting equipment in the port for the construction site of the Belene power plant, where there is a roughly a 1-year lag. The project's state of readiness there is about the same as in Temelin. Under these conditions, it would be difficult to move the vessel, weighing some 350 tonnes, and store it somewhere else in Bulgaria. Thus, it has been agreed that it will remain—properly conserved—in Bratislava for some time. This will result in no economic loss to Czechoslovakia; following operative [operativni] negotiations at the government level, the vessel has already been paid for.

POLAND

Government Responsive to Antinuclear Initiatives

51003005 Warsaw PRAWO I ZYCIE in Polish
No 18, 6 May 89 pp 4-5

[Article by Danuta and Aleksander Wroniszewski: "Green Wave"]

[Excerpt] The color green has always been associated with spring, nature, and hope, and lately also with ecology. This year, on the first day of spring, when madders were drowned all over Poland, the Wroclaw movement WiP [Freedom and Peace] (proclaiming a pacifist and ecological program) organized the first legal manifestation in its history. The participants directed by Leszek Budrewicz recalled their ecological slogans; however, primarily this was supposed to be a peace manifestation. WiP members handed flowers to the representatives of law enforcement. The militiamen tried to avoid accepting them for statutory reasons. Budrewicz expressed his hope that in the immediate future the Easter peace march will not be restricted to beating the pavement on Swidnicka Street, but will rather proceed to the Netherlands and Spain.

WiP members in Szcecin prepared such an event for Easter Monday. In the invitations they handed out to anonymous passersby one could read: "We hereby have the honor of inviting you to take part in the peace and ecological Easter March, organized in Szczecin for the first time. Instead of the traditional gluttony and boredom, there will be a holiday walk through the streets of the city proceeding under the slogans 'Europe Without Other Countries' Armies,' 'Poland Without Nuclear Power Stations.' We will announce the route of the march and details of the schedule in special posters after they are confirmed by the city authorities. We call on you to prepare your own banners, clothing, and other attributes which are in line with the main goals of the march."

In the opinion of many citizens of Szczecin, they have not yet had an event with so many participants organized by a still informal movement. Other informal groupings also took part, including the Federation of Fighting Youth, Solidarity, the POS [Polish Student Organizations], Interacademic Ecological League, and... those who did not quite know. Not only ecological slogans appeared on banners and were chanted during the march.

Several days later, on Sunday, 2 April, ecological protests occurred in Poznan, Pila, Gorzow Wielkopolski, and Wronki. In Poznan, where somewhat earlier the building of the nuclear power station in Klempicz was protested, a peace demonstration was announced. As the Polish Press Agency reported, it ended with the following balance: no arrests, 17 injured law enforcement personnel, and five overworked militia cars.

There were no incidents in the three other cities where protests were held against the construction of the Warta nuclear power plant in Klempicz, except, of course, one attempted battery, or essentially perhaps just intimidation, of a well-known Gorzow journalist, a very active WiP member. A young man with a green band on his arm assumed belligerent poses, and threatened the journalist, who was observing the manifestation, with battery for his unfavorable attitude toward the movement and open lack of fear of nuclear energy.

The Gorzow demonstrators began to assemble next to the cathedral before 10.00 hours.

The banners were unfurled with slogans like "We Do Not Want Klempicz," "We Want Healthy Air, Water, and Food," "Nuclear Power Stations Will Ruin the Polish Economy," "Fewer Power Plants, More Tractors," or "Radioactive Wind Will Blow Away All Doubts."

Meanwhile, doubts surfaced as to who was to walk at the head of the march: the sponsor, i.e., WiP representatives, Solidarity functionaries, who assumed responsibility before the city administration for the conduct of the event, or young people from the so-called RMN [Movement of Independent Youth]. After a short argument, the RMN banner was positioned first.

After mass was said, and Dabrowski's Mazurka [Polish national anthem] was sung, the chanting crowd went in the direction of the high-rise building of the City Administration. While still there, the leaders of groups taking part in the march talked to those gathered, as well as a guest, representative of the Citizens' Committee "The Watch" from Darlowo, who read a petition from the inhabitants of Darlowo to the Sejm (we reported on it in detail in the fall of last year). In turn, Stanislaw Zytkowski read a resolution passed on 19 March 1989, after the second ecological session held in Gorzow in March, on the topic "Prospects for the Development of Nuclear Power Generation" and "Fears and Dangers." Among

other things, the authors of the resolution demanded that the authorities discontinue building all nuclear power stations, and allocate all the funds saved for restructuring industry with a view to reducing its energy intensiveness, as well as make materials of that nature available to independent experts, and provide an opportunity for the opponents of nuclear energy to express their views in the mass media.

There already were 4,000 signatures under the resolution, and Stanislaw Zytkowski announced that signatures will be collected at the gates of plants and churches.

In both Gorzow and Szczecin, they demanded that an all-Polish referendum be held on continuing or discontinuing the construction of nuclear power plants. The protesters also expressed dissatisfaction with the fact that, as they see it, the government takes no interest in public opinion on an issue that important, expensive, and controversial.

To be sure, it is controversial to the point that opponents of nuclear power have great differences among themselves as to arguments for objecting to this. For example, the scientists from Poznan point out the side effects of the eventual operation of "Warta" nuclear power station—the drying of soil in Great Poland and destruction of the breadbasket of our country. Others, such as a representative of the legal association "Order and Freedom," argue that the development of this kind of power generation in Poland is unprofitable. They emphasize tremendous costs of construction which hamper other, currently more efficient investment projects, and a relatively short operational life of the power station, costly and difficult waste storage, as well as the fact, brought up by, among others, Stanislaw Albinowski, that several dozen percentage points of electricity now generated in our country are wasted. They admit that Minister [of Industry] Wilczek has recently made several necessary decisions on restructuring, but a well-conceived and stable policy for savings in energy consumption is needed.

The citizens of Great Poland, Lubusko, and Pomerania also state their disbelief in the opportunity for nuclear plants to be safe, all the more so if they are built by the Poles rather than the Japanese or the Americans. They say that in a country in which a decent car, or even reliable forks cannot be manufactured, endeavoring to get "the nukes" is very dangerous.

These apprehensions do not appear absolutely groundless. A TV report, shot by Ireneusz Engler a couple years ago and showing the beginnings of building the Zarnowiec "nuke," remained "shelved," to be sure, perhaps for the simple reason that it showed the entire "generic quality" of construction: substitute materials, and substitute labor, i.e., prison inmates... In its turn, the report by Eryk Mistewicz in the March 1989 issue of REPORTER on the Central Storage Facility for Radioactive Wastes in Rozana paints a shocking picture of 30 years of shabbiness and carelessness. Over the years, the Rozana facility has become much like the forgotten devil in the play by J. Drda. To be sure, the institute in Swierk did regularly ship two drums a week of radioactive wastes taking, however, little interest in what happened to them, and to the employees. The latter, dressed in aprons affording protection from getting soiled, but not from radioactive contamination, tested rarely and unaware of the results of latest tests, were making money on the side selling lead drums at the purchasing facility, and making cast iron drums available to the public.

"The forgotten devil" in Rozana was discovered in conjunction with loud protests against the drafted nuclear burial site in the vicinity of Miedzyrzecze, in Gorzow Province. In June of this year, a special commission certified by the International Atomic Energy Agency in Vienna will examine the Rozana storage facility. Preparations in Rozana are under way. If the inspection brings a favorable result, then nothing will remain but to believe the assurances of a character in the report by E. Mistewicz that life amid radioactive wastes is as quiet and healthy as at a resort.

Protests against the development of nuclear power generation are not in the least the domain of angry and confrontational young people. At a session of the WRN [Provincial People's Council] councilman Jerzy Hrybacz tabled a motion to convene a session on nuclear energy and the construction of the power station in Klempicz. One day later, this was the dominant extra-agenda topic at the WRN session in Poznan. Councilman Michal Domnarowicz introduced a letter to the minister of industry outlining doubts concerning the construction of Warta nuclear power station. The WRN Presidium transmitted this letter and other documents to Jerzy Bijak, government commissioner for nuclear power generation, who was visiting Poznan.

Meanwhile, the WiP members and others promise protests against nuclear power stations on the first Sunday of every month. The slogan "Clean Energy = Clean Death," indicating lack of confidence in the statements that nuclear power plants are clean and safe, will still remain. "Clean death" inflicted on the people and nature by the accident in Chernobyl will remain the supreme justification. This year, 20 Belorussian villages, in which increased radioactivity continued to occur, were evacuated.

There is no argument that only after the Chernobyl accident has the panic, the fear of this unknown power of the atom become awaken in people. Before 1985, nuclear power stations were first of all synonymous with progress. For example, in the GDR the public demanded that nuclear power stations be built for ecological reasons, because particle emissions from the coal power plants polluted the air too much.

The citizens of Gorzow or Szczecin protesting the construction of the nuclear power station in Klempicz,

removed from them by 100 kilometers or more, are nearer to the already existing nuclear power stations in Eberswalde and Greifswalde. The latter, incidentally built with the participation of young people from Szczecin working there within the framework of OHP [Volunteer Labor Brigades] brigades, is one of the largest in Europe: four reactors are already in operation, and four more are under construction.

In case of an accident and a threat of radioactive contamination, their proximity and the wind rose would be more unfavorable [than] in the case of Warta power station. "Indeed, 80 percent of the winds in Szczecin Province blow from the west and northwest," admits First Secretary of the PZPR Provincial Committee in Szczecin Stanislaw Miskiewicz. "However, the case of Chernobyl has shown that distance does not mean safety. The radioactive cloud traveled over Sweden, and subsequently, driven by shifting winds, came partly as far as Swinoujscie and its vicinity, which I could see much later on the maps of radioactive contamination."

The proponents of a clean environment, just as the opponents of nuclear power generation, have recently become more active. By all signs, they will be increasingly many, and increasingly louder, though it is not certain at all that in doing that they will help the government of Prime Minister Rakowski, who accepted environmental protection to be one of his three basic tasks. Thus far, increasingly many citizens gain "knowledge" about nuclear power stations from the protest banners, because there is little official information explaining this field; TV debates of scientists-proponents and opponents of the "nukes" remain in the dimension of declarations by the one side, and wishful thinking by the other. [passage omitted]

BRAZIL

Avibras, PRC To Sell Satellite Launchers

33420050 Sao Paulo FOLHA DE SAO PAULO in Portuguese 19 Apr 89 p A-8

[Article by Roberto Lopes]

[Text] The Avibras International Co. of London—a subsidiary of Sao Paulo's Avibras Aerospace Corp., the country's chief arms exporter—signed a contract with the Chinese Government 2 weeks ago to set up an agency which, operating like a trading company, will market launchings of space rockets and supply satellite tracking equipment to Third World countries. The new company will be called International Satellite Communication (Inscom). The signing of the agreement, which took place in Beijing on 4 April, was the result of almost 3 years of negotiations between the Brazilian firm and the China Great Wall Industry Corp., the industrial arm of the Chinese Ministry of Astronautics.

President Jose Sarney and Minister of Army Leonidas Pires Goncalves were informed of the talks about a year ago, even before Sarney's official visit to China (in July 1988). Except for them, only Ambassador Paulo Tarso Flecha de Lima, secretary general of the Ministry of Foreign Affairs, was kept informed of the details of the plan. The government respected the secrecy surrounding the negotiations. Today, in addition to Sarney, Leonidas, and Paulo de Tarso, only four other ministers—General Ivan de Souza Mendes, chief of the SNI [National Intelligence Service]; General Octavio Moreira Lima, minister of aeronautics; General Rubens Bayma Denys, chief of the Military Household of the Presidency; and Abreu Sodre, minister of foreign affairs—are familiar with the matter.

The secrecy is justified. In the Middle East alone, the immediate potential market for supplying space centers and launching artificial satellites is estimated by the Chinese at DM1 billion ($600 million)—that is, 13 times the value of Brazil's share of the scientific cooperation program with China for building two artificial satellites. The partnership between Avibras and Great Wall will be announced officially within 2 months, during the coming International Air Show at Le Bourget in Paris in the presence of government officials from Brazil and China.

News of the deal did not leak out until 3 weeks ago, when two executives from the Brazilian firm Elebra (one of them a colonel in the Air Force Reserve named Mendonca) intercepted a mission from the Chinese Ministry of Astronautics that was making a courtesy visit to Minister Moreira Lima in Brasilia. FOLHA DE SAO PAULO has learned that the Brazilian pair proposed to the Chinese that a partnership be formed for space launches and the joint development of new rocket projects. The Chinese listened attentively and smiled, and then one of them, U Keli, revealed that China was already involved in similar negotiations with Brazil's Avibras. U Keli, who is Great Wall's vice president for space affairs, is also the number two man in Inscom.

