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NATIONAL DEVELOPMENTS

HYDROPOWER

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Key Power Projects Listed for Development

40100079A Beijing CHINA DAILY in English 31 Aug 92 p 1

[Article by He Kui: "Key Projects Listed for Province's Development"]

[Excerpt] [Passage omitted]

Lubuge Power Station:

The Lubuge hydroelectric power station is being built on the Huangni River on the edge of Guizhou Province with a total investment of 1.7 billion yuan ($310.8 million) provided jointly by the World Bank and the Central Government. The project started in 1984 and was completed in June, 1991 with an installation capacity of 600,000 kilowatts and a yearly power generation of 3 billion kilowatt-hours.

Manwan Power Station:

The Manwan hydroelectric power station, located in Yun County of Lincang Prefecture and Jingdong County of Simao Prefecture, is the first phase of the entire terraced power station program on the middle and lower reaches of the Lancang River. With an investment of 1.5 billion yuan ($185.2 million) shared by the Ministry of Energy Resources and Yunnan Province, the project has an installation capacity of 1.5 million kilowatts and a yearly generation capacity of 7.8 billion kilowatt-hours. The first set of generators with a capacity of 250,000 kilowatts became operational on June 30 of this year and the whole project is scheduled to be completed before 1995. The project will help solve the problem of energy consumption of phosphate and salt by chemical industries and raw material industries such as non-ferrous metals during the Eighth 5-Year-Plan period (1991-95).

The Second Phase of the Xiaolongtan Power Plant Project:

The Xiaolongtan power plant is located at the Xiaolongtan open-cut coal mine and uses its coal directly from the conveyer belt. The first phase of the project started in 1983 and was completed in 1986 with an installation capacity of 200,000 kilowatts and an investment of 320 million yuan ($58.5 million). The second phase is scheduled to be completed this year with an installation capacity of 400,000 kilowatts and an investment of 500 million yuan ($91.4 million).

Transformation Projects on the Trunk Roads:

The transformation projects on Kunming-Wanding, Kunming-Daluo, Kunming-Hekou and Kunming-Zhaotong roads will be finished before 1995 with an investment of 140 million yuan ($25.6 million). Through the projects, 1,200 kilometres of existing roads will become high-standard State roads.

Power Sector Urged To Accelerate Pace of Technical Upgrading

926B0121B Beijing ZHONGGUO NENGYUAN [ENERGY OF CHINA] in Chinese No 7, 25 Jul 92 pp 23-28

[Article by Zhou Xiaoqian [0719 1420 6197] of the Ministry of Energy Resources: "The Electric Power Industry Must Accelerate the Pace of Technical Upgrading"]

[Text] Looking at the actual situation and problems that exist in the enterprise structure, technical structure, and product mix of China's electric power industry, the electric power industry must accelerate the pace of technical upgrading because accelerating technical upgrading centered on technical progress is essential for improving labor productivity and economic results in electric power industry enterprises.

I. The Current Situation and Problems That Exist in the Electric Power Industry

For the past 40-plus years, especially during the past 10-plus years of reform and opening up, China's electric power industry has relied on reform and policies in using a series of reforms in the production, construction, and management systems and the investment system as well as a series of policies formulated by the CPC Central Committee and State Council favorable to development of the electric power industry to spur development of the electric power industry. China's total installed generating capacity increased from 65,870MW in 1980 to 151,470MW in 1991, while power output increased from 300.6 billion kWh to 677.5 billion kWh, 1.3-fold and 1.25-fold increases, respectively, for average yearly growth rates of 7.9 percent and 7.7 percent, putting China at fourth place in the world. Since 1988, China has increased its installed generating capacity by more than 10,000MW and power output by about 50 billion kWh each year, which has effectively promoted development of our socialist forces of production and comprehensive national strengths and met the need for improvement of people's living standards to a substantial degree. In 1987, the installed generating capacity of China's electric power industry climbed the step to 100,000MW and during the 4-year period from 1988 to 1991, our electric power industry seized the favorable opportunity of readjustment of our national economy in striving to accelerate development of our electric power industry. By 1991 our installed generating capacity surpassed 150,000MW and we leapt up a new small step. The rate of development of our electric power industry has been relatively quick. However, there have been no significant advances in supplies of power generation equipment and other technology in the electric power industry and we have not taken a new route nor do we have new policies in the area of technical progress and technical upgrading, which has impeded further development of the electric power industry and improvement of economic results. The problems that exist at present are mainly in these areas:

1. China still has a severe power shortage China at present has a large electric power shortage in quantitative terms and is experiencing frequent power outages. There were 94,176 power outages in Hubei Province during 1991, an average of 258 a day, and this was an increase of 29,663 compared to 1990. The Chengdu Power Supply Bureau had 17,151 power outages during 1991, a 66.7 percent increase over the 10,287 outages during 1990. China still has an estimated power shortage of about 19,000MW and 85 billion kWh, and power outages are especially severe during peaks and the dry season. In the area of the quality of power supplies, there are occasional occurrences of frequencies and voltages that do not conform to specifications and other phenomena, and the stability, continuity, and reliability of power supplies are very poor. The reasons are one, a loss of proportion in macroeconomic development and a too-low elasticity coefficient in the electric power industry (0.7 during the Seventh 5-Year Plan and 0.79 in 1991) and two, backward overall levels of electric power generators, many problems in existing equipment, an overly large proportion of outdated and inefficient generators, a lack of replacement and upgrading for many years, and low equipment health levels and technical conditions.

2. Backward technical levels, poor economic results The electric power industry is a technology-intensive industry. Starting at the end of the 1960's, the electric power industries of all world nations focused on the goals of conserving energy and materials consumption, reducing environmental pollution, reducing costs, and improving labor productivity and economic results, and they developed rapidly in the direction of larger scales and centralization. For example, 78 percent of England's total installed generating capacity in 1988 was in generators 300MW and larger and in France in 1986 ultrahigh pressure generators 125MW and larger accounted for 94.4 percent of its total installed generating capacity in thermal power plants. Moreover, the United States began placing 200MW generators into operation during the 1930's and placed generators with a 500MW unit capacity into operation in 1969. In comparison, China's electric power equipment lags substantially behind. This is manifested mainly in these areas: 1) A high proportion of small generators and severe exceeding of service lives. Although 100MW generators had made their appearance in China by the end of the 1950's and levels at that time lagged only a few years behind Japan (Japan placed its first 125MW generator into operation in 1957), but after this China took 10 years to place its first 125MW generator into operation in 1969, whereas Japan placed its first 500MW generator into operation in 1968, which widened the gap of equipment levels. Added to the loss of control in industrial policies for electric power in China, especially during the Sixth 5-Year Plan and Seventh 5-Year Plan, a high tide of building small generators and small power plants rolled through all areas of China and during this 10-year period small generators grew rapidly instead of decreasing. Preliminary statistics indicate that about 10,000MW in small generators was added over this 10-year period. By 1991, low-temperature low-pressure small generators smaller than 6MW accounted for 11,830MW of China's 113,590MW in installed thermal power generating capacity, while moderate-pressure generators 6MW and larger accounted for 16,930MW. The total for moderate and low-pressure small generators was 28,760MW, equal to 25.3 percent of our total installed generating capacity. We had 81,330MW in high-temperature high-pressure generators, equal to 72 percent (ultrahigh pressure generators accounted for just 52,400MW, equal to 46.1 percent). Problems in this area also exist in the scale of power plants. In 1991 China had 2,353 thermal power plants 500 kW and larger with a total installed generating capacity of 108,590MW, an average capacity of just 46MW per plant. They included 111 power plants with 250MW and more, an average capacity of 640MW, and 64 power plants 500MW and larger. The largest power plant capacity was 1,625MW. In the United States, however, the largest single unit generator has a capacity of 1,300MW and the largest power plant in the Soviet Union is 4,800MW. Because of the small unit generator capacity, low parameters, and small power plant scale in conjunction with the fact that the operating time of more than 3,600MW of high-temperature high-pressure generators now exceeds 25 years, the equipment health situation is bad, which has resulted in high coal consumption, large power use by the plants, and low full-staff labor productivity and economic results.

Examine coal consumption to generate electricity. Since 1984, coal consumption to supply power at China's thermal power plants has held at about 432 g/kWh whereas advanced levels in foreign countries are about 330 g (in 1988 they were 325 g in the Soviet Union, 330 g in Italy, and 333 g in Japan). There is a difference of a full 100 g in China compared to advanced world levels. Coal consumption to supply power in some power plants is as high as 1,000 g. Compared to advanced levels in foreign countries and calculated for the amount of power generated in 1991, China's thermal power plants are consuming an additional 70 million tons-plus of raw coal.