Great Wall's partnership with Avibras differs from the one proposed by Elebra in that Inscom will not concern itself with developing new rockets for its customers, much less with any military objectives in connection with its work (something which the Chinese felt was implied in Elebra's intentions). Avibras and the governments of China and Brazil are well aware of the diplomatic difficulties with the big Western powers that they would have to face if the United States discovered that Inscom was going to sell rockets to Third World countries or that its contracts to supply space centers in the Middle East, Latin America, Asia, or Africa were going to be used for military projects on those continents.

The day before yesterday, late in the afternoon, Avibras Director of Government Relations and Sales Manager Pedro Vial, who will be a kind of manager for Inscom in Brazil, reacted with surprise and great nervousness as he talked to reporters who had gone to the firm's headquarters in the municipality of Sao Jose dos Campos (85 km from Sao Paulo). "The Inscom matter will be announced to the press by the company chairman, Joao Verdi Leite (chairman of Avibras), in Paris in June. Until then, FOLHA DE SAO PAULO will just have to wait," he said at first.

Despite that, Vial could not prevent our newspaper from interviewing two Great Wall executives who were at Avibras over the last holiday preparing the proposal which they will submit to the Ministry of Communications this morning in an attempt to win the contract for launching the satellites included in the Brasilsat-2 program. One of the Chinese, Fu Wen Long, will be a member of the Inscom board of directors. His companion, Chen Shouchun, Great Wall's vice president for science and technology, said that he saw "better prospects for Inscom in South America, the Middle East, and Asia. We are very happy with the new firm," he said in conclusion, and he never stopped smiling.

Capital of $500,000

Inscom, the company formed by the Sao Paulo firm of Avibras and the Chinese Government to launch satellites for Third World countries and supply them with tracking stations, will have its headquarters in Europe and branch offices in Sao Jose dos Campos (at Avibras headquarters) and in Beijing (where Great Wall's main offices are located). The company's initial capital will total $500,000 (about 1 million new cruzados), most of which will be supplied by the Brazilian firm.

Last December, Pedro Vial was in China negotiating that and other final details in connection with the undertaking. The day before yesterday, he would say only that the new company was going to be physically located on the top floor of the so-called VIP wing at Avibras, near the

landing strip used by Embraer [Brazilian Aeronautics Co.]. Avibras is experiencing a financial crisis. At the end of last year, after the Iraqi Government delayed payment on military rocket launchers of the Astros-2 type—the star performer in Avibras sales in recent years—the firm laid off over 1,000 employees and began paying the remaining 5,000 employees late.

"We had a cash-flow problem which we have not concealed from anyone, including our Chinese partners in Inscom. They know everything. Since our difficulties are due to circumstances of the moment and are temporary, we did not want to interrupt the firm's growth and the project with China. Next week we will begin paying the amounts due those who were laid off but have not yet received everything to which they are entitled. We will also try to straighten out our monthly payments. In other words, we will begin overcoming our difficulties. Today we are convinced that we did the right thing by not suspending the negotiations on Inscom because of our cash-flow problems," said Vial.

In fact, the military and financial areas of the government have always had faith in Avibras' ability to overcome its economic difficulties. A general assigned to Army Headquarters in Brasilia told FOLHA DE SAO PAULO early this month that the yards at one of the company's plants are full of rockets for the Astros-2 armored launch vehicles ordered by the Iraqi Army, and that they will be shipped as soon as the Baghdad government finishes paying off its debt to the Sao Paulo firm. Saudi Arabia, which already has the Astros, is also negotiating a new order for rockets.

In military circles, the difficulties at Avibras are regarded as a direct consequence of the events marking 1988—examples being Brazil's high inflation rate and the end of the Iran-Iraq War. Embraer, which manufactures the well-known Tucano aircraft and is attached to the Ministry of Aeronautics, has announced losses of $20 million for last year.

Great Interest in Rocket Market

The establishment of Inscom is the big bombshell in the genuine war that Brazilian industry's fight to enter the international market for rockets and artificial satellites has become. Last year, after FOLHA DE SAO PAULO reported the difficulties being encountered by the Space Activities Institute (IAE) of the Ministry of Aeronautics in developing a rocket capable of launching the scientific satellites being built by the National Institute of Space Research (INPE), and revealed that the INPE was trying unsuccessfully to lease foreign rockets for those launchings, the attention of Brazilian businessmen was drawn to that sector.

And that attention turned into good business prospects when the government announced the negotiations for a space cooperation agreement with the Chinese Ministry of Astronautics (the agreement was signed by President Jose Sarney in July of last year). The agreement provided for the joint development of two artificial satellites—10 times heavier than those being planned to date in Brazil. But the Sao Paulo firm of Orbita felt that satellite technology might be followed by the technology for building rockets, and so it immediately contacted the INPE, which was to be the Brazilian partner of the Chinese.

Orbita's interest in absorbing Chinese technology had the blessing of the INPE's manager at the time, Marco Antonio Raupp (who resigned this past January); but Raupp could never get the government interested in the undertaking, the simple reason being, as he himself was to say later, that there were so many changes of minister in the ministry concerned (the now-extinct Ministry of Science and Technology) that the matter could never be pursued with any regularity. More recently, it was the Elebra firm's turn to try to draw closer to the Chinese (see above).

But Orbita and Elebra were not the only ones to feel tempted by rockets and satellites. Around September 1988, Ozilio Silva, chairman of Embraer (which is attached to the Ministry of Aeronautics and manufactures light aircraft), presented the INPE's management with an order for a military observation satellite for Iraq, an order which could be filled thanks to the institute's experience in building its small scientific satellites.

Ozilio visited Baghdad last December to discuss the matter. But the fact that the order has a military purpose worries the Ministry of Foreign Affairs.

The establishment of Inscom differs from those other initiatives. Inscom will simply combine what Avibras already manufactures—ground-based systems for tracking artificial satellites—with what China already manufactures—space rockets—and try to transform that union into profits.

Avibras Designed Sonda Rocket

Avibras began its activities in 1961 as an aircraft manufacturer. In 1962, however, it won an international contract to produce solid rocket propellants and wound up cooperating with the Ministry of Aeronautics in the development of the Sonda family of research rockets.

After completing its work on Sonda-1 and the Sonda-2B and Sonda-2C rockets, Avibras worked on the second stage of the Sonda-3 rocket. It also worked on a 3-stage rocket—known as the Barium Project—which constituted the preliminary design for the Sonda-4 rocket that has now been developed by the Ministry of Aeronautics. Technical disagreements caused Avibras to withdraw from the space program and eventually led it into the arms industry, where it beat all export records from 1985 through 1987.

PERU

Foreign Minister Rejects Nuclear Test in Mururoa

PY2405181089 Lima EL COMERCIO in Spanish 14 May 89 p A-5

[Excerpt] Peruvian Foreign Minister Guillermo Larco Cox has strongly rejected the nuclear test carried out by France on 12 May at the Mururoa atoll in the South Pacific.

Larco Cox reiterated that Peru supports the decision of the Conference on Disarmament, held in Geneva (Switzerland) on 25 April 1989, to definitely ban the nuclear tests.

Larco Cox said that it is urgent to reach an agreement on the definitive ban of nuclear tests in keeping with the Peruvian proposal raised at international forums such as the United Nations and the South Pacific Permanent Commission.

Larco Cox reasserted Peruvian support for the Tlatelolco Treaty concerning the ban of nuclear weapons in the region, and to the Rarotonga Treaty, which seeks to establish a "denuclearized" zone in the South Pacific. [passage omitted]

ISLAMIC AFFAIRS

Arab Motives for Nuclear Technology Development Discussed

51004502 Muscat 'UMAN in Arabic 7 Apr 89 p 11

[Article by 'Ali ibn 'Abdallah al-Harithi: "The Arabs and Nuclear Power"]

[Excerpts] [Passage omitted] In his book, "Al-Taqah al-Nawawiyah al-'Arabiyah—'Amil Baqa' Jadid" [Arab Nuclear Power: A New Survival Factor], the author, Dr 'Adnan Mustafa, describes the various efforts that have been made in the Arab homeland in the field of nuclear power. He tries to draw the attention of Arab public opinion in a collected and logical way to understanding this complex and important subject, since nuclear power and nuclear technology constitute a vital factor for economic and political development in the Arab homeland. The book is 138 pages long and is divided into 4 chapters. [passage omitted]

The Arab States and Entry Into the Nuclear Field

In the second chapter, which the author devotes to discussing the horizons of nuclear power in the Arab homeland, he begins with an introduction in which he reviews the conflict between the interests of the advanced countries and those of the developing countries in the field of nuclear power. This conflict reveals itself in manifestations such as the subjugation of technology in the form of price inconsistancy and restrictions and obstacles to constructive international exchange. The advanced countries feel they must obtain adequate return for their research and development investments. The developing countries feel the large amount of outflow in exchange for the available technology, which is of a backward kind, scarcely satisfying their needs.

Countries advanced in the nuclear field are prone to great anxiety as a result of the close relation between nuclear power and nuclear weapons. Thus, the attempt by any nation to achieve nuclear self-sufficiency constitutes for them a danger to international security.

At the present time and in the near future, nuclear power is considered to be the available alternative for facing the power requirements that accompany economic development. In view of this consideration, the developing countries—the less advanced ones—have responded positively to the ability of some developing countries, such as Bangladesh, Brazil, India, Pakistan, and Turkey, to establish their national power programs firmly.

In light of the nearly complete monopoly on facilities for uranium enrichment, the less advanced nuclear countries, which import enriched uranium, feel a lack of confidence about the continuance of their being supplied with enriched fuel.

Three Basic Requirements

As for the scope of nuclear power in the Arab homeland, we find that since the early seventies the Arab homeland has witnessed the rise of new methods of acquiring nuclear technology. Algeria, Egypt, Morocco, and Tunisia have all defined long-range nuclear programs for themselves. They have been able to define the main problems that can arise during the stage of mastering the technology and have considered certain national measures to solve these problems. In the field of mastering the technology, some of the Arab countries have shown their interest in acquiring this technology. The main reason for this is the need of these countries for a source of long-term power. Furthermore, the existence of an Arab nuclear capability will surely provide an effective vehicle for increasing the Arab technological development rate and will contribute to the overall progress of Arab science, technology, and industry. There is no doubt that the success of national nuclear programs requires, among many important things, the establishment of a national organization for nuclear development. Such organizations have proven their success in the developing countries, stimulating nuclear activities ranging from the use of nuclear power to the planning and erection of nuclear industrial installations. In any case, the author of the book sees three requirements for implementing the process of mastering nuclear technology:

- To obtain the greatest return from the mastery process, the scientific and technological human resources of the technology-importing country must be capable of grasping all aspects of nuclear technology and must permit the treatment of the problems that accompany the implantation of this technology.
- The contribution of domestic industry to the establishment of heavy nuclear industry must made as large as possible.
- Popular acceptance of nuclear technology must be taken into account, since this is a debate that constitutes one of the main questions controlling the process of mastering nuclear technology. As for Arab public opinion, the Arabs who have expressed their satisfaction at the success of light nuclear technology in their midst are still uneasy about the rapid expansion of the nuclear weapons arsenal in the advanced countries.

As is well-known, before the seventies Arab consciousness of the importance of the potential role of nuclear power was limited to a few Arab countries. This consciousness centered on the fact that nuclear power, as a nondepletable and guaranteed source, would have an important role in the economic development programs of these countries. Subsequent implementation of this belief in Algeria, Egypt, and Iraq showed serious attention to certain aspects of the conventional nuclear power industry, while the remaining Arab countries made different degrees of progress in certain aspects of light

nuclear power. At the same time, the question of mastering nuclear power was taken into consideration in most of the Arab development plans. Thus, the mastering of nuclear technologies related to agriculture, medicine, industry, and the environment, has made excellent strides to date. The Middle East Regional Center for Radioactive Isotopes in Cairo has played an important role in spreading light nuclear technologies throughout the Arab homeland. It should be mentioned that this center was founded at the beginning of 1963 to realize a number of goals, including: training specialists in radioactive isotope applications, carrying out detailed research in the field of surface water, and helping to strengthen the development of research on radioactive isotopes and their technologies in the Arab countries that are members of the center.

In summary, the Arab approach to acquiring nuclear technology can be classified under two headings. The first stems from the need to absorb, assimilate, and master nuclear technology and use it in various peaceful fields, with work on building certain features of nuclear industry representing the core of the implementation of this policy. The second focuses only on the use of light nuclear technology, with extensive efforts being made to use radioactive isotopes in irrigation, agriculture, industry, and the environment. The implementation of these two kinds of Arab nuclear policy is embodied in specialized organizations or in relevant ministries that carry on various efforts in this field. Such efforts include: the discovery, mining, exploitation, and processing of uranium; the nuclear fuel cycle; and nuclear reactor technology. Two facts must be kept in mind when one considers analyzing the Arab situation as regards reactor technology:

1. The first fact is that the Arab countries consume imported industrial products in addition to the inventions of modern technology.

2. The second fact can be summed up in the existence of abundance in some Arab economic and technological resources.

Based on these two facts, one can discern three patterns of Arab behavior relating to the mastering of nuclear technology:

- The pattern of importation, followed by countries with abundant funding capability.
- The pattern of partnership, relied on by countries with low financial capability.
- The pattern of self-reliance, which only Algeria follows.

To strengthen the Arab move to acquire nuclear technology, Arab and international cooperation in the nuclear technology field has been necessary. The first signs of this cooperation began in the early sixties in the fields of science and technology. The goal of these efforts centered on two main things: first, coordinating the scientific and technological assistance programs granted to the Arab countries by Arab and international sources; second, linking the academic structures to development plans. The second of these goals has been stimulated through the exchange of expertise taking place today between Arab universities and research centers. The matter of Arab coordination has been frustrated by the administrative and political problems prevailing in the Arab homeland. Measures for it have thus been limited to including certain organizations for non-nuclear science and technology.

Sources of Nuclear Fuel in the Arab Region

Dr 'Adnan Mustafa devotes the third chapter of his book to a discussion of nuclear fuel sources in the Arab homeland. Preliminary indications of the abundance of Arab sources of nuclear fuel—uranium—have aroused wide hopes on the part of Arab agencies concerned with developing future Arab power resources. The modest efforts that have been made in the area of discovering, evaluating, and developing certain uranium deposits have succeeded in demonstrating the following facts:

1. Uranium is encountered in all six main forms of mining in many parts of the Arab homeland in various concentrations. The vein and sandstone types are distinguished by their prominent and confirmed deposits.

2. At the beginning of the eighties, the Arab homeland in general began seriously considering the exploitation of uranium potentials from secondary sources, particularly phosphate.

3. The success realized by Arab efforts in discovering and prospecting for uranium represents an incentive for moving Arab programs for the next period forward. Certain yields of these programs indicate that the policy of discovering and producing Arab uranium will move in the direction of bridging the gap between knowledge of Arab uranium sources, on the one hand, and knowledge available about world sources, on the other hand.

In the fourth chapter, which closes the book, the author discusses in a general way the tendency of the Arab countries in one way or another to acquire certain aspects of the nuclear energy industry within their borders. In the late seventies, some successes were achieved in this regard, but the successes that were achieved did not measure up to expectations.

EGYPT

Cooperation With Iraq on Missiles Denied

JN2805090489 Manama WAKH in Arabic
0800 GMT 28 May 89

[Text] Al-Shariqah, 28 May (WAKH)—Dr Jamal al-Sayyid Ibrahim, Egyptian minister of state for war production, has denied the existence of any Egyptian-Iraqi cooperation in the production of chemical or biological warfare weapons or in the field of manufacturing longe-range or medium-range missiles.

In an interview with the newspaper AL-KHALIJ, the minister said that cooperation between the two countries is currently restricted to providing expertise and cooperation in the manufacture of protective devices used in chemical warfare, establishing some military industries plants in Iraq, and providing certain production requirements as well as some end products.

The minister added that Egypt does in fact possess a group of chemical plants. He went on to say: However, Egypt is not producing any chemical weapons. It is only producing devices used for protection from chemical warfare; and there are several countries with which Egypt is cooperating to develop various types of protective devices designed to be used in case of chemical or biological warfare.

Dr Ibrahim said that the Ministerial Council of the Arab Cooperation Council [ACC] has outlined plans for establishing joint military industries projects and added that specialized committees will prepare the details of these projects so that they can be submitted to the [ACC] summit to acquire the capital, prepare the cadres, and make available all the necessary requirements.

INDIA

Media Hail Missile Launch, Criticize U.S.

Positive Press Response

BK2305105489 Hong Kong AFP in English 1033 GMT 23 May 89

[Text] New Delhi, May 23 (AFP)—Newspapers here hailed Tuesday the launch of India's maiden intermediate range ballistic missile (IRBM) and said it would boost the country's deterrent capabilities.

Most dailies said the launch was significant because New Delhi's biggest neighbours China and Pakistan—with which India has fought a total of four wars—possessed, or were in the process of manufacturing, similar systems.

Editorials and commentators also flayed the United States for criticising Indian efforts to launch the missile, called Agni (fire), saying Washington was indulging in discrimination.

The 19-metre (62-foot) high, two-stage surface-to-surface Agni was test fired Monday from eastern India's coastal Chandipur region, 32 days after the first attempt to launch was called off because of technical snags.

A second try on May 1 was also called off for similar reasons.

THE TIMES OF INDIA described Agni's launch as "the biggest step forward in India's quest for a credible deterrent capability" since the 1974 explosion of a nuclear device in northwest India.

"The real success of such a capability is that it should never have to be used," it said. "It has to be achieved nevertheless. This is specially so with regard to missiles because of their proliferation in our neighbourhood."

The HINDUSTAN TIMES described Agni's blast-off as "an unqualified success," while the ECONOMIC TIMES said it "is an occasion for gratification."

THE HINDU newspaper noted that Agni—which has a range of up to 2,500 kilometres (1,560 miles)—had military overtones and, mentioning Pakistan and China by name, added that "the signals it sends out are undoubtedly of special significance."

Noted defence analyst K. Subrahmanyam said Agni was the first step in the country's attempt "to fill a vital gap in its security needs," and referred to the missile programmes of China and Pakistan. China, with which India fought a brief border war in 1962, also possesses IRBM's.

"Pakistan is said to have tested an unnamed missile capable of hitting Delhi and Bombay which puts it very near the IRBM category," Mr. Subrahmanyam said.

Prime Minister Rajiv Gandhi said Monday that Agni would provide New Delhi with a non-nuclear option "with high precision at long ranges."

He added that the "technology proved in the Agni is deeply significant for evolving national security options."

An official statement released Monday echoed the prime minister's views, and added that Agni was "expected to provide such options to the country in facing an increasingly complex security environment."

Agni's launch attempts drew criticism from the U.S. Government, and moves were reportedly afoot in Washington to impose trade sanctions against India and block technology transfers if New Delhi went ahead with the test firing.

Newspapers Tuesday accused the United States of adopting double standards.

Washington, THE TIMES OF INDIA said, "has not said a word about the capability Israel demonstrated by testing its latest nuclear-capable missile and its bid... to export the technology to others."

THE HINDUSTAN TIMES praised the government for standing up to "overt and covert pressures" by the U.S., while the pro-Moscow PATRIOT newspaper criticised Washington for keeping quiet about Pakistani missile programmes.

"Washington's pressure on India is, therefore, meant to retain for a member of the U.S.-Pakistan-China strategic consensus, all advantages that nuclear weapons and missiles delivery systems give," the PATRIOT said.

New Delhi has said the launch was intended as a show of its technological capabilites and that it had no intention of mass-producing the missile.

India successfully test-fired a missile called Prithvi (Earth), with a range of 250 kilometres (155 miles), in February 1988.

But the country's civilian space programme suffered a major setback five months later when a missile, the Augmented Satellite Launch Vehicle, crashed into the Bay of Bengal 150 seconds after lift-off.

News reports after Agni's launch said that Indian scientists would begin work on production of an inter-continental ballistic missile with a range of more than 5,000 kilometres (3,125 miles).

Public Hails Launch

BK2305161889 Delhi Domestic Service in English 1530 GMT 23 May 89

[Text] More reports of nation-wide acclaim of the scientists, engineers, technicians, and others who were associated with the launching of the [intermediate-range surface-to-surface missile] Agni yesterday has come in. The achievement has generated a feeling of confidence and happiness among the people in all walks of life. They consider the event as symbolizing the country's progress in advance research and indigenous technology. State governors, chief ministers, and others have hailed the launch and greeted the team of workers who made it possible.

Welcoming the launch, the Congress-I has described it as a matter of pride for all. In a statement the six general secretaries of the party, Mr V.N. Gadgil, Mr Ghulam Nabi Azad, Mrs Sheila Kaul, Mr K.N. Singh, Mr Oscar Fernandes, and Mr A.R. Mallu, and the treasurer, Mr Sitaram Kesari have said that, appropriately, this feat was achieved in the Nehru centenary year as it was Jawahar Lal Nehru who made self-reliance in scientific [as heard] temper the cardinal principles of the Congress ideology. They congratulated the prime minister and the scientists who worked under his leadership with dedication and determination to make this possible.

Some opposition parties have also congratulated the scientists for the achievement. Among them are the Communist Party of India, the Bhartiya Janata Party, Telugu Desam, and the Janata Dal. In a resolution passed at the conference of its office bearers in Bangalore today, the Janata Dal said the event heralds a new era in missile technology.

Commentary on Agni Launch

BK2305110589 Delhi General Overseas Service in English 1010 GMT 23 May 89

[Science editor K.S. Jayaraman commentary]

[Text] India reached a major milestone in military missile development technology yesterday when it successfully test-fired its first intermediate-range ballistic missile [IRBM], Agni. The two-stage missile weighing 14 tons and about 19 meters tall took off from Defense Ministry's test range in Chandipur on the east coast of Orissa State in the early hours of the morning [22 May], ushering India into the select club of nations that have the capability to design and build such long-range missiles.

The IRBM is a result of about 6 years of work by scientists of the Defense Research Development Organization. Agni is the third missile to roll out of defense laboratories under the integrated guided missile development program, that has a budget of about $500 million. Trishul, a 12-kilometer-range surface-to-air missile was test flown in 1987. A year later India successfully tested Prithvi, a surface-to-surface missile having a range of about 250 kilometers. Agni is the most advanced in the family of missiles. Its first stage is solid propelled, and the second stage has twin engines powered by a storable liquid fuel. The missile is designed to deliver a 1-ton warhead at a target as far away as 2,500 kilometers within about 8 minutes. The missile is equipped with a strap-down inertial navigation system and an on-board computer to carry out the task of guidance and flight control.

Yesterday's launch was described by the defense minister, Mr K.C. Pant, as a test flight to prove the indigenously developed advanced missile technology. The Indian Government has not announced details of yesterday's test flights, except that the missile followed the predetermined flight path and impacted in the designated area in the Bay of Bengal. According to an official announcement, preliminary analyses of data indicated that the test flight fully met the mission's objectives. One of the mission's objectives was to evaluate the performance of an indigenously developed heat shield during the fiery reentry through the atmosphere. The heat shield that is meant to protect the warhead from intense heat is a key hardware in the defense delivery system. The heat shield was developed by the defense scientists quite some time ago and was being tested for the first time by Agni.

The successful test flight of Agni has demonstrated India's technological capability, but it cannot be interpreted as a signal that India wishes to become a regional superpower. While hailing the achievement, the Indian prime minister, Mr Rajiv Gandhi, emphasized that India is a nonviolent country and has no aggressive designs on anyone. The testing of Agni was part of India's continuing efforts to safeguard the country's independence and security by self-reliant means, he said.

According to the prime minister, a great deal of misinformation and disinformation has been spread by interested quarters that the Indian missile would be used to carry a nuclear warhead. In a statement, Mr Gandhi made it clear that Agni is not a nuclear weapon system. It only gives us an option to deliver nonnuclear weapons with high precision at (?long) range, an option that is of great relevance to contemporary strategic doctrine, he said.

India detonated a nuclear device 15 years ago, but it set an example to the whole world by its refusal to convert this nuclear capability into nuclear weapons. It wishes to keep it that way, Mr Gandhi said, adding that India is passionately committed to peaceful coexistence. India firmly believes that Agni, while providing a limited deterrence, will in no way become a threat to regional peace. As one Indian defense analyst puts it: Agni, which has broken the big power monopoly, may be a major contribution to India's negotiating strength for advancing international peace and stability.

Advanced Surface-to-Surface Missile Tests Planned

AFP Report

BK2605162589 Hong Kong AFP in English 1550 GMT 26 May 89

[Text] New Delhi, May 26 (AFP)—India plans to test an advanced surface-to-surface missile at the end of the year after joining an exclusive club of nations with the successful launch of a ballistic missile, defence scientists said Friday [26 May].

The planned testing of Akash (sky) in December is part of a tight schedule set for India's indigenous missile development programme, the scientists told a news conference here.

Akash, a medium-range missile, would have a multi-target capability. Its testing will be followed by the deployment in 1991 of Prithvi (earth), a short-range tactical battlefield missile, and Trishul (trident), a surface-to-air missile, the scientists said.

Prithvi was successfully tested in 1988 and Trishul in 1987. A third-generation anti-tank missile named Nag (cobra) is undergoing flight trials.

Both Akash and Nag are expected to be operational by 1993, said the scientists, including V.S. Arunachalam, Abdul Kalam and R.N. Agarwal, who are all closely involved in the billion-dollar missile development program launched in 1983.

The news conference came a day after Defence Minister Krishna Chandra Pant said India was likely to opt soon for a missile-based defence system. India has reportedly decided to also begin work on producing an intercontinental ballistic missile.

Defence researchers here are basking in the aftermath of Monday's successful test of Agni (fire), India's first intermediate range ballistic missile (IRBM), which put the country in an exclusive club of nations with their own ballistic missile technology.