Examine the power used at power plants. The efficiency of the blowers, water pumps, coal pulverizers, and so on used in China's power plants is low and power use in the plants has consistently held at about 8 percent for many years. In contrast, advanced levels in foreign countries are generally 5 to 6 percent. Calculated at being an average of 2 percent too high, our power plants are consuming an additional 10 billion kWh of electricity each year, which is equivalent to the amount of power generated by a 2,000MW power plant. 2) The equipment performance of large capacity generators lags far behind foreign countries. According to 1990 statistics, the effective availability coefficient for China's 274 large generators with a capacity of 49,390MW was 81.99 percent, which is about 10 percent lower than equipment imported from foreign countries. By 1991, we had 126 Chinese-made 200MW thermal power generators with a capacity of 25,200MW, equal to 22 percent of our total installed thermal power generating capacity and one-sixth of our power output. These are the main force generators in China, but their effective availability rates are 8 to 10 percent lower than our 100MW and 125MW generators and their coal consumption is about 20 percent than similar generators in foreign countries and 125 g higher than our 125MW generators. 3) Power grids are weak and dispatching and communication automation measures are backward. Since the founding of our nation, although China's power grids have developed substantially and the East China, Northeast China, Central China, and North China power grids of about 20,000MW had taken shape by 1991, their 500 kV AC frameworks are still taking shape. There has also been substantial development of 220 kV grids but they still have many defects, and 110 kV power grids have even larger bills due because of a lack of investment sources. Overall, the structure of our power grids is relatively weak and line losses are rather large, fluctuating around 8 percent for many years. In comparison, they are just 5.6 percent in Japan and 6.3 percent in the United States, so we lag substantially behind the developed countries. Moreover, automation levels and communication levels in power grids are relatively low and when accidents occur in grids they can result in grid disassociation and even collapse. For example, two successive instances of grid disassociation, large-area local power outages, and other major grid breakdowns occurred in the Guangdong Power Grid in recent years. Similar events have also occurred in the Guizhou Power Grid, causing substantial economic losses. Urban power grids, especially the grids in Beijing, Shanghai, and other large cities, have aging equipment that has exceeded its service life. Since reform and opening up, as urban economies have developed and household and urban government electricity use has continually increased, there is an extreme lack of correspondence between the structure and equipment in urban grids, making replacement and upgrading very urgent. There are even more problems in rural grids. Safety is poor and line losses are great, some having yearly losses of as much as 30 percent, so they also need upgrading. 4) Labor productivity is low and the quality of personnel is poor. In 1991 China had 2 million electric power employees, including 200,000 engineering and technical personnel, equal to just 10 percent. Enterprises use too many personnel and labor productivity is low. For identical 1,000MW power plants, foreign countries have about 200 employees while China at a minimum has 1,000 and as many as 2,000 to 3,000 in some cases. 5) The amounts of pollutants discharged by thermal power plants exceed standards and there are acute environmental protection problems. In 1991, soot discharges by thermal power plants 6MW and larger in the electric power industry as a whole totalled 3.63 million tons and the average dust elimination efficiency was 93.8 percent. Although all newly-built power plants during the past several years have adopted high efficiency electrical dust removers and other equipment, the efficiency of dust removal from a large number of small generators and old generators is low and smokestacks are low. Dust, sulfur dioxide, contaminated water, and other discharges exceed standards and they must be quickly upgraded or abandoned.

3. Investments in technical upgrading are small, equipment is hard to replace For a long time, the electric power industry has had an inadequate understanding of the importance of intensive expanded reproduction in which technical upgrading and technical progress are the main aspects and they have used their main forces on extensive expanded reproduction. The use of new equipment and new technology during extensive expanded reproduction to replace intensive technical upgrading has been going on for 40 years and especially during the past 10 years. Electric power capital construction and additions to installed generating capacity have grown very quickly but economic results have not improved much. In the area of investments in the electric power industry, investments in capital construction have grown very quickly but investments in technical upgrading, especially bank loans for technical upgrading, have basically not been utilized. In the area of investments in capital construction, 30 billion yuan was completed during the Sixth 5-Year Plan and 98.9 billion yuan was completed during the Seventh 5-Year Plan, for a total of 128.9 billion yuan, equal to 7.2 percent of investments in fixed assets under ownership by the whole people and 12 percent of investments in capital construction. During this 10-year period, however, only 18.5 billion yuan in investments in technical upgrading for electric power were completed, equal to just 1 percent of investments in fixed assets under ownership by the whole people and 3.4 percent of investments in technical upgrading over 10 years. The investments used for technical upgrading for electric power are basically depreciation funds and over 10 billion yuan in bank loans for technical upgrading basically have not been utilized in the electric power industry. They only began using 40 million yuan in 1987 in the later part of the Seventh 5-Year Plan. In contrast, fixed assets in the electric power industry exceed 120 billion yuan, equal to about 20 percent of the fixed assets of all of China's industry. There is a strong difference between this proportion and the proportion of investments used for technical upgrading for electric power. The reason is our inadequate understanding of the role of technical upgrading in the electric power industry in the electric power industry as a whole, and as a result there are many bills due over the past 40 years in the area of technical upgrading and technical progress and we must rouse ourselves to catch up.

II. The Basic Train of Thought and Main Principles of Technical Upgrading

Technical upgrading in China's electric power industry must focus closely on the objectives of "conserving energy and reducing consumption, improving environmental protection, safe electricity supplies, improving the two results". The basic train of thought is:

1. Technical upgrading must be integrated with readjustment of the industrial structure, enterprise structure, and technological structure, which means upgrading small condensed steam thermal power generators and encouraging heat and power cogeneration in accordance with the industrial policy stipulated by the state.

2. Technical upgrading must be integrated with technical progress, meaning that there must be clear technical progress goals for newly-built power plants, generators, and power transmission and transformation, and we cannot mark time at our original technical levels.

3. It must be integrated with intensive exploitation of potential in enterprises, which means making full use of existing fixed assets in enterprises and striving to use a small amount of increased investments to mobilize the maximum results from existing reserves.

4. Technical upgrading must be focused on as a long-term strategic task. There should be prominent foci now for implementation in phases and groups. We must line up and advance according to the amount of economic benefits and implementation situation for conditions, concentrate finances, focus on the first group, and start with the first group.

5. There must be clear objectives for upgrading, which means that every project must clarify its economic benefits, energy conservation benefits, environmental benefits, and social benefits. When upgrading retired generators, the capacity, models, and times of the generators to be retired or discarded must be clarified.

6. Strictly distinguish the boundary between capital construction and technical upgrading projects. Upgrading cannot be used as a pretext for something that is actually expanded reproduction. With a prerequisite of demarcating clear boundaries, some projects can combine technical upgrading with capital construction and energy conservation to make better use of capital and foster its scale economy benefits.

Based on these fundamental trains of thought, the main principles for technical upgrading are:

1. For all condensed steam small generators that have stable heat loads as well as the conditions for upgrading to heat

supply generators, upgrading should be carried out according to the principle of using heat to establish electricity and heat and power cogeneration.

2. In principle, implement disassembly first and then construction for moderate and low-pressure small condensed steam generators, and if there are problems they can also be built and then disassembled. Some projects that can integrate with local or easy replacement and upgrading into large generators should have coal consumption of less than 330 g/kWh and integrate with technology imports to achieve technical progress.

3. Upgrading of hydropower stations should mainly be based on using existing reservoir capacity and remaining generator pits or drainage channels to build water turbine generators and increase the peak regulation capacity of the electric power system with the objective of increasing overall social benefits in the electric power industry during the Eighth 5-Year Plan.

III. Primary Content and Objectives in Technical Upgrading

Based on the basic trains of thought and principles listed above, the primary content of technical upgrading during the Eighth 5-Year Plan should include three areas: replacement and upgrading of moderate and low-pressure small capacity equipment that has exceeded its service life by replacing it with high efficiency large capacity equipment, abbreviated as "replacing the small with the large"; conventional upgrading that mainly involves technical improvements for existing equipment and integration of technology development with technology imports and technical upgrading to attain the objective of technical progress.

Replacement and upgrading that involves "replacing the small with the large" for moderate and low-pressure generators and generators that have exceeded their service lives is one of the main aspects of technical upgrading and technical progress for electric power during the Eighth 5-Year Plan and the next 10 years as well as one of the primary measures for reducing coal consumption in China by 4 to 5 g [per kWh] each year, reducing environmental pollution, and achieving stable operation of electric power systems and guaranteeing electricity supplies.

China currently has 28,000MW of high-consumption low-efficiency moderate and low-pressure generators including almost 12,000MW in small generators 6MW and smaller, about half of which is located in frontier regions and independent electricity supply regions. It will be hard for large grids to supply power for a period of time, so they must continue operating. There is no upgrading value for the other half and they can only be gradually abandoned. Thus, there are about 16,000MW of moderate and low-pressure generators where we must truly carry out technical upgrading by "replacing the small with the large". Reconsidering part of the high-temperature high-pressure generators that have exceeded their service lives, there is a total of 18,500MW that requires upgrading.

1. Primary content and objectives of technical upgrading By the end of the Eighth 5-Year Plan, if China "replaces the small with the large" to upgrade 5,500MW of moderate and low-pressure generators and generators that have exceeded their service lives and replaces them with newly-built high-efficiency large-capacity power generation and heat supply generators, the results would be obvious. For one thing, it would guarantee that the upgraded 5,500MW could continue to provide stable supplies of electricity for long periods and could increase the installed generating capacity by 2,000MW and power output by 10 billion kWh using the same amount of coal. Second, the Ministry of Energy Resources has stipulated that coal consumption must be reduced by 25 g [per kWh] during the Eighth 5-Year Plan. If upgrading of these generators could be completed on schedule, preliminary estimates indicate that this could reduce coal consumption by 15 g, so over one-half could be accomplished by relying on "replacing the small with the large". Third, there would be significant environmental benefits. Compared to the original 5,500MW of medium-sized and small generators, the upgraded 5,500MW could reduce ash and dust discharges by 2 million tons and carbon dioxide discharges by 5 million tons.