The others are the United States, the Soviet Union, Britain, France, China and Israel.

Mr Kalam denied reports that Agni could be equipped with nuclear warheads. The missile could carry only conventional warheads, he said.

The scientists reiterated that Agni's test, which has aroused fears in the United States of a missile arms race in South Asia, was a technology demonstration and not the induction of a new weapons system.

The missile would need further tests before reaching the operational stage, they said.

Mr Arunachalam said the 14-tonne Agni had reached a range of about 1,000 kilometres (600 miles), although it has a potential range of 2,500 kilometres (1,560 miles), during Monday's test and added that its accuracy had exceeded expectations.

No difficulties were encountered in manoeuvering the transition from a first stage solid propulsions system to the second stage liquid propellant, he said. The heat shield withstood the extremely high temperatures generated during the test.

Prime Minister Rajiv Gandhi has said that Agni would give New Delhi an effective non-nuclear deterrent with its ability to deliver non-nuclear warheads with high precision at long ranges.

India's missile development programme was launched in 1983, 11 years after India reportedly abandoned Project Devil—aimed at building a family of missiles and step up indigenous defence production.

Project Devil, employing 800 experts and costing 770 million dollars, was reportedly scuttled because it was found to be over-ambitious. But the government never announced the decision.

Scientist on December Launch

BK2705035689 Delhi Domestic Service in English 0240 GMT 27 May 89

[Text] The scientific adviser to the defense minister, Dr V.S. Arunachalam, has said that the medium-range surface-to-air missile Akash [Sky] is expected to be launched by December this year. Addressing a news conference in New Delhi yesterday, he said the main purpose of the test launching of the long-range missile Agni [Fire] was basically to establish the designing of heat shield for reentry inertial navigation system and change of propulsion from stage one to stage two.

Dr Arunachalam said the successful launching has proved that India has acquired the vital reentry technology which would give a big boost to the integrated missile development program.

The third generation antitank missile Nag [Cobra] is currently going through flight test trials, he said.

New Missiles May Be Able To Deliver Nuclear Weapons

51500125 Bombay THE TIMES OF INDIA in English 10 Apr 89 p 12

[Article by Ravi Shastri: "Indian Missiles at Takeoff Stage"]

[Text] India's missile programme has reached the takeoff stage. This is evident from the preparations now under way to test-fire Agni, a ballistic missile with a range put at 2,500 km in recent reports.

Several other third world nations are also well on their way to developing such missile systems. This proliferation accounts for the Western initiative to prevent the spread of missiles which may have the capacity to deliver nuclear and chemical weapons. Seven major Western powers have now setup what they call the missile technology control regime (MTCR) to retain exclusive control over this weapon system. But such hegemonistic control may be difficult to establish as shown by the rapid strides made by India.

Indigenous development in India was accelerated by the integrated guided missile programme (IGMP) launched under Mrs Gandhi in July 1983, with an initial funding of Rs 380 crores. Though attempts to indigenise missile technology had been made earlier, such attempts were aborted as a result of bureaucratic red tape and the absolescence of technology employed. A prime objective of the IGMP was to minimise delays and get the wheels of research and development moving smoothly.

Apex Body

As part of this effort, the Defence Research and Development Laboratory (DRDL) at Hyderabad was made the apex body to coordinate research, with Brig (Dr) V.J. Sundaram, a physicist who had worked on solid fuel rocket propulsion, heading the research team. At the same time an effort was made to involve specialised agencies in the effort, with each given the task of developing individual sub-components. As a result, several research institutions and private companies have participated in the coordinated programme.

Given the overlap between satellite launch vehicles and long-range missiles, it is possible that several propulsion technologies developed by the Indian Space Research Organisation (ISRO) have been adopted for use in the missiles. Two major problems which DRDL would have to solve itself, however, would be guidance and reentry. Three major guidance systems are employed for guiding missiles—wire, radio and inertial. The first two have inherent problems. The first two have inherent problems. Wire-guided missiles need a long wire in tow which tends to get enmeshed in foliage while the missile is on its initial trajectory. Radio-guided missiles are vulnerable to jamming. Inertial guidance systems in which a pre-programmed on-board computer charts out the missile's path is the most efficient.

Missile Tech

The soon-to-be-launched Agni, as well as the earlier Prithvi, are believed to employ inertial guidance.

This is a major achievement of DRDL scientists, given the fact that the sale of inertial guidance sub-components, such as high altitude gyrocoscopes along with advanced materials, are strictly controlled by the missile technology control regime.

The successful launch of the Prithvi in February last year heralded India's entry into the missile age. Though a short-range missile, not much of use as a nuclear delivery system, its high accuracy would make it prove extremely effective with conventional warheads against such targets as massed troops, armour and dams. Its 1,000 kg payload capacity gives it theoretically the capability to carry a nuclear warhead.

However, the delivery of a strategic nuclear warhead over short distances such as 150 km would be counter-productive because winds may carry radio-activity back to Indian territory. To be effective as a nuclear delivery vehicle, a missile would need to carry a 1,000 kg warhead over a distance of at least 800-1,100 km. Even if the range of Agni is only 1,600 km, as is more likely, rather than the reported 2,500 km, nuclear delivery may indeed be within India's reach.

What payload Agni will be able to carry is not yet known. Reports indicate that Agni's first stage employs solid fuel while its second-stage engine is fuelled by a liquid propellant. Inertial guidance would render electronic counter-measure (ECM) techniques employed against the missile ineffective. Agni may, therefore, prove to be a potent long-range strategic delivery vehicle that could be the Indian answer to strategic blackmail. The possibility of India breaking the monopoly of nuclear weapon stakes over long-range missile systems has not gone down well with the nuclear non-proliferation establishment. In fact, some analysts have named India one of the prime targets against whom the missile control regime is aimed. Prithvi and Agni are only the most talked about missiles being developed by DRDL. A short-range surface-to-air missile (SAM), Trishul, with a range of 9 km has been tested a number of times and is due to go into production by 1990, while a longer range SAM, designated Akash with a 27 km range, is also believed to be in an advanced stage of development. A laser-guided antitank missile, Nag, may go into production by 1993. The

mid-1990s may thus witness reduced dependence of the Indian armed forces on external sources of supply for their missile requirements.

Three Wings

As of today, all three wings of the Indian armed forces depend on missiles imported from the Soviet Union and France. With France and Britain already party to the control regime, and the Soviets likely to follow suit, future Indian missile requirements may come under increasing pressures.

It is imperative, therefore, for Indian defence planners to speed up indigenous research and development of missiles of all categories and potential capabilities. Recognising the need for indigenisation, the defence minister, Mr K.C. Pant, said in reply to Parliament question that guided missile is one area "where we want to be totally self-sufficient."

Striking Range

The past few years have witnessed the deployment of missiles in and around the south Asian region. Chinese ICBM's have in any case the range to strike any part of India. Besides, a quarter of the 350-strong Chinese IRBM force is based in Tibet, according to some accounts. The Chinese transfer of the SCC-3 IRBM to Saudi Arabia and of the shorter range to Syria raises the possibility that such missiles could be transferred Pakistan at some future date, given the history of cooperation between the two countries in strategic fields.

In any event, Pakistan has now developed two new surface-to-surface missiles which were recently exhibited at a National Day parade. It is claimed that these have been developed indigenously though observers think that China's help with technology and sub-systems has played a very important part. The range of these is said to be 80 km and 300 km, and the payload capability, 500 kg. A third missile for use against low-flying aircraft has also been unveiled. It closely resembles the Chinese version of the Soviet SAM.

Gen Aslam Beg, Pakistan's army chief, has announced that the country's space scientists would be ready with a multi-stage rocket in the next 2 years. In sum, Pakistan is fast catching up. In view of these developments, the Agni test comes none too soon.

Defense Minister Says 'Agni' Can Carry Warheads

BK2605031589 Delhi Domestic Service in English 0240 GMT 26 May 89

[Text] The defense minister, Mr K.C. Pant, says the long range missile 'Agni' has the potential to carry lethal warheads and deliver them with a high degree of accuracy. He, however, pointed out that India still has some way to go before missiles enter operational service and are integrated with the armed forces.

Addressing the economic editors conference in New Delhi yesterday, Mr Pant said the integrated missile development program aims at building up our missile-based defenses. This is an option, which the country will have to consider in the coming years, he said. The defense minister said the government's policy is to compete in the international market and sell equipment and systems as also enter into agreement with other countries for joint production.

The industry minister, Mr Vengal Rao, who also addressed the conference, said the center's policy is to modernize and upgrade the technology in industry to enable it compete in foreign markets.

Nuclear Reactor Commissioning Time Reduced

BK0106153189 Delhi Domestic Service in English 1430 GMT 1 Jun 89

[Text] India is now able to reduce the time required for commissioning of a 235-megawatt [nuclear] reactor from 9 years to about 7 and ½ years. According to the Department of Atomic Energy, this has been possible from the experience gained over the years. The department has drawn up a heavy water production program to match the requirements of nuclear power generation.

Commentary Views Missile-Based Defense System

BK3105110689 Delhi General Overseas Service in English 1010 GMT 31 May 89

[Mahendra Ved Commentary]

[Text] With the successful test firing of Agni, India's first long-range ballistic missile, many questions are being asked about its purpose to which great prestige and significance is being attached and for which the nation can take justifiable pride. Actually, Agni's launching need not have raised this question. Already the Bharat Dynamics Limited, a public sector undertaking of the Ministry of Defense, is working on the production of Prithvi, the surface-to-surface tactical missile with an estimated range of 150 kilometers. It is the entry of Prithvi that will mark the beginning of integration of missile based defenses into the network of our Armed Forces.

The defense minister, Mr K.C. Pant, addressing the Economic Editors Conference in New Delhi on Thursday said that the integrated guided missile development program aims at developing capabilities for ensuring national security through missile-based defenses. However, while expressing happiness at the successful demonstration of a capability for developing missiles, Mr Pant said we still have some way to go before missiles enter operational service and they are integrated with our Armed Forces. This is an option which the country will have to consider in the coming years. The defense minister and earlier on the day of the Agni's launching on the 22d of May, the prime minister, Mr Rajiv

Gandhi, had repeatedly stressed that Agni was essentially a technology demonstrator. So far as this missile is concerned the position remains unchanged. As Dr Arnuchalam, the scientific adviser to the defense minister and the chief of the Defense Research and Development Program, has said Agni would have to be further tested. The scientists and engineers working on it would have to carry forward data in the coming months. The development stage is never over. They would definitely like to do more experiments. The significant thing is that it remains a technology demonstrator. For its integration into the military defenses, there would have to be a decision at the highest levels of the political and military leaderships of the country. This should mean that there is nothing instant about Agni, certainly not its integration into the country's defenses.

Let us look at Prithvi which is very much on its way to joining the defense system. The project was sanctioned in July 1983. It has undergone eight flight trials so far. The performance of its missile subsystems has been established. It was test launched in February last year and has since undergone further development. Its missile and ground systems have been perfected. Next to Prithvi is Akash, which is a medium-range air defense system with multi-target tracking capability employing command and homing guidance system. Akash has a high energy solid propellant for the booster and integrated ramrocket for the sustainer. Akash is now undergoing flight trial preparation and its systems are being tested to achieve perfection. The first test launch of this surface-to-air missile system is due toward the end of this year.

The work is also going on the antitank missile Nag which is the third generation missile with advanced guidance system for achieving fire and forget capability. The Trishul is another short range surface-to-air defense system which is scheduled to be ready sometime in 1991. It will use high strength steel rocket motor chamber with composite propellant in dual thrust mode. The exciting thing about Akash is that it has multi-target handling capacity. Feasibility studies are going for Astra, an air-to-air missile system.

Coming back to Agni, Dr Arunachalam has said the place of its splash down in the Bay of Bengal was a pre-determined spot and it was accurate. All its systems worked well and its reentry was perfect. The parameters set for Agni have proved to be sound and the various systems effective and perfect. No doubt, the scientists have every reason to be feel happy. The task ahead is to keep testing it through more prototypes and prepare for a day when it has to be productionized.

Emergency Drill for Tarapur Planned for December

51500126 Bombay THE TIMES OF INDIA in English 25 Mar 89 p 18

[Text] Thane, 24 March—The emergency drill under the disaster plan of the Tarapur atomic power station (TAPS) would be held in December this year, according to a decision taken at a meeting held at the collectorate here.

According to an official release, it was decided to create awareness among the nearby villagers about the drill, by organising meetings, showing films and displaying informative boards.

The officials from TAPS, the revenue department, the police and the Western Railway discussed at the meeting various measures to be taken in case of an emergency. The collector, Mr G.B. Pingulkar, presided.

It may be recalled, that a similar drill organised in October last created panic among people from the nearby villages, who had fled their homes temporarily, because of fear that "some poisonous gas was to be released from the TAPS." The distinct administration had failed to inform the people and that it as only a drill and there was not cause for panic.