In addition, a high degree of attention should be given to work on upgrading with conventional technology during the Eighth 5-Year Plan to improve levels in existing technical equipment. Besides continuing to make arrangements for projects held over from the Seventh 5-Year Plan and several projects to perfect matching technology, we should also focus on arranging for a group of projects with significant energy conservation and loss reduction benefits that would have obvious benefits for safe and stable power grid operation and environmental protection. The primary objectives can be considered as: 1) Focus on upgrading the flow-through portions of 200MW steam turbine generators and boiler combustion systems as well as converting electrical feedwater pumps into steam-powered feedwater pumps, adding safety monitoring and protection devices, and so on. Preliminary estimates indicate that upgrading 200MW Chinese-made generators could reduce the amount of coal consumed to generate power from the present average of 390 g/kWh to about 370 g/kWh, which could conserve more than 6 million tons of coal a year. Increasing the effective availability rate from 76 percent in 1989 to 82 percent and reducing unplanned shutdowns by 40 percent could increase the amount of power generated by 13.3 billion kWh. 2) Focus on water-saving, energy-saving, and environmental protection improvement and upgrading at thermal power plants. For example, upgrade low-efficiency high-consumption auxiliary equipment and extend the use of high-efficiency blowers and water pumps at power plants; carry out upgrading as quickly as possible in north China, northwest China, Shandong, and other regions that have the proper conditions, adopt dry dust removal technology and high concentration multiplying ash flushing pumps, make rational improvements in circulating water concentration multiplying rates and waste water recovery and utilization rates; dust removers should also be upgraded at thermal power plants near cities and in tourism regions and we should carry out industrialization experiments for desulfurization for large generators; actively open up channels for comprehensive utilization of powdered coal ash from thermal power plants and use upgrading to strive for closed-loop circulation of ash flushing water at 40 percent of power plants, attain water consumption rates of less than 1 m^3/second per 1,000MW and an average dust removal efficiency of 95 percent at thermal power plants, achieve comprehensive utilization of 27 million tons of powdered coal ash, and reduce power use rates in power plants by 1 percent, which could conserve an estimated 5 billion kWh of electricity a year. 3) Carry out upgrading to exploit potential and increase capacity at hydropower stations. Use upgrading of rotors, replacement of generator wires and rods, and so on to exploit potential and increase capacity by 800MW; carry out consolidation processing of the large dams at 43 hydropower stations to improve the safety and flood control capabilities of hydropower stations. 4) Adopt advanced technology and equipment for replacement and upgrading in power grids. The pace of upgrading has been particularly slow in urban grids and rural grids and the quality of power supplies is poor. Gradually upgrade urban power grids in 35 large cities including Beijing, Shanghai, and so on; rationally deploy and simplify voltage grades, use fully-sealed integrated electrical devices in urban transformation stations; perfect and upgrade 110 kV and higher power grids, focus on solving irrational connections, inadequate reactive compensation, inadequate switching and breaking capacity, and other problems in networks; focus on replacement and upgrading of simple and crude high-consumption transformers and other outdated equipment in rural grids.

5) Continue to carry out dispatching communication and automation upgrading, gradually upgrade communication dispatching and automation to meet the requirements of large generator and large grid operation and with a prerequisite of fully fostering the role of existing equipment, upgrade primary bureau, plant, and station communication dispatching and automation measures, continually raise dispatching automation levels, use economical dispatching to reduce grid fuel consumption by 0.5 to 1 percent.

2. Technical progress, technology development, and technology importing should be integrated and rationally arranged Technical progress is the core of technical upgrading. Technical progress in the electric power industry is manifested primarily in improvements in equipment levels, updating of technical flow processes, and more scientific management work, and we must use technology importing as a supplement to accelerate the pace of technical progress in China's electric power industry.

The primary objective of technical progress is to use technology development and technology importing and to utilize advanced and mature technology and equipment to reduce energy consumption, conserve water and land, reduce environmental pollution, guarantee safe and reliable electricity supplies, increase labor productivity, and improve overall economic results. The focus is mainly on four areas: 1) Improve combustion technology at large thermal power plants, improve efficiency, and improve environmental protection. Upgrade boiler combustion systems, import advanced pulverizing systems, increase boiler combustion efficiency; import in-furnace desulfurization technology and dust removal and desulfurization technology, develop air cooling technology, dry ash removal technology, and gas-fired condensed steam combined cycle power generation like power, heat, and coal gas triple combined cycle technology and so on to conserve energy resources, conserve fuel, and increase thermal energy conversion rates. 2) Improve safe operation levels in power grids. Raise communication and dispatching automation levels in China, including importing and developing thermal power generator simulators, dispatcher training simulation systems, dispatching distribution processing systems, dispatching automation in the Northwest China Grid and key provincial grids, microwave communications among large regional grids, and satellite and mobile radio communications systems in frontier regions, integrate with urban grid and rural grid upgrading, import integrated electrical devices, high breaking capacity switches and improved oil switches, increase reactive compensation, develop and import miniaturized and simplified rural electrical devices, and so on to improve the quality of safe electricity supplies and reduce losses. 3) Large wind-powered power generation and other new energy resource technology. Import wind-powered generators and design and manufacturing technology as well as wind energy field wind-powered generator cluster control technology. Achieve digestion, absorption, and batch production, make major efforts to develop wind fields in northwest China, north China, and coastal regions. Do research on key technologies for dealing with geothermal generator fouling, corrosion, and warm water-discharge and back-filling. Import solar energy power plant equipment and some manufacturing technology, build a 20 to 30MW grade solar energy power plant in conjunction with development of solar powered photocell technology, complete preparatory scientific research work for construction of a photocell demonstration power plant to increase photoelectric conversion efficiency and reduce costs. 4) Scientific research and technology importing in electric power manufacturing enterprises under the jurisdiction of the Ministry of Energy Resources. Import and develop high-efficiency blowers and dual-inlet dual-outlet coal pulverizer AC motor variable frequency speed regulators, feedwater pumps, speed regulation systems, and valve electrical powered devices to conserve energy and reduce consumption in power plant auxiliary machinery and reduce line losses in transformer stations, import rubber ball production lines for rubber cleaning and washing systems; support the Fuchunjiang Hydraulic Machinery Plant in importing and developing low-head bulb-type generators.

The "replacing the small with the large" technical upgrading described above will require an investment of about 16 billion yuan during the Eighth 5-Year Plan. Consideration can be given to three areas for raising this capital: 1) Special "replacing the small with the large" electric power upgrading loans from state banks; 2) Local capital raising or issuing bonds; 3) Relying on 90 percent of the increase collected from rapid depreciation funds in depreciation and 70 percent of the "two funds" for use as capital raised by enterprises themselves.

IV. Countermeasures and Proposals

The electric power industry is a technology-intensive industry. Power generation equipment must operate for long periods under severe conditions of continuous high speeds, high temperatures, high pressures, and high corrosion. Electric power technology has also developed very quickly, so we must truly establish and adhere to the concept that S&T are the first force of production, closely integrate technology development, technology importing, technical upgrading, and technical progress, focus on conserving energy and reducing consumption, truly run large and medium-sized electric power enterprises well, improve economic results, and continually increase investments in technical upgrading in the electric power industry to compensate for the bills due over many years. Currently, investments in capital construction in the electric power industry account for more than 12 percent of China's total investments in capital construction, whereas its investments in technical upgrading account for just 3.4 percent of all investments in technical upgrading, so the discrepancy is very large. For this reason, I propose that the state increase its investments in technical upgrading in the electric power industry and that investments in technical upgrading be increased until they equal the proportion of China's total investments in capital construction that its capital construction investments accounts for. In addition, besides taking full advantage of every policy that the state gives them, electric power departments should also ask the state to give them these policies:

1. The state should provide special loan indices for "replacing the small with the large" in the electric power industry.

2. The depreciation rate in the electric power industry should be increased by 2 percentage points from the present basis.

3. Permit 1.5 percent to be deducted from the volume of sales of electric power for use as a new technology and new product development fund in the electric power industry.

4. Determine electricity prices and heat prices for replacement and substitute generators according to the conditions for repayment of the principal and interest. To ensure that there is sufficient compensation capability for "replacing the small with the large" replacement and upgrading projects and exploiting potential and increasing capacity at hydropower stations and that they can attract bank loans, compute the benefits of these projects independently and set their electricity prices and heat prices according to the need to repay the principal and interest, and provide unified prices for an entire grid.

5. For generators that at present are still assuming responsibility for directive-type power generation tasks, for all those where replacement and upgrading is planned, their power output planned for the period from their shutdown to the completion of upgrading is subtracted each year from state plans and a policy of guaranteed amounts and unguaranteed prices is implemented for power supplied to key state and "dual guarantee" enterprises.

6. The fuel coal indices for updated and replaced generators are transferred from retired moderate and low-pressure generators. "Replacing the small with the large" projects should also be given the various preferential policies provided to energy conservation projects, for example exemption from taxes for 3 years, state payments of interest via deductions, etc.

China's Power Output, Installed Capacity Rank Fourth in World

926B0114A Beijing BEIJING KEJI BAO [BEIJING SCIENCE AND TECHNOLOGY NEWS] in Chinese 22 Jul 92 p 2

[Article: "China's Electric Power Industry Begins Restructing, China Jumped to Fourth Place in the World in 1991 in Power Output and Installed Generating Capacity"]

[Text] It was revealed at the National Power Grid Operating Mode Work Conference held a few days ago in Dandong City, Liaoning Province that China's electric power industry has developed very quickly in the past several years and that a restructured electric power industry in which large generators, large power plants, and large power grids are the primary indicators has now begun to take shape.

Since reform and opening up, developing the electric power industry by raising capital through multiple channels, at many levels, and via a variety of modes has seen flourishing development in China and led to rapid growth in the electric power industry. This is particularly true during the past few years, when China's generating capacity in large and medium-sized generators has grown at an annual rate of 10,000MW. By the end of 1991, China had 389 thermal power generators at the 100MW grade and above, equal to 60.75 percent of our installed thermal power generating capacity, and we had 200 hydropower generators at the 40MW grade and above, equal to more than one-half of our installed hydropower generating capacity. China has 23 power plants at the 1,000MW grade and above. China has 3,400 kilometers of 330 kV power transmission lines and 7,600 kilometers of 500 kV power transmission lines, including more than 1,000 kilometers of DC power transmission lines. China has also formed four multiprovince power grids with installed generating capacities of more than or almost 20,000MW, the East China, Northeast China, Central China, and North China grids. The installed generating capacity in the Northwest China, Shandong, and Guangdong power grids is now almost 10,000MW each.

With the development of large generators, large power plants, and large power grids, at the end of 1991 China had a power output of 677.5 billion kWh and an installed generating capacity of 151,470MW, having leapt up to fourth place in the world in both figures. China's electric power industry will continue to maintain a relatively rapid momentum of growth during 1992. We completed power output of 355.682 billion kWh in the first half of 1992, an increase of 10.59 percent over the same period in 1991.

Outlook for Hydropower Development From Viewpoint of China's Energy Development and Environmental Protection

926B0121A Beijing ZHONGGUO NENGYUAN [ENERGY OF CHINA] in Chinese No 7, 25 Jul 92 pp 1-3

[Article by Zhang Jinsheng [1728 3160 3932] of the Ministry of Energy Resources Hydropower Development Department: "The Outlook for Hydropower Development in Terms of China's Energy Resource Development and Environmental Protection"]

[Text] China's energy resource development and environmental protection are strategic foci in China's modernization and construction and have been given a priority status. Accelerating the development of energy resource work in China is the foundation for guaranteeing sustained, stable, and coordinated development of our national economy.

China is the world's biggest coal producing and coal consuming nation and in the foreseeable future coal will continue to serve as our primary energy resource and occupy a dominant status in China's energy resource production and consumption. To increase the utilization results of coal and reduce pollution, China will adopt economically effective technology for coal equipment and adopt coal cleaning technology to control the spread of pollution. In 1990, coal accounted for 75.6 percent of our energy resource consumption, about 70 percent of our industrial fuel, and 60 percent of our chemical industry raw materials, and coal provided 80 percent of our commercial and civilian energy resources. Coal provides about 90 percent of the fuel used in thermal power plants. Coal dominates China's energy resource structure, which means we are facing a series of most serious challenges. The large increase in coal production and utilization is placing growing pressure on the environment and transportation, and while China is developing coal consuming industry and electric power, we must also meet the urgent need for environmental protection.

Most of the atmospheric pollution in China arises from coal soot. In 1990, large plants discharged 8.6 trillion cubic meters of waste gas from their smokestacks, an increase of 2.8 percent from 1989. A total of 21 million tons of industrial dust was spread into the sky in 1990. Since 1979, most thermal power generators have gradually been outfitted with static electricity and other dust removal devices and the amount of ash discharged per kW each year has been reduced from 160 kg in 1979 to 52 kg in 1989. Northern China is more severely polluted than southern China. The soot content per cubic meter in northern China has reached 475 mg, which is 387 mg higher than the national average. The amount of carbon dioxide discharged by China's fossil fuels was 460 million tons in 1989 and is expected to reach 640 million tons by the year 2000. The average discharges of carbon dioxide per capita are about 0.5 tons, just one-tenth the amount at present in the United States and 1.1 tons below the world average.

China's discharges of sulfur dioxide reached 15 million tons in 1990. Although acid rain has not spread throughout China, it has appeared in southern and southwestern China and is having substantial negative effects on industrial and agricultural production and the people's lives. It has been projected that annual discharges of sulfur dioxide will reach 20 to 25 million tons in the year 2000.

The amount of industrial solid wastes produced in 1989 was 570 million tons and we have a total of 6.75 billion tons stored in heaps that are taking up 55,400 hectares of land. This was an increase of 160 million tons over 1988 and there was a corresponding increase of 1,600 hectares in the amount of land taken up. Coal gangue production reached 124 million tons in 1988 and the amount of coal gangue accumulated over the years and stored in heaps is 1.6 billion tons and is taking up 8,670 hectares. The amount of coal gangue and powdered coal ash we generate each year accounts for one-third of the amount of industrial solid waste that China generates. About one-third of the coal gangue in dumping yards spontaneously combusts and it has become a source of pollution that is receiving the greatest attention near mining regions. The comprehensive utilization rate for coal gangue at present is just 17 percent. In 1989 we had a total installed generating capacity of 68,788.4MW in power plants with generators larger than 50MW that consumed 216 million tons of raw coal and generated 62 million tons of ash which had a comprehensive utilization rate of 25.7 percent. At the end of 1988, powdered coal ash heaps were taking up 13,000 hectares of land.

In China, per capita energy resource consumption is low while energy resource consumption per unit of value of output is high. This duality of energy resource consumption is the crux of China's energy resource problems. Compared to advanced levels, China could conserve about 200 million tons of coal a year. China's energy resource development strategy must be to combine development with conservation, strive to improve the energy resource structure and deployments, encourage energy conservation, reinforce energy resource management, promote technical upgrading for energy conservation, rely on technical progress to improve energy resource production and utilization rates, and reverse the ecological vicious cycle caused by urban atmospheric pollution from the burning of large amounts of coal and excessive consumption of organic energy in rural areas. We must combine full efforts to conserve energy with adopting effective policies and measures to improve China's energy resources and our environment and ecology.

I. A Look at Hydropower Development

China's total average annual precipitation is 6.19 trillion cubic meters, which corresponds to a rainfall depth of 648 mm. China has many rivers with abundant water resources, and we have 1,500 river basins covering areas larger than 1,000 square kilometers. Total runoff in China's rivers exceeds 2.71 trillion cubic meters and we rank sixth in the world in surface water and total groundwater, deducting about 28,100 cubic meters that is calculated redundantly. China has 17 large rivers with yearly flow rates greater than 50 billion cubic meters. We have 130 large lakes with water areas larger than 100 square kilometers.

Our per capita available water resources are only 2,400 cubic meters, one- fourth the world average value, making China one of the world nations with the smallest amount of available water.

China has 378,000MW in developable and useable hydropower resources which corresponds to yearly power output of 1.92 quadrillion kWh, making us the world's nation with the greatest amount of hydropower resources. However, China's hydropower resources are extremely unevenly distributed with 67.8 percent of the total for China concentrated in the southwestern part of our country. North China, northeast China, and east China have less than 7 percent of our developable hydropower resources, but their amount in absolute terms is still rather substantial. According to the results of a final survey from 1977 to 1980, the total statistics for 1,946 hydropower stations with capacities larger than 10MW would give a total installed generating capacity of 357,000MW that could generate 1.830 trillion kWh of electricity each year, which would account for the greatest portion of China's developable hydropower resources. They would include 203 big power stations larger than 250MW, equal to 80 percent of China's total capacity. The 69 hydropower stations with installed generating capacities greater than 1,000MW would have a total capacity of about 150,000MW, including 17,680MW in installed generating capacity at the Three Gorges project.

In hydropower engineering, we should concentrate our forces on developing hydropower on the upper and middle reaches of the Huang He, the upper and middle reaches on the trunk and tributaries of the Chang Jiang, the Lancang Jiang, and the Hongshui He as well as north of the Long-Hai [Lianyungang- Lanzhou] Railroad to Beijing, through Gezhouba to Shanghai, and from Yunnan along the Hongshui He to Guangzhou to form a framework for transmitting power from west to east China.

During the 10-year period from 1980 to 1990, the objective of doubling the scale of our installed electric power generating capacity and our power output was achieved ahead of schedule but hydropower developed more slowly. Yearly power output from hydropower increased from 58.21 billion kWh to 126 billion kWh and the installed generating capacity increased from 20,318MW to 35,300MW.

The scale of large and medium-sized hydropower projects now under construction is 22,010MW, including a total of 19,710MW at 24 large-scale projects, of which 11,980MW may go into operation before 1995, and 2,300MW in medium-sized projects, which basically can be placed into operation prior to 1995.

Projections are that about 15,000MW of large and medium-sized hydropower stations can be placed into operation over the next 5 years and that the installed generating capacity each year at large and medium-sized hydropower stations can reach or surpass 4,000MW in 1994.

By the end of 1990, about 63,000 small hydropower stations had gone into operation with a total installed generating capacity of 13,239MW, and they generated 36.7 billion kWh of electricity during 1990.

To accelerate rural electrification based on small-scale hydropower, we have successfully completed 100 electrification counties. The second step is to build an additional 200 electrification counties. Starting in 1983, the installed generating capacity each year in small-scale hydropower has now reached 500 to 700MW.

At present, China has only developed 9 percent of its hydropower calculated according to installed generating capacity and only 6.6 percent calculated according to power output. We hope that by the year 2000 China's total installed generating capacity will reach 70,000 to 80,000MW (including 6,000MW at pumped-storage power stations) and that yearly power output can reach 220 to 240 billion kWh. During the 5-year period up to 1995, we hope to start construction on hydropower stations with a total of 22,000 to 23,000MW in installed generating capacity. Projections indicate that hydropower stations may account for 6 to 8 percent of primary energy resource production, 30 percent of the installed electric power generating capacity, and 20 percent of power output in China by the end of this century.

In China, accelerating hydropower development is an effective way to reduce coal utilization and reduce pollution. Hydropower is a non-polluting renewable energy resource. If we were to use one-half of our developable hydropower, we could conserve about 500 million tons of raw coal each year. This would greatly reduce the pressure on transportation and aid environmental protection.

To provide hydropower to the more developed regions along our southeast coast, we must develop and study long-distance ultrahigh voltage power transmission and transformation technology.

At present, prior to starting construction on hydropower projects in China we must make a comprehensive assessment of the environmental impact and socioeconomic benefits of projects, pay special attention to arrangements for the population resettled from reservoir regions, and implement development- type resettlement.