PAKISTAN

U.S. Nonproliferation Policy Criticized

BK3105123589 Rawalpindi HAIDER in Urdu 21 May 89 p 3

[Editorial: "The Statement of the Director of the CIA"]

[Text] Making a statement before the public affairs committee of the U.S. Congress, CIA Director Webster has given a detailed report on the nuclear programs of Pakistan and India. He said Pakistan is busy improving its nuclear capabilities, whereas India has started research on technology that can be used in the production of large nuclear weapons. According to Mr Webster, India can attack Pakistan anytime it wants to force Pakistan to give up its nuclear program. He added that India has also begun work on manufacturing a hydrogen bomb.

It is noteworthy that the statement of the CIA director has come at a time when Pakistani Prime Minister Ms Benazir Bhutto is about to visit the United States. The statement of the CIA director is indicative of the fact that by raising the issue of Pakistan's atomic program once again prior to Ms Benazir Bhutto's visit to the United States, the U.S. Government wants to express its concern to Pakistan and thus maintain its pressure on Pakistan as ever before in the context of the latter's nuclear program.

The fact is that the United States' attitude is contradictory toward the nuclear programs of Pakistan and India. By sheer expression of its fears against Pakistan's peaceful nuclear program, the United States has always tried to attach strings to its assistance to Pakistan and has also attempted to get some Pakistani concessions in the context of the peculiar political situation of this region.

But it has totally ignored the atomic program of India, although India detonated a nuclear device in 1967 and is continuously manufacturing nuclear weapons.

The CIA director also admitted before the congressional committee that India has commenced work on manufacturing a hydrogen bomb. Nevertheless, Pakistan's stand on its nuclear program is very clear. Pakistan says its nuclear program is for peaceful purposes and it has absolutely no intention of making any nuclear weapons. Because of its honest stand on this issue, it has gone to the extent of making a proposal expressing its readiness to throw open its atomic installations for international inspection, provided India is ready to do the same. But India is not ready for talks on any proposal for international inspection of its nuclear installations.

If the United States considers Pakistan its ally, irrespective of its usual idea about its ideological and political supremacy over Pakistan, it should prove by its acts that it is a true friend of Pakistan. It will absolutely have to play the role of a friend—to make Pakistan economically self-reliant and ensure its stability.

So far, the analysis of the people of Pakistan is that the United States has always extended its arm of friendship to Pakistan because of its specific interests. One of its interests was to make Pakistan a buyer of its arms. Because of its interests, the United States has granted assistance and loans to Pakistan on many occasions. But it has not make serious efforts to lead the people of Pakistan toward prosperity and to make them economically self-reliant.

In our opinion, the visit of Prime Minister Benazir Bhutto to the United States has paramount importance, as it is the visit of the head of an elected government. However, regarding this visit, the U.S. Government should make its position clear to the people of Pakistan. If necessary, in the context of the proposed visit of Benazir Bhutto, the United States can take such steps and decisions that will make the people of Pakistan forget the bitter experiences of the past and consider the United States their true friend. But if it tries to give priority only to its own interests in the context of Pakistan's peaceful nuclear program, there may later be circumstances contrary to its expectations.

Islamabad Reports India's 'Agni' Missile Launch

BK2205085389 Islamabad Overseas Service in English 0800 GMT 22 May 89

[Text] India has successfully test fired today its first intermediate-range ballistic missile—Agni—which had been bogged down by technical snags for a month. The missile, launched from the Chandipur area of eastern Orissa State, has a range of up to 2,500 km and has been targeted to land in the Bay of Bengal.

Defense experts have said "Agni" can also be equipped with nuclear warhead or used to launch satellites.

The launch put India in an exclusive club of countries—which so far includes the United States, China, Soviet Union, Britain, France, and Israel—with their own ballistic missile capability.

Meanwhile, the United States has expressed concern over India's development of the missile.

Nuclear Power Generation Program Outlined

BK2905123589 Karachi DAWN in English 22 May 89 p 3

[Text] Lahore, May 21—A 20-year programme for nuclear power generation through reactors produced locally on the principle of "co-manufacturing" has been drawn up by the Pakistan Atomic Energy Commission (PAEC). The idea of acquiring nuclear technology through the "co-manufacturing" principle has the approval of the Prime Minister Benazir Bhutto. With the 20-year plan ready, the stage is now set for a sure and a steady take off, highly placed PAEC sources told DAWN here on Sunday.

Under the "co-manufacturing" principle, private industries of Pakistan would collaborate with some foreign firms in the development of nuclear reactors. The Government of the countries to which these firms belong would have nothing to do with the project. Thus, technically being a private-sector venture, Pakistan would not be required to sign the Non-Proliferation Treaty (NPT), which it is reluctant to do unless India does the same, the sources said.

The PAEC estimates that Pakistan would be able to have a capacity to generate about 6,000 megawatts of nuclear power by the turn of the century. The first reactor to be fabricated locally would take some seven years to complete and would have a 300-MW capacity. Thereafter, it would make over half a dozen reactors of the same capacity before switching over to 600 MW reactors. The simultaneous fabrication of 300 MW and 600 MW reactors would continue for some time, after which, fabrication of low capacity reactors would be given up.

A high-capacity reactor cannot be undertaken at the very outset because in the present situation, local industry would not be able to make much of a contribution, thereby making reliance on imported components necessary.

The idea of gradually acquiring capability to manufacture high-capacity reactors has been borrowed from India, which is very much in the field since the late [Prime Minister] Pandit Nehru, who had given New Delhi a 30-year programme of promoting nuclear technology. India standardised 235-MW reactors and has been manufacturing one reactor biennially since the last decade and is gradually proceeding towards the 500 MW capacity.

The PAEC has already assessed the engineering capability of some 400 major industrial units, a number of which have already been trained in maintaining high standards of quality. Heads of some 20 industrial units were taken to various European countries where they were shown 50 industries engaged in the manufacture of nuclear reactors.

Pakistan has already signed memoranda of understanding with 17 industries for collaboration in this field.

Answering a question about the existing potential of the local industries to undertake the new assignment, the sources said: "We are not starting from scratch. We are already mobilised."

Questioned as to why Pakistan could not make any headway in this field in the past, the sources said it was because of lack of commitment. The late Zulfiqar Ali Bhutto had planned about two dozen nuclear reactors for the country by the end of current century, but no serious work was done in this regard by the governments that followed, the sources maintained.

To another question the sources said given serious attention, Pakistan would have acquired a nuclear reactor without signing the NPT. [sentence as published] A number of countries are prepared to provide Pakistan a nuclear reactor provided it paid for the same in cash. It was mainly because of lack of foreign exchange that Pakistan could not obtain it.

A 600-MW reactor costs about 1.5 billion dollars.

A number of countries have facilities to manufacture reactors and sell the same to other countries but they are not finding buyers. Consequently, their plants are lying idle and they are desperately trying to find purchasers who can pay in cash.

With Pakistan in a position to pay in cash, a number of other countries would be prepared to provide it with a reactor. Neither the International Atomic Energy Agency, nor any country opposed to Islamabad's nuclear programme, would be able to hinder the deal. The real problem, the sources said, was lack of the availability of the required amounts in foreign exchange.

With the co-manufacturing concept, the sources said, Pakistan would be able to attain technology and capacity to manufacture reactors at one-tenth of the cost prevailing in the international market.

Scheduled Shutdown of Leningrad AES Explained

PM2205135789 Leningrad LENINGRADSKAYA PRAVDA in Russian 12 May 89 p 1

[Article by A. Agrafenin and T. Syrchenko under the rubric "In the CPSU Oblast Committee Press Center": "Reactor Readied for Repair"]

[Text] As already reported, the scheduled repair of one of the reactors at the Leningrad V.I. Lenin nuclear electric power station [AES] will begin in June this year. This event has given rise to all kinds of rumors and distortions. Yesterday a meeting took place in the CPSU Oblast Committee [obkom] press center at which journalists received answers from specialists to questions connected with the forthcoming repair and the situation around the nuclear power station in Sosnovyy Bor.

A.P. Yeperin, director of the Leningrad nuclear electric power station, reported that during the repair the fuel channels (16-meter zirconium tubes in which the nuclear fuel is placed) of the first power unit's reactor will be replaced. The fuel channel clearances in the reactor's graphite core will also be calibrated. This year the power workers are planning to replace 40 percent of the tubes. In November, by the beginning of the cold season, all the station's units will be working once again. It is planned to complete the repair next year.

Journalists asked about the safety of the upcoming jobs. Specialists gave assurances that there is no cause for concern. The replacement of the fuel channels is a customary operation in the Soviet power industry. Similar operations have been carried out at Siberian nuclear electric power stations. Individual fuel channels were also replaced when the reactor was shut down at the Leningrad power station during previous scheduled preventive maintenance. For example, last year in the same unit 10 channels were replaced and their clearances reset. This was done in 11 days. Now it is simply a question of a larger operation.

The reactor repair is part of a major reconstruction program at the station which is to be completed in the 13th 5-Year Plan. In particular, it is also planned to replace the station's assemblies approaching the end of their design life, including computers and control systems.

Naturally, the question arises: How will the shutdown lasting almost 6 months affect the city's power supply this year and next year? It is well known that the Leningrad AES provides 60 percent of the Lenenergo's [Leningrad Regional Power Administration's] electricity. The shutdown of one reactor reduces the Leningrad AES' capacity by one-fourth. It was said at the press conference that all the work is being coordinated by the Lenenergo control service. Leningrad heat and electric power stations are making up some of the power. At the same time Leningrad stations are becoming members of the Single European Power System, which will also "safeguard" electricity consumers in the city on the Neva.

All the same the question of the Leningrad AES' safety was crucial at the meeting. The power workers were asked again and again what measures are being taken by them after the accident at Chernobyl. Leningrad AES Director A.P. Yeperin stressed that increasing safety was the main concern of all the station's workers. He enumerated specific technical measures which have been taken to qualitatively improve the work of the emergency containment system. The power workers are not counting the cost. For example, in implementing these measures the prime cost per kilowatt-hour of electricity increased from 0.7 kopeks to 0.85 kopeks.

At the meeting Yu.V. Kuznetsov, sector chief at the Radium Institute, said that soil, water, silt deposits, air, and agricultural produce have been monitored for over 10 years in the Leningrad AES region. The "pollution" figures are tens and hundreds of thousands of times below the norms regulated by the appropriate USSR Ministry of Health documents. But it is odd that the results of these observations have not been broadly publicized. This may be one reason for the rumors.

"Many questions would not have arisen for the population if there had been sufficient glasnost," O.V. Bodrov, chairman of the "Zelenyy Mir" Association in the city of Sosnovyy Bor, said. "We must aim to inform the public widely about everything that is going on at the Leningrad AES and around it. Because there is an element of distrust, which is not, incidentally, connected with doubts about the level of the Leningrad AES personnel's responsibility but connected with the lack of information, we propose setting up a council which will include representatives of Leningrad enterprises, the public, and the press. This council will monitor the situation around the station and inform the population about it. I think that no difficulties will arise because everyone is interested in this."

The specialists also answered journalists' numerous questions. G.I. Barinova, chief of the CPSU Obkom Ideological Department, presided at the press conference. S.G. Petrov, secretary of the Leningrad CPSU City Committee, took part in the work.

Energy Official Discusses Reactor Safety Decree

18220128 Moscow PRAVITELSTVENNYY VESTNIK in Russian No 8, Apr 89 p 10

[Interview with V.V. Marin, first deputy chairman of the USSR Council of Ministers Bureau of the Fuel and Energy Complex, by V. Lvov: "Levels of Safety"; date and place not given]

[Text]The government constantly holds in view the issues of providing safety in nuclear energy. Since the accident at the Chernobyl AES [nuclear power station], a

major complex of multiplan measures directed toward increasing the reliability of nuclear stations has been carried out. Serious improvements have been introduced in the designs of active power units and those under construction, and in the construction of equipment and equipment systems. The training of the operating staff has been significantly improved. Scientists and specialists continue intense work in this direction, developing and implementing in principal new technological decisions. It can be stated with certainty that today the possibility of an accident such as that of Chernobyl is completely excluded.

A new stage has now come to this work. Its basic tasks were determined in the resolution recently adopted by the USSR Council of Ministers on supplementary measures to increase the safety of nuclear stations. Such resolutions used to be closed. But today, we will tell the readers of PRAVITELSTVENNAYA GAZETA not only of the fundamental positions of this document, but of what seems to be left between the lines.

Our interlocutor is V.V. Marin, first deputy chairman of the USSR Council of Ministers Bureau of the Fuel and Energy Complex.

[Lvov] Vladimir Vasilyevich! What problems will be solved during the new phase of work on raising AES safety?