Hydropower projects usually do not simply involve power generation. Most of them have comprehensive utilization benefits like pumping water, flood regulation, irrigation, soil improvement, shipping, and so on.

Compared to thermal power, building hydropower stations simultaneously achieves development of primary and secondary energy resources. Often, we only compare electric power construction from the perspective of secondary energy resources and neglect the peak regulation, frequency regulation, accident reserve, environmental protection, and other comprehensive benefits of hydropower. Assessing the economy of thermal power plants solely from the perspective of power plant investments and construction schedules is not fully reasonable. If we take into consideration the investment in coal mines and the investment and costs of coal transportation and power transmission for power plants and then re-compare hydropower and thermal power, the results of economic evaluations are roughly the same. If we reanalyze environmental protection costs and even include irreversible losses to energy resource development and the environment from construction of thermal power projects, and take into consideration the significant benefits of hydropower after the loans are repaid, in most situations hydropower should be considered to have significant advantages, so obviously developing more hydropower in regions with abundant hydropower resources is even more advantageous. In future development of coal and thermal power, we must strive to readjust and improve China's energy resource and electric power structure and when conditions permit give preference to developing hydropower to take full advantage of China's enormous hydropower resources. Thus, when evaluating hydropower projects we must also take into consideration their comprehensive utilization benefits and environmental impact. The problem is that it is hard to make quantitative assessments of environmental impacts and the problem still lies in the fact that hydropower must assume full burden for the investment for comprehensive utilization. Moreover, the expenditures on compensation for the extremely complex negative environmental impacts of hydropower construction must be completely borne by hydropower. For example, reservoir expenditures sometimes account for 20 to 30 percent of the project investment or even more, which has become a major factor restricting hydropower development that cannot be ignored. Thus, evaluations of hydropower projects must make comprehensive economic comparisons. Short-term economic analysis based on the old fuel system and price system must be rejected.

The main problem in developing hydropower is a shortage of capital. China must increase its investments in hydropower and we hope to receive more preferential loans from international organizations to accelerate hydropower development.

Power, Oil, Coal Output Set Records

40100010 Beijing CHINA DAILY in English 17 Oct 92 p 1

[Text] China's coal, oil and electric power output in the first nine months of this year hit record highs.

Statistics show that the country produced 770.469 million tons of coal from January to September this year, 0.77 percent more than in the same period last year.

In the period 547.4 billion kwh of electric power was generated, 10.84 percent more than in the same period last year and fulfilling 77.65 percent of the State quota for 1992.

Of the power generated, 447.8 billion kwh were generated by thermal power stations, some 12.44 percent more than in the same period a year ago.

In the period, the country installed power generating equipment with a combined capacity of 7.28 million kw.

From January to September, the country produced 106.42 million tons of oil, 1.73 percent up from that for the same period last year.

Energy, Raw Materials Projects Become Operational

926B00119A Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 13 Aug 92 p 1

[Article by reporter Luo Ping [5012 5393]: "Joint Development of Large Southwest China Area Produces Results Quickly, Fosters Region's Overall Economic Advantages, Several Energy Resource and Raw Materials Projects Go Into Operation"]

[Text] The five provinces and autonomous regions and seven localities of southwestern China have seen initial results from fostering their overall regional economic advantages and jointly developing their resources. Some of the cluster of energy resource and raw materials projects have now been placed into operation and construction is being speeded up on others.

Southwestern China is a region with abundant natural resources and superior conditions for transmitting electricity from west to east China and shipping out raw materials. Accelerating development of the resources of the southwest China region to convert potential advantages into economic advantages during the 1990's is one of the state's key deployments. To seize this excellent opportunity, the five provinces and autonomous regions and seven localities have striven to make their development forces grow and signed an agreement on joint development of their resources in September 1991.

Although it has been implemented for less than 1 year at present, several small projects have already produced benefits. The coal washing and cleaning production base area and Yezhu Pumped Hydropower Station with an installed generating capacity of 4MW completed through a joint investment by Chongqing and Sichuan have both been placed into operation. At the Guizhou aluminum production base area expanded through a joint investment by Tibet and Guizhou and the cooperative construction of Shannan Iron Alloy Plant in Tibet, Tibet has already received the aluminum ingots in April 1992. Chengdu made an investment for cooperative construction with Guizhou of a coal gas project and Chengdu began receiving 5,000 tons of coking coal in 1991 for 20 years to meet its urgent needs and Guiyang will be able to utilize coal gas within the year.

Joint investments and cooperation have enabled development of a group of large projects. The Panxi-Liupanshui region is extremely rich in coal and other mineral resources. The region covers Sichuan, Yunnan, and Guizhou and these three provinces raised development capital. Work on a comprehensive resource development and utilization program has now entered the implementation stage. Guangxi, Guizhou, and the State Energy Resource Investment Company have made a joint investment to construct the Panxian Thermal Power Plant where three 200MW generators will be placed into operation in 1994. Xiangshui Power Plant, built jointly by Guizhou, Yunnan, and the State Energy Resource Investment Company, has completed the "three elements of infrastructure and land levelling" [putting in roads, power, and water, grading the site]. The big Longtan Hydropower Station on the Hongshui He is being built through a bilateral joint investment by Guangxi and Guizhou and work in preparation to begin construction is now proceeding at a feverish pace.

Inner Mongolia To Be Major Power Base by End of Century

926B0123A Hohhot NEIMENGGU RIBAO in Chinese 27 Jul 92 p 1

[Article by Wang Yongfu [3769 3057 1133]: "A Heartening Grand Plan for Electric Power Development and Construction, Inner Mongolia Autonomous Region Will Become an Electric Power Industry Base Area by the End of the Century"]

[Text] Not long ago, the Inner Mongolia Electric Power Management Bureau submitted its "Proposal To Accelerate Electric Power Construction in Inner Mongolia To Increase the Power Transmitted to North China and Northeast China and Ensure a Turnaround in the Electric Power Shortage Situation in the Beijing-Tianjin-Tangshan Region", and it received a high degree of attention and support from leaders in the State Planning Commission and Ministry of Energy Resources.

According to this proposal, the installed electric power generating capacity in Inner Mongolia Autonomous Region will reach 8,250MW by the end of the Eighth 5-Year Plan with the addition of 4,420MW, and it could transmit 2,300MW of power to north China and 1,500MW of power to northeast China. This would include an installed generating capacity of 2,920MW in the western part of Inner Mongolia. The four 330MW generators at Dalad Power Plant, four 200MW generators at Fengzhen Power Plant, the 500MW generator at Haibowan Power Plant, two 100MW generators at Jungar Power Plant, and two 50MW generators at Hohhot Power Plant will be completed and placed into operation in succession. By 1995, the total installed generating capacity in the Western Inner Mongolia Grid will reach 4,660MW which, besides meeting power use requirements within the Inner Mongolia Autonomous Region, would mean a surplus installed generating capacity of 2,260MW that could ensure the stable transmission of 1,500MW eastward to the Beijing-Tianjin-Tangshan region.

Besides the expansion projects at Yimin, Yuanbaoshan, and Huiliuhe power plants in the Inner Mongolia Autonomous Region, plans also call for support from central authorities with Inner Mongolia to be the primary force in raising capital to build two 100MW generators at Huolinhe and two 50MW generators at Horqin Youyi Zhong Banner. During the Eighth 5-Year Plan, Inner Mongolia Autonomous Region will add 1,500MW in installed generating capacity and may be able to increase its transmission of power to other regions by 1,000MW.

During the Ninth 5-Year Plan, Inner Mongolia's electric power will strive for even greater development on the basis of the Eighth 5-Year Plan and add a total of 6,900MW in installed generating capacity in western Inner Mongolia to raise the total installed generating capacity in Inner Mongolia Autonomous Region to 20,550MW. Besides satisfying the power use requirements of the Inner Mongolia Autonomous Region itself, it will be able to transmit a stable 5,000MW of electric power over a long period to the north China region and achieve the goal of solving the electricity shortage problems of the Beijing-Tianjin-Tangshan region. The installed generating capacity in eastern Inner Mongolia will reach 10,490MW and it will be able to transmit 6,500MW of electric power to the provinces of northeast China.

Electric Power Capital Construction Said Ahead of Schedule

926B0104C Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 7 Jul 92 p 1

[Text] Beijing 6 July 1992: Electric power capital construction is ahead of schedule in the first half of the year.

As of 30 June, a total of 29 large and medium-sized power generating units had been put into operation with a combined capacity of 5,230MW. This corresponds to 63 percent of the annual schedule. This has never happened before in the history of power facility construction in China. Of the units that are operational, 73.7 percent are over 200MW capacity. For example, Unit 1 of Shidongkuo plant No. 2 in Shanghai is an imported 600MW super-critical unit which represents state-of-the-art technology in the 80's. It functions smoothly and has met all specifications required to pass inspection.

Developing International Cooperation To Promote Hydropower Construction

926B0122A Beijing SHUILI FADIAN [WATER POWER] in Chinese No 7, 12 Jul 92 pp 3-4

[Article by Pan Jiazheng [3382 1367 6927], chief hydropower engineer in the Ministry of Energy Resources: "Develop International Cooperation, Promote Hydropower Construction"]

[Text] **Editor's note:** In May 1992, the China Council for the Promotion of International Trade and China Electric Power Enterprise Federation jointly held the 4th International Energy Resource (Electric Power) and Technology and Equipment Supply Exhibition in Beijing. Over 250 plants and businesses from 16 countries and regions including China, Canada, member nations of the European Economic Community, and others participated in the exhibition. During the exhibition, the China Electric Power Enterprise Federation held a meeting of Chinese and foreign plants and businesses participating in the exhibition, and chief hydropower engineer Pan Jiazheng of the Ministry of Energy Resources introduced the prospects for hydropower construction and development in China and the Three Gorges project. We are publishing a summary of comrade Pan Jiazheng's comments below.