[Marin] Stipulated first and foremost is the reconstruction from 1989-94 of all 14 active energy units built during the seventies. Today their safety systems are not completely up to the increased modern demands. These, as well as newly constructed power units, will be equipped with the so-called passive supplemental safety systems which do not require any sort of external power supply. This is very important. This allows for reliable cooling of the reactor in the event of any accident situation and for the localization of any discharge of radioactive matter while the reactor installation is depressurizing. Some of these systems have no analogies in world practice and are a serious step forward in resolving the problem of providing AES safety.

Also important is the condition that active energy units and those newly brought on line are equipped with developed diagnostic systems for checking the state of the equipment and the tubing. Such systems allow for the timely manifestation of the nuclear station's deviation from normal work modes and for taking measures in advance for the prevention of critical situations.

It is intended that the major scope of the work of replacing obsolete equipment at the AES's be executed during the period of scheduled repairs. This concerns first the control and measuring equipment, the computer equipment, the parts and assemblies of equipment which deteriorate quickly.

In connection with the exhaustion of design resources of the work of reactor equipment, a resolution has been adopted to this year halt the operation of the second power unit of the Beloyarskaya AES, and in 1990 the second power unit of the Novovoronezhskaya AES. As is known, the first power assemblies of these stations were halted several years ago.

Great attention has been directed toward the improvement of AES fire safety by expanding the application of nonflammable and radiation-resistant materials, including special enamels for the protective covering of building constructions and parts of roofing overlaps, as well as fireproof cable products and fire-resistant oils...

[Lvov] How is quality control over AES construction and assembly work and the production of equipment, apparatus, and control systems implemented?

[Marin] Safety provisions at nuclear stations depend to no small degree on the high quality of work at all stages of creation of the power units, including the choice of the site, the process of developing the project, as well as its construction, preparation, and the assembly of equipment.

An important element of this work is the further improvement of documentation of the technical specifications which define safe conditions and limits during the creation and operation of nuclear power installations. The basis of these is the requirements and recommendations of the International Atomic Energy Authority [IAEA] and the conclusions of the results of careful analysis of the causes of the Chernobyl AES accident.

[Lvov] How is the precise definition of the seismic characteristics of the sites of active AES's proceeding, as well as of those under construction and in the planning stage?

[Marin] The USSR Academy of Sciences, the USSR State Construction Committee, and the USSR Ministry of Geology are working intensively to correct the map of seismic zones in the areas where nuclear stations are situated. This work will be completed by 1 October this year.

[Lvov] Has the fate of the fifth and sixth power units previously under construction been decided definitively? Is an expansion of the active AES planned with the use of high-capacity reactors?

[Marin] The USSR Council of Ministers adopted a simple resolution to refuse to construct the fifth and sixth power units of the Chernobyl AES temporarily closed down after the accident. No expansion is planned of other active nuclear stations with the use of high-capacity reactors. In particular, it was decided to halt the construction of the fourth power unit at the Smolensk AES and the sixth power unit of the Kursk AES.

[Lvov] Our readers are interested in how spent nuclear fuel is stored. What safety provisions are involved? Are there any threats to nature and people?

[Marin] Safety provisions during the storage and transport of spent nuclear fuel and the utilization and burial of radioactive wastes formed during the operation of nuclear plants is the subject of particular attention. Accumulated domestic and international experience and scientific research allow for the simple confirmation that the technological processes, means, and methods reliably guarantee the safety of AES personnel, the population, and the natural environment.

This is the system for dealing with spent nuclear fuel in our country and the world today. The fuel assemblies unloaded from the reactor are first placed in water-filled cooling pools at the reactor where they are retained over the course of several years. After a reduction to a safe level of residual energy emission, the spent assemblies are transported to special on-site storage facilities from which they are later sent to reprocessing enterprises. They are transported in special container cars which have been carefully tested and built in compliance with IAEA requirements. In particular, their pressurization is not disturbed even in a fall onto a hard surface from a height of 9 meters, in a head-on, high-speed collision with other railway transportation equipment, in various types of fires, etc. The safety of such transportation has been confirmed by many years of practice.

The liquid and solid low- and medium-level radioactive wastes formed during the AES operation processes are concentrated in special, reliably protected vessels on the premises of the station. Ongoing control of their condition is arranged, precluding any sort of threat to nature and people. The AES is equipped with installations for burning solid and bitumenized liquid radioactive wastes. With this assistance the wastes turn into stable, compact structures. The volume of such wastes is insignificant and their dependable storage does not present any particular difficulties.

[Lvov] How is the work progressing on the creation of new-generation reactor installations with improved safety, reliability, and economic characteristics? When will they be introduced into the power industry?

[Marin] Work in this direction is in full swing. The most progressive domestic and foreign achievements are being utilized in the development of projects for reactor installations and of new-generation power units in general, and in the selection of lay-out and construction solutions. The main goal is to create an installation with such a degree of internal self-protection that it is independent of any equipment failure or personnel error. It is planned that the project work and necessary scientific and construction research will be completed by the midnineties so that by the 14th 5-Year Plan, construction will begin on the new generation of AES's.

It must be noted that the prototypes of such installations have already been created. The heat-supply nuclear stations under construction in Voronezh and Gorkiy can be counted among them. They have no analogies in world practice for their level of reliability and safety. Extremely promising in this field are the power units with high-temperature reactors, of which construction is planned to begin in the midnineties.

[Lvov] How is glasnost being expanded in AES activities?

[Marin] This is a very important question. The distrust of the nuclear power industry by a certain segment of society was to a significant extent linked with the groundless limitation of information on the work of AES's. Measures are now being taken to correct this situation. Information centers are now being created at each nuclear station. Here one may receive data on the work of energy units, the measures in effect and still planned for providing their safety, and the radiation conditions in the adjacent environment. AES's are now open for visits by representatives of labor collectives, educational institutions, and public organizations.

A center for public information in the field of nuclear power has been formed in Moscow. Its task is to provide competent, exhaustive answers to any questions which trouble people. A discussion club meets regularly at the Nuclear Power Institute imeni I.V. Kurchatov. Anyone may participate in its work.

As you can see, everything has been done to possess complete information on the AES's. It seems to me that the side of the mass information media must also provide a high level of responsibility for the accuracy and competence of materials published. And last, the resolution of the USSR Council of Ministers emphasizes the especially important role of the nuclear power industry in strengthening the country's economy as one of the most important progressive trends in increasing the generation of electric and heating power. For example, this has been confirmed by the experience of such countries as France, Belgium, and the FRG, in which AES's produce 70, 66, and 31 percent of all electric power, respectively.

Apparently, broad explanatory work is required among the public and all the country's population on the issues of the prospects for nuclear power.

AUSTRIA

Cabinet Adopts Nuclear Agreement With CSSR

AU2405163089 Vienna DER STANDARD in German 24 May 89 p 6

[APA report: "A New Nuclear Treaty With the CSSR"]

[Text] Vienna (APA)—An extended agreement between Austria and the CSSR, which was adopted by the Cabinet on Tuesday [23 May], provides more protection against a possible defect in a CSSR reactor. Foreign Minister Alois Mock spoke of a further positive step toward nuclear safety.

With the treaty, the rights to information and consultations were extended to all nuclear plants—that is, also to research reactors, deposits, and the entire territory of the two states. Temelin and Mochovce are also included in the information system. So far, only light-water reactors near the border have been included.

The information on new projects is to be provided after the building permit has been granted, and not merely half a year before the start-up of operations. The exchange of data on radiation will also be improved. Now information about events that are not defects in the strict sense of the word, but which could cause concern in the population of the neighboring state, is also obligatory.

CSSR Power Plants Threaten 'Ill Feelings'

AU3005090889 Vienna DIE PRESSE in German 30 May 89 p 2

["AG" report: "CSSR Power Plants: New Ill Feelings Between Prague and Vienna?"]

[Text] Prague/Vienna—The CSSR's power plant projects threaten to cause new ill feelings between Prague and Vienna. At the beginning of the first conference of environment ministers of CSSR neighboring states in Prague, Austrian Minister Marilies Flemming urgently appealed to the host country not to build the projected nuclear power plants at Temelin and Mochovce near the Austrian border. Flemming said that she can imagine that, if such were to be the case, Austria would grant financial support. Obviously as a reaction to this, a news conference by the CSSR nuclear energy commission was announced for today.

A delegation of Austrian environmental protection activists who wanted to hand over a petition against the Slovak Gabcikovo hydroelectric power station on the Danube was turned away at the CSSR Embassy in Vienna yesterday [29 May].

The paper that was slipped through under the fence was immediately crumpled up and thrown back.

FEDERAL REPUBLIC OF GERMANY

Court Rules Niederaichbach Plant Dismantling Possible

51002425 Hamburg DIE ZEIT in German 31 Mar 89 pp 17-20

[Article by Juergen Benz and Michael Haller: "The Long Shadows of the Nuclear Age"]

[Text] Feeling guilty, we have tried to make it clear to our children that they and their descendants will have to live with the damned nuclear power plant ruins, because their radioactive internal parts are much too dangerous to dismantle.

We have long been familiar with the idea that these useless concrete giants on the banks of our rivers will petrify into horrible memorials to an epoch that foundered because of technological megalomania.

Meanwhile, we have also had to give in to the opponents of nuclear power, who even then, in the 1970's, wagged their fingers at the unsolved problem of nuclear waste disposal: Where to put the radioactive stuff, when, after 25 or 30 years of operation, the plants have to be shut down once and for all due to old age?

But now, quite unexpectedly, we may be optimistic again: In Niederaichbach in Lower Bavaria, near the kreis city of Landshut, on the bank of the beautiful Isar River, for the first time in Europe a shut-down nuclear power plant is being dismantled and completely removed. In 5 years at the most, the dismantling engineers tell us, flowers will again grow and cows be able to graze on the green meadow there, as if there had never been a radioactive power factory. A mirage?

On Monday of last week the Regensburg administrative court of the first instance decided that the city of Landshut—which brought suit in July 1987—would not infringe on its rights and duties to care for the citizens by dismantling the Niederaichbach nuclear power plant (KKN). The radioactivity released in dismantling the reactor, as calculated for the court by experts, would constitute only minute fractions of the permissible amount of radiation. Even if the amounts present from the reactor accident at Chernobyl and radiation from the still operating neighboring power plants Isar I and Isar II are added in, the radioactivity remains so low that the legally prescribed limit of 30 millirem per year will not be exceeded. The conclusion of the judge: Scrapping the nuclear ruin will not affect the well-being of the citizens around the city of Landshut—and the last hurdle, for the time being, on the by now very long path toward complete dismantling has thus been eliminated.

A new, economically prosperous, future has begun for the nuclear industry: the epoch of nuclear power plant scrapping. Even construction of the 23 units (so-called blocks) in operation today in the FRG were a profitable

business for the nuclear industry. Then, to be sure, came the dry period of nuclear power plant rejection: New power plant projects are now hardly possible to undertake in the FRG due to the resistance of the population. But the scrapping of decrepit plants promises to be just as profitable: Around the world more than 50 reactors have been shut down; this means there is specialist work to be done for the next 30 years. In the next 7 years alone nuclear power plant operators want to dismantle completely five power reactors out of the 16 power plants that are now shut down; by the end of the century the nuclear industry anticipates numerous additional complete dismantlings. In 2013, presumably, the last nuclear power plants will be shut down in the FRG. The Emsland power plant and a second block at Neckarwestheim were only added to the network last year; both are given a normal lifetime of 25 years.

The decommissioning work is also able to provide valuable service for the rehabilitation of the currently so badly tarnished image of the nuclear industry. Finally, the engineers will again be able to show that they really have a complete grasp of nuclear energy, that they are even able to overcome the problems of nuclear energy and present the frightened society with a carefree post-nuclear future.

According to the letter of the German nuclear law, the operators of nuclear power plants are obligated to take care of their removal. However, they are not expected to stick to a time frame. They are thus able—purely theoretically—to decide in favor of one of three possibilities after the shutdown:

Stage 1: The fuel elements are removed, other radioactive parts are enclosed in a safety container, all access is blocked. The plant remains standing, but must be guarded for safety reasons.

Stage 2: In addition to removing the fuel elements, still intact components and building parts are removed—with the exception of the reactor building and the safety container.

Stage 3: Means "total removal." The entire facility is completely dismantled until the original condition of the site, the "green meadow," is restored.

And this last stage is now to be practiced for the first time with the Niederaichbach case.

"All of that is no problem," beams Ulrich Loeschhorn, physicist and project leader of the Karlsruhe Nuclear Research Center (KfK) responsible for the decommissioning. "Anyone who can build a thing like that can also pull it down again." Loeschhorn is standing on the bank of the Isar in front of the gray, windowless concrete cube, from which a thin smokestack stretches toward the sky: 16 years ago Niederaichbach was loudly celebrated as the prototype of a nuclear power plant developed domestically by Siemens engineers—a "gas-cooled, heavy-water-moderated, pressure tube reactor for natural uranium." But after scarcely 17 months full of mishaps the Bayernwerk AG plant had to close forever on 31 July 1974. During this period of operation the particularly expensive construction, calculated at DM230 million, had only delivered 18.3 full days of operation at 100 megawatt power.

Shortly afterward the turbines were dismounted, the fuel elements removed and the radioactively contaminated area of the plant sealed off; "secured containment" is what nuclear technicians call this first stage of mothballing according to the nuclear law.

"Theoretically" the ruin could now be left standing like that forever, says Ulrich Loeschhorn. The only unattractive thing would be the high costs of maintenance and protection, which by now have climbed to nearly DM1.5 million annually.

A Chicken Coop in the Nuclear Power Plant?

The specialists from Wuerzburg and Karlsruhe have allocated 6 years for the complete disassembly divided into five phases (for details see the schedule above). The scrapping of "inactive," meaning uncontaminated steel, was begun as early as July 1987; 500 tons were removed and recycled. Since the fall of 1988 the dismantlers have been tearing out the so-called contaminated installations, that is to say installations contaminated only on the surface. Among them are the two heat exchangers, which at that time caused all the breakdowns, and the entire control system, the heavy water cycle with the large outlet tank in the basement. Apparently this work offers no problems as well: Since the power plant was in operation for such a short time, the material is only slightly contaminated. The four dozen men from the dismantling companies "are working quite normally in overalls made of a linen material," stresses Ulrich Loeschhorn; they can touch, saw, and weld without any danger. Radiation in this area is said to be "at most 0.2 millirem per hour," a dose which in fact is considered to be safe. Loeschhorn is frequently quoted by journalists as saying that he could easily put a chicken coop in this part of the nuclear power plant and without concern eat the eggs they lay. Meanwhile, he finds this allegory misleading.

Not until the middle of next year will it "perhaps" get a little trickier, when the men push into the reactor core area in order to remove the "activated" material from there: primarily the pressurized tubes, the high-grade steel components in the reactor, the moderator tank and a protective shield (thermal shield) of various metal alloys.

During operation these components were bombarded by neutrons, so that their activated atoms are now in turn radioactive. The reactor core is enclosed by an 8-meter-high and nearly 2-meter-thick concrete mantle, the so-called containment vessel. In this inner space 2,000 curies, or 74 billion Becquerel of radioactive material—relative to the material cobalt 60—was measured 5 years ago. Even if, due to the short half-life of cobalt 60, the

radioactivity has now decreased, this radiation could be dangerous to people, even in Loeschhorn's opinion. For this reason the dismantling in this area must be handled by remote-controlled gripper machines. And since such automatic machines did not exist, these robots called "manipulators" were developed by the firm of Noell especially for the Niederaichbach decommissioning. One of them, a rotating manipulator, will sit on top of the reactor platform and reach down into the depth up to 20 meters with its enormous gripper arm, sometimes with a saw, sometimes with a drill, hammer or screwdriver, in order to cap the 351 pressurized tubes in the moderator tank. The second one, a crane manipulator, will be able to lift up to 3 tons of knocked down material. The two machines have been undergoing tests for a long time and will finally be ready to use in early summer 1990.

The weak point, Noell engineers say, is the human element, or, in concrete terms, the operating crew, which still has to learn to handle the robots. It must be possible, for example, to control the gripper arm with millimeter precision. In order to operate it, a control center made of 35-centimeter-thick steel will be hung in the reactor dome. The men will then control the work of the robots through narrow lead windows and via camera-fed monitors. All of this will present no problem at all, Loeschhorn says in a casual tone, as if he had already buried 50 reactors.

Gentle Blasts

The hot phase of the decommissioning, which many inhabitants around Landshut are most afraid of, will then begin in the fall of 1990: the destruction of the containment vessel, the meter-thick concrete ring which contains the nuclear area. It has this name because it is to prevent strong radiation from getting into the biosphere. As a result of being bombarded with neutrons, the concrete mantle has been activated to a depth of 60 centimeters and emits radiation. Since it consists 40 percent of steel, the robots would scratch themselves to pieces if they were to cut it up. The dismantling engineers, therefore, had the idea of using the manipulators to drill deep holes in a tight line into the concrete ring and filling them with explosives. If they have calculated and drilled correctly, the blasted-off chunks will fly inward, where they can be gathered and smashed by the automated giant. No, not to worry; one will blast quite "gently" with "soft detonations" and so to speak squeeze the radioactive concrete off the steel skeleton; there will be no jolts, no cracks, and no dust clouds. "First, an experienced blaster will be present, and, second, we will make everything dust-proof." The containers packed full of fragments will be filled up with concrete, and then taken away.

The last phase, if one is to believe Ulrich Loeschhorn and the men from Noell, will then be utterly boring: The power plant building will be made to collapse with bulldozers and wrecking balls, before the construction rubble is hauled away, toward the end of 1992—presumably 130,000 tons.

Making that much construction rubble of Hazard Class I disappear is not too difficult a task today, despite dumps being overfilled and many depots being blocked, because there are still sufficient construction debris dumps.

But at first the Karlsruhe demolition experts wanted to profit from getting rid of the nuclear power plant rubble by using it as a foundation for the autobahn between Landshut and Dingolfing. Meanwhile, however, the road workers were surprisingly fast, and the highway has already been built. The most recent proposal, just to dump the whole lot at various garbage dumps, is not exactly environmentally sound—but rather harmless, compared to the problem of waste removal of radioactively contaminated material.

To begin with, there are 1,700 tons of contaminated steel scrap from the second demolition phase, an amount corresponding to 2,000 VW Golf automobiles. Where should it be put?

Melting Furnace for Nuclear Scrap

Occasionally, nuclear waste disposal companies have mixed contaminated high-grade steel in homeopathic dosages, as it were, with melted ore in the blast furnaces of the steel mills. But in such quantities? Furthermore, the Karlsruhe demolition experts wanted to test whether the contamination of the cast metal would be lower and the slag radiate all the more. So they decided to build their own small blast furnace for contaminated steel at Karlsruhe. This by no means inexpensive "melt-down facility for radioactive materials," Eiram for short, also serves other purposes, such as compression of highly radioactive materials, so that they can be permanently stored in as little space as possible.

The 6-meter-high smelting furnace has already stood on KfK's site for some time; right now it is being inspected by TUeV [Technical Monitoring Association], and in about 10 days it will be taken into operation—a world premiere. In contrast to the blast furnaces of the Ruhr region, which can swallow up to 100 tons, Eiram can be loaded with a maximum of 2 tons. In order to melt away the Niederaichbach steel, the five expert workers who handle this will have to be busy for a good 2 years.

Until recently, the Karlsruhe physicists were convinced that their melted down steel would not exceed the prescribed radiation limit of 0.5 Becquerel per gram and, therefore, could be given to steel merchants, resold without indication of origin and processed—for instance as an additive in frying pans, eating utensils or ship's cabins. But meanwhile they are not so sure any more.

Under certain circumstances the reprocessed steel scrap could actually give off a higher radiation dose than permitted. In extreme cases, physicist Christian Kueppers of the Ecological Institute in Darmstadt believes, the radiation dose could even exceed the 30-millirem value which has been determined in the Radiation

Protection Regulation to be the maximum value for exposure of the population to emissions from a nuclear power plant. For example, if a sailor lived for 1 year in a ship's cabin made of reprocessed steel, he would possibly even have to count on a radiation load of 170 millirem—from cobalt 60.

It is obvious that German nuclear power plant owners, who in the future will have to pay for decommissioning their plants themselves—in contrast to Niederaichbach—would like profitably to dispose of as much high-grade scrap as possible. The higher the permitted value set down in the regulation, the more material can be sold through scrap dealers. The Nuclear Research Center in Karlsruhe saw this connection as well and initially applied for a permitted value for Niederaichbach which was almost 10 times higher than the limit which the Bavarian environmental authority was ultimately ready to approve. Meanwhile, the officials, who do not exactly appear hostile to nuclear energy, think even this limit of 0.5 Becquerel is too high—see the ship's cabin example. Other than that, the Radiation Protection Commission came to the decision on 1 October 1987 that in the future an unlimited release of nuclear power plant scrap were only permissible if radioactivity remained below 0.1 Becquerel per gram. "Even this value would not give us headaches," comments Ulrich Loeschhorn; "after melting the contaminated steel, the melted products have even lower values."

Nevertheless, Karlsruhe would like to give up steel recycling: The KfK itself wants to use the 1,700 tons of steel scrap in constructing a gigantic 5,000 ton shielding wall, which is needed within the framework of a (not yet approved) research program for studying cosmic radiation.

However, at Niederaichbach there are another approximately 500 tons of steel and 500 tons of concrete which are radioactive, meaning they in turn emit radiation—the material which must first be brought out of the core area of the nuclear power plant with the two mechanical giants. The regulations permit no latitude: This scrap is so radioactive that it must be packed in 2,000 so-called standard casks, then loaded into containers, declared as nuclear waste and disposed of. But where? There is no approved permanent storage site.

Waiting for Permanent Storage

Some 20 years ago the nuclear industry was convinced that it had solved the permanent storage problem once and for all with the former salt mine of Asse near Wolfenbuettel. But toward the end of 1978 the tests had to be stopped as a result of legal misgivings in the FDP [Free Democratic Party].

The following year the waste disposal people set upon the salt dome at Gorleben. After many expert opinions and deep drillings the PTB [Federal Institute for Physics and Technology] confirmed that it was suitable, but for highly radioactive material. Three years later the sinking of the shaft began; 14 months after that work had to be stopped after an accident. But officials from the PTB are still hoping to be able to continue to establish the storage facility. They also know, however, that this nuclear catacomb cannot be stocked until 2009 at the earliest, if at all. And even then Gorleben would primarily be a possibility for heat-developing, meaning highly radioactive waste, to which the comparatively harmless remains of Niederaichbach do not belong.

For its low-level radioactive waste, which meanwhile is piling up at countless sites in the FRG in sheds, factory halls and on public land, the nuclear industry now sets its hopes to the Konrad ore mine not far from the Asse salt mine northeast of Salzgitter. The pits of the mine are suitable as permanent storage for a total volume of about 650,000 cubic meters of low-level radioactive material primarily because they are dry. The PTB determined their suitability as early as 1982, and the process of drawing up a plan has been under way since 1986; there are also hardly any objections to the change in the function of the mine. Nevertheless, so far there are no approvable documents in existence. Only optimists still believe that permanent storage can begin in 1993; realists in the licensing environmental agency are cautiously speaking of 1995.

Until then, the Karlsruhe technicians will provide interim storage for the 2,000 standard casks on their site. "No problem," they say, "we have enough space."

Model (Almost) Without Value

Assuming that there will actually be a happy end for Niederaichbach in 6 or 7 years, and that all the poisonous stuff will disappear into the shaft of the Konrad mine never to be seen again: Will the demolition of the KKN actually become a model for scrapping retired nuclear power plants? This much is certain: The innumerable attempts over many years to use remote-controlled automatons to saw up the recalcitrant steel reinforcements in the interior of an inaccessible hollow space, to pick up contaminated concrete lumps and chop them to pieces—this is know-how which can also be transferred to large reactors. Other than that, however, Niederaichbach does not appear to be a model, but rather a special case.

This special role was already recognized in 1959 in the construction contract. Niederaichbach was to be added to the network as a prototype for a new construction series, the pressurized pipe reactor, a development started by AEG and finally concluded by Siemens, in order to compete with the well-known light-water reactors as well as the English magnox reactors. Client and manufacturer decided in favor of cooling with carbon dioxide, which in order to be more economical was to be under high pressure and at high temperature.

After a suitable site had finally been found, the final construction plans were at long last ready at the beginning of 1965. In a paper the top people from the

participating companies congratulated themselves: The Niederaichbach Nuclear Power Plant project has taken a long time before starting up, but instead it was possible to think it through, work on it and prepare it all the more." Excitement grew into euphoria as the Euratom commission and the French Commissariat a l'Energie Atomique (CEA), supported by Electricite de France, gave it a good grade, in particular because of the development capability of the series." "If the preconditions on which these calculations are based are met—which the operation of KKN will prove—the production series of heavy-water-moderated and gas-cooled pressurized tube reactors could be fully competitive for the foreseeable future," the operators rejoiced at the time.

Some 8 years later people knew better; the production series was a failure. The steam generators which were as hot as 500 degrees suffered series of pipe damages. Ultimately, the engineers realized that without expensive rebuilding one would never get more than 30 percent of the nominal capacity. The decision was made to shut down. Of the DM230 million in construction costs the Federal Government had paid 130 million and the state of Bavaria 10 million. Equivalent value: a radioactive ruin. As in Goethe's "Sorcerer's Apprentice," the nuclear power operators now looked for a magic formula with which they could banish the radioactive spirits that they had called up and now could no longer get rid of.

Search for a Decommissioning Prescription

The state-financed KfK then took over the now worthless status symbol in order to study the mothballing technique with tax money. "With the facility in Lower Bavaria it was possible for the first time in the FRG to gather experience in shutting down a nuclear power plant," it was said at the time in KfK in-house reports.