I. During a Period of Dynamic Development in Economic Construction, China Will Make a Major Effort to Develop Hydropower

There are still 9 years from now to the year 2000. This will be an important period for dynamic development of economic construction in China and, as a basic industry, energy resource construction will develop quickly. Based on China's national conditions, accelerating development of our huge hydropower resources to reduce the pressures on coal extraction, transportation, and pollution is an unwavering principle. The state will adopt a series of polices to accelerate the development of hydropower.

In a macro perspective, China will have a total installed generating capacity of almost 40,000MW at hydropower stations of all categories by the end of 1992, which includes about 20,000MW currently under construction. We will also be starting construction of several hydropower stations soon and China will be able to have an installed hydropower generating capacity of 80,000MW by the year 2000. This means that for a period of time into the future, China will place more than 4,000MW in hydropower installed generating capacity into operation each year on the average. In this development, several key large hydropower stations will play leading roles. They include Gongbai Gorge, Laxiwa, and Heishan Gorge on the upper reaches of the Huang He and Xiaolangdi, Wanjiazhai, and Longkou on the middle reaches of the Huang He; Hongjiadu and Goupitan on the Wu Jiang; Longtan and Etan on the Hongshui He; Dazhaoshan and Xiaowan on the Lancang Jiang; Baobugou on the Dadu He; Tongzilin and Jinping on the Yalong Jiang; the Three Gorges and Xiangjiaba on the trunk and tributaries of the Chang Jiang and Jinsha Jiang, and others. There are also a big group of large and medium-sized hydropower stations and high-head large-capacity pumped-storage power stations scattered across various river basins in many provinces (autonomous regions). At present, we are now carrying out planning, feasibility research, and initial designs for hydropower projects with a total capacity of more than 100,000MW.

All of the key large hydropower stations listed above are extremely magnificent projects at international levels and during their construction we have encountered many difficulties and problems that include technical problems, capital problems, and social problems. However, we are capable of relying mainly on our own forces to resolve these problems. At the same time, based on China's policy of reform and opening up, we also warmly welcome cooperation with friendly countries, enterprises, and persons and we welcome foreign countries to provide capital, equipment, technical consulting, technology transfers, and many other types of cooperation. For a period during the past, we were already cooperating with many countries, enterprises, and financial organizations in conducting quite successful cooperation in the hydropower area. However, the scale was not that large and there were not many methods. In the future, we hope that by exploring bilateral and multilateral efforts, we will be able to find more routes and methods to accelerate and expand this type of cooperation. Such cooperation benefits not only Chinese and foreign bilateral enterprises but can also promote friendship between China and the governments and people of all nations. This also has major significance for alleviating global environmental pollution. Let us work together to build this bridge to promote friendship and prosperity for future generations. Our initial plan is to hold a special exhibition of technology and equipment for large hydropower projects and the Three Gorges project in June and July 1993. Preparations for this work are now underway, and after a program has been decided on we will immediately notify all of our friends in advance to participate in the exhibition.

II. Construction of the Three Gorges Project Will Start Very Soon

On 3 April 1992, the 5th Session of China's 7th National People's Congress passed the proposal regarding construction of the Three Gorges project. This completed the legislative procedures for construction of the Three Gorges project. In my personal estimation, construction of the Three Gorges project, especially project preparations and resettlement, will start very quickly.

The Three Gorges project is a magnificent comprehensive utilization project that will have enormous flood control, water-borne shipping, and power generation benefits. The most realistic economic benefits and the raising and repayment of the capital, however, mainly reflect and rely on its power generation capabilities that are without precedent in the world.

According to the feasibility research report that was passed, the Three Gorges Hydropower Station will be the largest hydropower station now under construction or planned for construction in the world at the present time. It will install 26 generators with a unit capacity of 680MW, a design head of 81.7 meters, and rotors 9.5 meters in diameter, for a total installed generating capacity of 17,680MW. The electricity it will generate will be transmitted via 15 500 kV AC and +/-500 kV DC power transmission lines to central China, east China, and the east Sichuan region. The longest power transmission distance will be about 1,000 kilometers. The main structures at the Three Gorges project will be a 175 meter tall concrete gravity dam, two plant buildings, and a dual-line five-level ship lock and the world's largest ship lift.

The Three Gorges project will involve an enormous amount of engineering, including about 88 million m^3 of rock and earth excavation, the pouring of 26 million m^3 of concrete, and the fabrication and installation of 550,000 tons of metallic structures. Construction of the entire project will take 18 years. The first 3 years will involve preparations for construction. Next, it will enter the first phase of construction of the main part of the project, which will also take 3 years. Next will come the second phase of the main part of the project, which will take 6 years, and the first group of generators will be placed into operation. The third phase of the project will also take 6 years and will mainly involve continued installation and startup of the generators and completion of all the structures. At 1990 price levels, the static total investment for the Three Gorges project (including the key facility, resettlement, and power transmission and transformation) is 57 billion yuan. On this foundation, and in accordance with the actual construction schedule, price indices, capital components, and required interest rates, we can calculate the total amount of the dynamic investment for the construction period. This is not a fixed value, but instead depends on the factors mentioned previously and is estimated to be 150 billion yuan.

To build the Three Gorges project, we must purchase 26 huge water turbine generators and the corresponding high-voltage electrical equipment, power transmission and transformation equipment, and automatic control equipment. During construction, we will also have to purchase several pieces of advanced high-power construction machinery and large amounts of materials. The primary technical problems involved in the Three Gorges project have already been resolved but there are still many concrete problems that must be conscientiously studied and resolved in the future. For all of these things, we welcome cooperation with foreign countries to import capital, technology, equipment, and management systems.

The Three Gorges project is an epic project of mankind for transforming nature and global prosperity. It should become a project that reflects the will and abilities of the Chinese people as well as a project that reflects the friendship of the world's peoples and international cooperation. For this reason, we warmly welcome financial circles, enterprise circles, and technical circles in foreign countries to become concerned with the Three Gorges project, participate in the Three Gorges project, and leave their own names and contributions in the annals of this majestic project that will span the centuries.

Large and Medium-Sized Hydropower Stations Under Construction in 1992

926B0122B Beijing SHUILI FADIAN [WATER POWER] in Chinese No 7, 12 Jul 92 pp inside front, back covers

[Three tables provided by Guo Zhanchi [6753 0594 3069] of the Ministry of Energy Resources Hydropower Development Department: "Listing of Large Hydropower Stations Under Construction in China in 1992, Listing of Medium-Sized Hydropower Stations (50MW to 250MW) Under Construction in China in 1992, Listing of Medium-Sized (25MW to 50MW) Hydropower Stations Under Construction in China in 1992"]

[Text]

Table 1. Listing of Large Hydropower Stations Under Construction in China in 1992

Rank	Power station name	Construction site	Installed generating capacity (MW)	Yearly power output (billion kWh)	Scale under construction (MW)	Year construction started	Time of power generation by first generator
1	Ertan	Yanbian-Miyi, Sichuan	6 X 550 = 3,300	17.7	3,300	1991	June 1998
2	Tianhuangping Pumped-Storage	Anji, Zhejiang	6 X 300 = 1,800	3.16/4.28	-	Preparing for construction	-
3	Lijia Gorge	Hualong-Jianca, Qinghai	4 X 400 = 1,600	5.9	1,600	April 1988	1995
4	Xiaolangdi	Mengjin, Henan	6 X 260 = 1,560	5.1	-	Preparing for construction	-
5	Shuikou	Minqing, Fujian	7 X 200 = 1,400	4.95	1,400	March 1987	31 May 1993
6	Longyang Gorge	Gonghe, Qinghai	4 X 320 = 1,280	5.942	-	1978	September 1987
7	Manwan	Yunxian County-Jingdong County, Yunnan	5 X 250 = 1,250	6.303	1,250	May 1986	1993
8	Yantan	Dahua, Guangdong	4 X 302.5 = 1,210	5.66	1,210	March 1985	1992
9	Wuqiangxi	Taoyuan, Hunan	5 X 240 = 1,200	5.37	1,200	September 1986	1994
10	Geheyan	Changyang, Hubei	4 X 300 = 1,200	3.04	1,200	January 1987	1993
11	Tianqiao First Cascade	Anlong, Guizhou and Longling, Guangxi	4 X 300 = 1,200	5.226	1,200	1991	1998
12	Guangdong Pumped-Storage	Conghua, Guangdong	4 X 300 = 1,200	2.38/3.128	1,200	July 1988	1992
13	Wanjiazhai	Pianguan, Shanxi	6 X 180 = 1,080	5.1	-	Preparing for construction	-
14	Tianshengqiao Second Cascade	Anlong, Guizhou and Longling, Guangxi	4 X 220 = 880	4.92	880	1982	1992
15	Ankang	Ankang, Shaanxi	4 X 200 = 800	2.8	400	1979	9 December 1990
16	Shisanling Pumped-Storage	Changping, Beijing	4 X 200 = 800	1.2/1.65	800	1990	1995
17	Baozhusi	Guangyuan, Sichuan	4 X 175 = 700	2.3	700	November 1984	1996
18	Baishan Second Phase	Huadian, Jilin	2 X 300 = 600	2.037	300	1985	December 1991
19	Tongjiezi	Leshan, Sichuan	4 X 150 = 600	3.21	600	January 1985	1992
20	Lianhua	Hailin, Heilongjiang	4 X 137.5 = 550	0.79	-	Preparing for construction	-
21	Dongfeng	Qingzhen, Guizhou	3 X 170 = 510	2.42	510	November 1984	1993
22	Dongjiang	Zixing, Hunan	4 X 125 = 500	1.32	500	March 1978	November 1981
23	Wan'an	Wan'an, Jiangxi	4 X 100 = 400	1.516	200	1984	16 November 1990
24	Daxia	Bayin-Yuzhong, Gansu	4 X 75 = 300	1.465	300	1991	1995
25	Shilong	Fusong, Jilin	280	0.1257	280	Preparing for construction	-
26	Taipingyi	Wenchuan, Sichuan	4 X 65 = 260	1.72	260	1990	1994
Total		-	26,460		19,290	-	-