And that is still the reason for the decommissioning today: With the nuclear power plant cycle of construction—operation—shutdown—dismantling it was possible for the first time to gather experience and work toward a prescription for decommissioning. To the Ecological Institute in Darmstadt such reasons are "pure nonsense, since with the Niederaichbach nuclear power plant no more experience in dismantling nuclear plants could be gathered than would be possible at any other nonradioactively contaminated plant." No one knows, it says, whether a reactor, which after about 25 years of operation gives off a hundred thousand times more radiation, can be disassembled without risk according to the Niederaichbach model. The amounts of contaminated waste are correspondingly larger. If Biblis, for example, were to be decommissioned it is anticipated that at the end of the normal period of operation there would be 18,000 tons of "total radioactive waste" that would have to be eliminated.

That is why the Environmental Protection Association in Bavaria is more afraid that another power plant—Isar II—might arise on the riverbank site, if once again it becomes a meadow. Landshut mayor Josef Deimer (CSU) [Christian Social Union] even advocated "simply letting the nuclear hunk stand there as a memorial to technical megalomania:" Maybe people would learn from it.

Since then, nuclear power plant operators have learned one thing above all: Decommissioning, if shutdown is included in the calculation, will cost just as much as construction of the entire nuclear factory—possibly even more. For Niederaichbach Karlsruhe estimates the price for decommissioning to be DM180 million at present. To this are added 100 million for the shutdown and maintenance costs since 1974 for the ruin, and finally the permanent storage costs. In this context, at least, scrapping the KKN waste, which is only weakly radioactive, will be relatively cheap.

The electricity companies would have to dig very deeply into their pockets if they had to tear down large nuclear power plants of the Biblis type. They commissioned a study by the nuclear engineering service in Hanau, which is supported by the Stillko 2 computer program developed expressly for this purpose. The computer—purely hypothetically—arrived at the conclusion that tearing down a 1,300 megawatt pressurized water reactor of the Biblis A type immediately after shutdown would cost at least DM387 million and a boiling water reactor of the Brunsbuettel type (806 megawatt) DM464.7 million (in June 1988 DM). Consequently, the electricity companies even today set aside 0.2 to 0.3 pfennig of the kilowatt hour price for actual decommissioning.

The Association of German Electricity Works [VDEW] for a long time has been running the "Decommissioning of Nuclear Power Plants" working group, in which dismantling experts have devised and calculated concepts for shutting down and decommissioning nuclear power plants. In its most recent study, 2 years ago, the group demonstrated the cost explosion for the permanent storage prices which is likely to be anticipated: In case of decommissioning immediately after shutdown, the predicted permanent storage costs for a boiling water reactor grew from DM20 million (1976) to DM70 million (1985)—and the tendency is to keep growing. Experts also made it clear that the type of nuclear power plant dismantling is predetermined by the permanent storage concept. This means that the breaking up and packaging of radioactively contaminated parts at Niederaichbach is precisely fitted to the permanent storage in the Konrad mine. "Since the permanent storage containers at the Konrad permanent storage site are generally larger than the 200 and 400 liter casks used until now, the new packaging concept has a simplifying effect," dismantling experts joyfully say, "since even larger pieces can now be packed." The nuclear power plant operators have obviously been firmly convinced for the last 2 years that the ore mine will be given over to them.

Turn Off and Wait

If only enough money and a permanent storage site were available, shutting down the nuclear power plants would

no longer be a problem, in the opinion of the circle of experts. They do not say anything about the actual possibilities and risks of total dismantling, perhaps because Niederaichbach really is nothing but a special case. Nevertheless, in the FRG, in addition to two research reactors, two commercial power reactors have already been shut down for good but not yet torn down: after a long period of operation nuclear power block A at Gundremmingen in Bavaria with 237 megawatt, and the nuclear power plant at Lingen on the Ems with 256 megawatt capacity.

For the Lingen nuclear power plant, which has been dead since the early 1970's, "safe containment" of the plant was arranged: One wanted to wait until the radioactivity had greatly subsided after a few decades. Meanwhile, the operating company, United Electricity Works of Westphalia Inc., is using the area as some sort of testing range. Today the agile waste disposal specialists from the Noell company are testing decontamination of the famous/infamous Chernobyl by means of a special method they have developed.

Block A at Gundremmingen has one of the oldest power reactors in the FRG: It was shut down in 1974 after 12 years of operation because of continuous interruptions. Since then, 3,000 tons of contaminated steel have been removed and half of them delivered over the course of several years to various blast furnaces of the steel industry to be melted down—with financing from the EC coffers in Brussels within the framework of the "EC research program for decommissioning techniques." Since the beginning of this year the research program has been operating in its third edition, with the goal of finding the most economic technique for extensive reprocessing of the increasingly larger mountains of radioactive waste.

Electricity company demolition experts would prefer to raze the Gundremmingen reactor. But compared to Niederaichbach its interior has many thousand times more radiation. And in this case one is not as sure as KfK expert Ulrich Loeschhorn that "in principle" large reactors can be demolished in the same manner as totally harmless Niederaichbach. For example, nuclear technicians are hesitant to take apart the little research reactor at Kahl, which with its 16 megawatt capacity is comparatively small. The plant concluded its nominal operating period of 25 years last year and was shut down. But to this day no one knows what radiation intensity actually exists in the reactor core, how much "radioactive" material will have to be stored, and whether it is actually permitted to dismantle it according the 5-stage model.

No matter how the Niederaichbach example is evaluated, genuine nuclear power plant dismantling will not take place until permanent storage sites of type Konrad and Gorleben are actually available. Otherwise there remains only "safe containment," say the engineers of the Nuclear Power Plant Decommissioning working group. And that means taking care of the most horrible and expensive ruins ever.

In the Business of Supplying Nuclear Energy

Some 5,000 workers on 2.5 square kilometers of strictly guarded land: The know-how people of the German nuclear industry, the Karlsruhe Nuclear Research Center, KfK for short.

Owner: the FRG (90 percent) and the state of Baden-Wuerttemberg (10 percent). Mission: applied technological research. Total budget last year: DM718 million. Specialty: "complex, risk-filled developments," (according to managing board chairman Horst Boehm to HANDELSBLATT). His motto: Technology transfer. His friends: Industry and the expert community. His enemies: nuclear power opponents. His most difficult job: participating in the licensing process to operate nuclear facilities.

The KfK is a reliable enterprise. Of course, sometimes an "embarrassing oversight" happens, as press spokesman Klaus Koerting calls the illegal storage of 6.6 tons of pure uranium from KfK with the scandal-plagued company Transnuklear in Hanau.

The abbreviation KfK was frequently found in the mass of brothel receipts and gift lists. A slipup on the path toward a brilliant future.

KfK was spawned 33 years ago as a large research facility in order to enable the young republic to join the nuclear powers at least in the civilian area. Today, it is the Disneyland of nuclear technology. That is where the industrious Teko stands, the model for the planned reprocessing plant (WAA) in Wackersdorf, and the brave KNK II breeder reactor, a model for the fast breeder. For more than 10 years it had fed power to the public grid when, as it came on line again last December, an incident of the Urgent Category had to be reported.

Even the Gorleben permanent storage facility and the Konrad shaft are present at Karlsruhe in miniature. On the KfK grounds not only does the Thina simulator test for accidents in the breeder reactor, but the kindhearted Tamara works here as well, a waste incinerator facility, symbolizing a new orientation for the technology center.

Environmental protection is now on the agenda of the future enterprise, which had already felt the cold breath of a threatening cutback in personnel. Methods to purify, detoxify, and desulfurize power plant flue gases are to be tested. Its up-to-date goal: cutback of the nuclear field to 30 percent. New hobbyhorses such as waste removal and meteorology, microstructure, and maintenance technology are cultivated. Flexible equipment, such as articulated arms, is now finding a future application area in the decommissioning of nuclear plants as well.

[Box, p 17]

Green Meadows the Goal

How should a nuclear power plant be scrapped? Experts employed by the Association of German Electricity Works, Ltd. have developed a 5-stage plan. After shutdown (removal of the fuel rods) begins the

1st phase: Scrapping all components of the power plant which are not contaminated (between 800 and 3,000 tons of steel for each reactor type).

2d phase: Manual disassembly of installations which are superficially contaminated and can be recycled (1,700 to 2,500 tons of steel).

3d phase: Dismantling of "activated" elements with remote-controlled grippers (manipulators); packaging of the waste for permanent storage.

4th phase: Remote-controlled destruction of the containment vessel in the interior of the reactor (500 to 1,000 tons of steel-reinforced concrete), breaking up and packaging of the rubble for permanent storage.

5th phase: Conventional demolition of the buildings, grading of the site.

Then the German technicians were offered a singular opportunity at Niederaichbach to practice dismantling a radioactive ruin. To be sure, the Americans have already scrapped a few small research reactors, but no one has yet dared undertake the systematic annihilation of large commercial plants of at least 100 megawatt power and correspondingly large amounts of radioactive material. Niederaichbach was, thus, to be more than just a case involving legal approval for the industry. Under the curious eyes of Japanese, British, and American specialists, the ruin should become a demonstration object for the German art of demolition—"child's play for us," maintain the dismantling engineers from nuclear plant specialist Noell Ltd. in Wuerzburg, a subsidiary of federally owned Salzgitter AG.

FINLAND

Expansion of Nuclear Power Plants Considered

51002423z Stockholm NY TEKNIK in Swedish 27 Apr 89 p 10

[Article by T. Backmansson: "Finland Interested in Swedish Nuclear Power"]

[Text] Finland may buy a new nuclear power plant from ABB Atom; the decision is still two years off. The Finnish government is not expected to decide on the future of nuclear power before the national elections in 1991. No new nuclear power plants will be built or ordered while the present coalition government is in power. The administration made this decision under public pressure after the Chernobyl disaster. After the national elections in 1991, the new government will be free to decide whether or not to expand nuclear power.

Klaus Raninen, speaker for the board of the state power company, Imatran Voima, says that nuclear power is "on hold" in Finland.

The power company keeps up to date with the development of the Swedish boiling water reactor and the Soviet pressured water reactors. The Finns also follow developments in West Germany and France.

According to Klaus Raninen, Finland will have to choose between reactor manufacturers from these two countries. This opinion is shared by Magnus von Bonsdorff, VD at the Industry's Power, the company that runs the two Asea reactors in Olkiluoto.

"We have not decided to buy a new power plant from ABB, not yet. But we remain prepared to do so," he says.

Magnus von Bonsdorff does not favor ABB over other possible suppliers, but he says that it is important that ABB's expertise in nuclear power not be wasted.

"This know-how is a valuable asset, and as I see it, of a multinational common interest," he emphasizes. And he adds that the prospects for expansion of nuclear power have become considerably better.

Opinions Change

The fact that the government easily granted a 10-year extension of the lease for the operation of the country's four nuclear reactors is the first concrete result of a change of opinion in Finland.

Finnish electric power consumption is expected to increase by about three percent per year until the mid 1990's. The increase will be met with a new 500 megawatt coal plant in Pori, some municipal heating plants, and larger imports of electricity from Norway and the Soviet Union. Toward the end of the 1990's, additional expansion will be needed.

"We do not know yet whether it will be coal, nuclear, or some other kind of energy," says Taisto Turunen, director of the Energy Department at the Ministry of Trade and Energy.

People in the ministry and the power companies agree that Finland can take care of its electric power consumption without nuclear power until the end of the 90's, and that a decision regarding expansion can wait until 1991.

Greater Energy Demands

Director Pentti Sierila at the Forest Industry's Central Confederation, however, does not agree. He thinks that the decision about expanding should already have been made.

"The Forest Industry's decisions to build new paper machines and to increase production of mechanical pulp entail higher energy demand, and inexpensive energy is the basis for maintaining profitability."

Today, the industry pays 15 pennies (25 Swedish ore) per kWh, which is about the same as in Sweden.

In recent years, the importation of natural gas from the Soviet Union has become increasingly significant for Finnish energy supply. The forest industry in eastern Finland and the petrochemical industry are major consumers. The high price and the somewhat uncertain supply, however, are slowing growth.

Considering the other energy sources, hydropower is fully utilized. The rivers that are not being exploited are protected. To an ever larger extent, water power has assumed the role of a regulating power plant, meeting peak demand needs. Peat is used mostly by municipal heating plants, and there is no significant increase in sight.

[Box, p 10]

Finnish Reactors Operate Efficiently

Finland has two reactors, Loviisa of Soviet manufacture and Olkiluoto of Swedish manufacture.

Loviisa has two 465 MW pressurized water reactors. Olkiluoto has two 735 MW boiling water reactors. Today Finland has the total capacity of 2400 MW.

The Finnish nuclear reactors have very high operating rates. To date in 1989, all of the reactors have been operating at over 100 percent capacity.

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