Table 2. Listing of Medium-Sized Hydropower Stations (50MW to 250MW) Under Construction in China in 1992

Rank	Power station name	Construction site	Installed generating capacity (MW)	Yearly power output (million kWh)	Scale under construction (MW)	Year construction started	Time of power generation by first generator
1	Daguangba	Dongfang, Hainan	4 X 60 = 240	520	240	June 1990	1993
2	Panjiakou Pumped-Storage	Qianxi, Hebei	3 X 70 = 210	237/359	140	January 1984	30 June 1991
3	Dongxiguan	Wusheng, Sichuan	4 X 45 = 180	1,140	180	1992	1995
4	Fengman Generator Expansion	Jilin	2 X 85 = 170	-	85	1989	1991
5	Xiaoshan	Fusong, Jilin	160	324.4	160	Preparing for construction	-
6	Qingxi	Dabu, Guangdong	4 X 36 = 144	440	144	1988	1992
7	Sanmen Gorge Expansion	Sanmen Gorge, Henan	2 X 50 = 100	-	100	1991	1994
8	Yanghu Pumped-Storage	Langkazi, Tibet	4 X 22.5 = 90	95.44	90	August 1989	1994
9	Dashankou	Hejing, Xinjiang	4 X 20 = 80	310	60	1987	1991
10	Puding	Puding, Guizhou	3 X 25 = 75	340	75	1989	1992
11	Zuojiang	Chongzuo, Guangxi	72	308	72	-	-
12	Shuanggou	Fusong, Jilin	70	386.8	70	Preparing for construction	-
13	Zhaoping	Wuzhou, Guangxi	3 X 21 = 63	305	63	January 1990	1994
14	Sanjiangkou	Shimen, Hunan	5 X 12.5 = 62.5	325	-	1985	January 1989
15	Guxian	Guxian County, Henan	3 X 20 = 60	182	40	1972	1991
16	Nanjindu	Yongzhou, Hunan	60	293	60	1987	1992
17	Tongtouchang	Lushan, Sichuan	3 X 20 = 60	478	60	1991	1994
18	Lazhuang	Luoping, Yunnan	3 X 20 = 60	330	40	1987	1991
19	Dongjin	Xiushui, Jiangxi	2 X 30 = 60	116	60	1991	1994
20	Shuidong	Youxi, Fujian	3 X 19 = 57	225	57	April 1990	1993
21	Xiaodongjiang	Zixing, Hunan	55	154	-	1984	1990
22	Baiyun	Chengbu, Hunan	3 X 18 = 54	142	54	October 1991	1994
23	Baishiyao	Yingde, Guangdong	3 X 18 = 54	278	54	1992	1995
24	Jiangkou	Xuanhan, Sichuan	3 X 17 = 51	211	-	November 1987	March 1991
25	Yutan	Dayong, Hunan	2 X 20 + 10 = 50	229	50	October 1991	1993
26	Gaosha	Shaxian County, Fujian	4 X 12.5 = 50	200	50	1991	1993
27	Tuohai	Nilka, Xinjiang	4 X 12.5 = 50	248	25	May 1984	November 1988
28	Yaotian	Leiyang, Hunan	4 X 12.5 = 50	221	-	1985	December 1988
Total		-	2,487.5	-	2,029	-	-

Notes: 1. Panjiakou is a mixed-type pumped-storage power station with an installed generating capacity of 150MW in conventional generators and 210MW in pumped-storage generators.
2. The installed generating capacity at Fengman Power Station prior to the generator expansion was 554MW.
3. The installed generating capacity at Sanmen Gorge prior to expansion was 250MW.

Table 3. Listing of Medium-Sized Hydropower Stations (25MW to 50MW) Under Construction in China in 1992

Rank	Power station name	Construction site	Installed generating capacity (MW)	Yearly power output (million kWh)	Scale under construction (MW)	Year construction started	Time of power generation by first generator
1	Guanjiao	Guanling-Zhenning, Guizhou	3 X 16 = 48	184	16	1987	1990
2	Mahui	Peng'an, Sichuan	2 X 23 = 46	353	-	September 1987	October 1991
3	Chaoyangsi	Xianfeng, Hubei	3 X 15 = 45	214	45	1991	1994
4	Gedong	Taijiang, Guizhou	2 X 22.5 = 45	209	45	1991	1993
5	Huangdan	Muchuan, Sichuan	3 X 15 = 45	204	45	1991	1994
6	Suojinshan	Wufeng, Hubei	3 X 15 = 45	191	45	March 1990	1993
7	Wu'anxi	Longyan, Fujian	3 X 15 = 45	135.7	45	July 1991	1994
8	Erlangba	Ningqiang, Shaanxi	43.6	170	16	1982	1991
9	Longtan	Shangyou, Jiangxi	2 X 20 = 40	88	40	July 1990	1993
10	Xihe	Ebian, Sichuan	2 X 20 = 40	260	40	August 1991	1993
11	Yemao	Yishan, Guangxi	3 X 12.5 = 37.5	187	37.5	November 1991	1993
12	Xigou	Heihe, Heilongjiang	2 X 18 = 36	96	-	July 1987	November 1991
13	Xiaogangou	Golmud, Qinghai	4 X 8 = 32	182	8	1988	1990
14	Fengshuling	Chun'an, Zhejiang	2 X 16 = 32	72	32	1987	1992
15	Luosichi	Shehong, Sichuan	3 X 10.5 = 31.5	180	21	1987	1990
16	Sanjiangkou	Xinping, Yunnan	2 X 15 = 30	224	30	May 1990	1992
17	Anju	Tongliang, Sichuan	2 X 15 = 30	178	30	December 1987	December 1991
18	Wenfeng	Santai, Sichuan	3 X 10 = 30	166	10	1988	1991
19	Weituo	Hechuan, Sichuan	3 X 10 = 30	156	30	1988	1992
20	Mowu	Shunchang, Fujian	2 X 15 = 30	131.7	30	October 1991	1993
21	Liangqian	Taining, Fujian	3 X 10 = 30	123	20	1987	1991
22	Duping	Fengkai, Guangdong	1 X 30 = 30	128	30	1989	1993
23	Tianhu	Quanzhou, Guangxi	2 X 15 = 30	100	30	1990	1992
24	Yanzhou	Lixian County, Hunan	2 X 14.75 = 29.5	115	29.5	1990	1993
25	Kashi Second Cascade	Kashi, Xinjiang	3 X 8.8 = 26.4	178	17.6	1988	1991
26	Longmentan Second Cascade	Jinjiang, Fujian	2 X 13 = 26	100	130	1985	1991
27	Ganbao	Lixian County, Sichuan	3 X 8.5 = 25.5	184	25.5	1988	1992
28	Sijiutan	Guang'an, Sichuan	3 X 8.5 = 25.5	164	25.5	August 1989	1993
29	Tianlou Dizhen	Enshi, Hubei	4 X 6.3 = 25.2	134	18.9	January 1988	1991
30	Chengjia First Cascade	Yangshan, Guangdong	25	107	25	1991	1993
31	Jinjiang	Renhua, Guangdong	2 X 12.5 = 25	96	25	1990	1993
32	Heizi	Baicheng, Xinjiang	26	134	-	-	-
33	Xidaqiao	Aksu, Xinjiang	26	146	-	-	-
34	Shankou	Habahe, Xinjiang	4 X 6.3 = 25.2	114	25.2	1992	1994
Total		-	1,136.9	-	850.7	-	-

Baishan Station Completed; Second Largest Facility in Nation

926B0104B Beijing RENMIN RIBAO in Chinese 24 Jun 92 p 1

[Article by Du Xiaoming [2629 2556 2494]

[Text] Changchun 23 June 1992: The last 300MW generator of the second phase of the construction of the Baishan hydroelectric station has been completed and it is officially up and running. This marks the completion of the second largest hydropower project in China next only to the Gezhouba station.

The Baishan station is located on the upper reaches of the Songhua Jiang in Jilin province. The station was constructed in two phases, 900MW in phase one and 600MW in phase two. Construction began in May 1975.

The Baishan station was designed and constructed with domestic resources. All the power generating equipment was built in China. The top of the dam is 676.5 m long and its maximum height is 149.5 m. To date, it is the highest gravity arch dam in China. The total capital investment is 1.4 billion yuan and the entire investment can be recovered after the facility produces 17 billion kWh of electric power. It also provides other benefits such as flood control.

Fengman Installed Capacity Reaches 720MW

926B0114B Changchun JILIN RIBAO in Chinese 15 Jul 92 p 1

[Article by reporter Li Shicheng [2621 4258 1004]: "Fengman Power Station Second Phase Expansion Project Goes Into Operation and Generates Power, Premier Li Peng Writes Inscription for Placing New Generators Into Operation"]

[Text] The second phase expansion project at Fengman Power Station, which has always received a high degree of attention from party and state leaders, was formally placed into operation and generated power on 14 July 1992. State Ministry of Energy Resources minister Shi Dazhen [0670 1129 4394], Jilin Province vice governor Liu Shulin [0491 2885 2651], and Northeast China Electric Power Management Bureau director Zhao Xizheng [6392 1585 2973] cut the ribbon to place the project into operation.

At the ceremony, premier Li Peng's inscription for placing the new generators into operation was read: "A Pearl on the Songhua Jiang". A congratulatory telegram sent by Jilin Province governor Gao Yan [7559 0917] was read.

Construction of the second phase expansion project at Fengman Power Station formally began in April 1988. After more than 4 years of unremitting efforts by employees of the Sixth Hydropower Bureau, First Hydropower Bureau, and Fengdian Ersong Company, the No 9 and No 10 generators were formally connected to the grid on 18 December 1991 and 19 June 1992, respectively, increasing the total installed generating capacity at Fengman Power Station to 720MW and making it the primary peak regulation power station in the Northeast China Power Grid.

The victorious completion of construction of the second phase expansion project at Fengman Power Station is an indication that Fengman Power Station, China's first big hydropower station, has leapt up to a new stage. At the same time, it also increased the peak regulation capacity in the Northeast China Grid, which will play a major role in spurring development of the national economy in the three provinces of northeast China.

Lancang Jiang Update

40100072A Beijing XINHUA in English 0641 GMT 1 Sep 92

[Excerpts] [Passage omitted] The 4,800-kilometer Lancang River rises in the Tanggula Range in Qinghai Province and flows across Tibet and Yunnan to Southeast Asian countries which call it the Mekong River. The river, which flows 1,240 kilometers from northwest Yunnan's plateau to Xishuangbanna with the drop of 1,780 meters, is ideal for producing hydroelectric power. It is one of the ten main electric power bases in China.

Yunnan began geological surveys in 1957 to build six hydroelectric power stations at different levels along the upper reaches of the river and eight more on the middle and lower reaches.

On completion, this chain of power stations will have the capacity to generate 100 billion kWh of electricity annually.

The eight power stations in the middle and lower reaches of the river are now well under construction.

The first stage of the Manwan hydropower station began in 1986. It includes installation of five 250,000-kilowatt power generating units. The first generating unit will go into operation next year and the first phase of construction will be completed in 1995.

Construction of the Dachaoshan power station, which will have six 225,000-kilowatt units, will begin in 1993 and the first unit is expected to go on stream between 1998 and 1999.

A feasibility report for constructing the Xiaowan station on the lower reaches of the Lancang River has been approved.

According to the report, construction of the station will begin in 1996 and its first unit will go into operation in 2004.

With a total installed capacity of 4.2 million kilowatts and a water storage capacity of 15.36 billion cubic meters, the Xiaowan station will have a 284.5-meter-high concrete arch dam—the highest in the world.

It will be jointly built by Guangdong Province, the State Energy Investment Company and Yunnan Province and its power will be transmitted to Guangdong.

Preparation for building the Nuozhadu hydroelectrical power station is under way. The station will have an installed capacity of 4.5 million kilowatts, and its reservoir will hold 23.1 billion cubic meters of water. [passage omitted]

"It is possible for Yunnan to provide electricity for Guangdong as well as Southeast Asian countries with the exploitation of the water resources of the Lancang River," states Zhu Zhiqiang, director of the Yunnan provincial power supply bureau.

According to a spokesman for the provincial government, the Ministry of Energy of Thailand has discussed with the Yunnan Electric Power Bureau the possibility of supplying electricity to Thailand.

Some companies from Thailand have shown interest in investing in and building the Jinghong power station [downstream from Nuozhadu].

Yunnan has expressed its approval of foreign investment, particularly from Southeast Asian countries, in tapping the hydropower potential of the Lancang Jiang to promote regional economic cooperation, said the spokesman.

Nation's First 500MW Unit Now Operational at Shentou Plant

926B0104A Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 2 Jul 92 p 1

[Text] Taiyuan 1 July 1992: China's first 500MW Thermal Electric Power Generator was put into operation yesterday at the Shentou plant in Shanxi.

Experts believe that the construction of this pit-mouth plant is at the world-class level. Moreover, it further enhances Shanxi's position as China's largest energy producing base.

The Shentou Power Plant No. 2 is located east of Shuozhou, Shanxi. The construction of Shentou Power Plant No. 2, with a design capacity of 2,200MW, began on 1 May 1988. The 500MW unit completed was manufactured in Czechoslovakia.

There are a number of high-capacity power generators under construction in Shanxi and it is expected that an additional 1,300MW will be completed by the end of this year.

Accelerating Development of Chongxin Coal Resources

926B0114C Lanzhou GANSU RIBAO in Chinese 16 Jul 92 p 1

[Article by Shi Wenzhong [0670 2429 1813] and Liu Weidong [0491 5898 2639]: "Chongxin Accelerates Development of Coal Resources, Raises Capital, Trains Skilled Personnel, Guarantees Key Aspects"]

[Text] Chongxin County has seized a favorable opportunity in trying in every possible way to accelerate the pace of construction in a key coal producing county.

Chongxin County has abundant coal resources with good coal quality and shallow burial that are easy to mine. Coal production has already formed on a substantial scale and it has relatively powerful strengths. Given this, the Ministry of Energy Resources State and Local Coal Mine Corporation formally established Chongxin County as a key national coal producing county in early 1989. For more than 3 years, Chongxin County has integrated with reality and decided that the county will produce 1.54 million tons of coal a year during the Eighth 5-Year Plan and 2.04 million tons a year during the Ninth 5-Year Plan and plans to build three new mines and upgrade six mines. Through their efforts and work, they have now formally begun construction of six projects with a yearly production capacity of 1.17 million tons. To ensure construction of a key coal producing county, Chongxin County has reduced expenditures in administrative institutions and units and reduced meetings and documents. They are actively training skilled excavation personnel. Over the past 2 years, Chongxin County has commissioned Xinyao Coal Mine with systematic training of over 20 specialized coal personnel and used directional assigned training in schools to fight for college and polytechnical school graduates and imported three arrangements from society to train over 50 specialized coal excavation technical personnel. At the same time, Chongxin County has established a Coal Production Management Bureau and Office in the county and the relevant townships and towns. Every construction project they have begun has a project leadership group with responsibility assigned to individual personnel, which has greatly accelerated the pace of development of coal production in the key county.

Oil Industry Surpasses Target for First Half of Year

926B0108A Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 18 Jul 92 p 1

[Text] China Petroleum and Natural Gas Corporation oil fields have produced 68.7501 million tons of crude oil and 7.51 billion cubic meters of natural gas in the first half of this year, fulfilling half of the annual plan. The national goals assigned for oil and gas prospecting for the first half of this year have also been fully completed, and new discoveries have been made, in both the east and the west.

This year, despite rising water levels and greatly increased obstacles to sustained output from old oil fields, oil field units got an early start, and were early into production; exploitation of shallow deposits and other measures were pursued to increase production. New operating wells increased by 432 over the same period last year, and efforts were made to enhance output from 2,367 commercial operating wells. The oil and gas fields applied measures appropriate to their respective circumstances, linked up production goals and economic realities, improved production administration, and overcame the effects of diminishing crude oil yields from old oil fields; steady output was maintained in the first quarter, and overall gains were made in the second quarter, guaranteeing success of the mission for the first half year.

Outlook Said Good for Oil and Gas Exploration in Three Xinjiang Basins

926B0120B Beijing RENMIN RIBAO in Chinese 16 Aug 92 p 1

[Article by reporter Zhang Guorong [1728 0948 2837]: "Gratifying Achievements in Oil and Gas Exploration in Three Large Xinjiang Basins, Crude Oil Output Will Increase Substantially in 1992 and 1993"]

[Text] Wu Zongying [0702 1350 5391], a press spokesman for the China Petroleum and Natural Gas Corporation, revealed to reporters on 15 August 1992 that the pace of oil and gas exploration and development has been accelerated in the three large Junggar, Tarim, and Turpan-Hami basins in China's Xinjiang and that some oil and gas-bearing structures with very good prospects have been discovered. It is expected that total crude oil output from the three large basins may reach 8.7 million tons in 1992, an increase of 1 million tons over 1991, and that total output will surpass 10 million tons during 1993.

Xinjiang's Tarim Basin, Turpan-Hami Basin, and Junggar Basin are an important region for implementation of the strategic principle of "stabilizing east China, developing west China" in China's petroleum industry during the Eighth 5-Year Plan. Since 1992, under the encouragement of comrade Deng Xiaoping's primary talks during his tour of southern China, the area of exploration in these three big basins has continually grown and crude oil production has begun to leap toward a new stage. They have now become a realistic replacement region for increasing oil and gas reserves and output in the petroleum industry during the Eighth 5-Year Plan.

Exploration has proceeded at a surging pace in Xinjiang's three big basins and each of them have their own characteristics. Tarim Basin has focused on the need to develop large areas and locate high output large oil fields and has resolutely undertaken exploration in the region. They have now basically clarified the regions of the primary attack and the oil and gas-bearing strata systems of the primary attack. Several oil and gas-bearing structures with very good prospects have been discovered in the central Tarim, northern Tarim, and other regions and they have gained a grasp of reserves and resources capable of supplying 5 million tons of crude oil production capacity during the Eighth 5-Year Plan. On the basis of the need to concentrate forces to gain a grasp of reserves and accelerate the construction of crude oil production capacity, Turpan-Hami Basin has proven and controlled seven oil and gas fields. Exploration work in Junggar Basin is now extending from marginal regions toward the central part and has basically proven an integral oil field in the Cainan region. An exploratory well drilled in the central zone of the central part has found several 10 meters of oil strata and a good momentum that has not been seen for the past 10 years has appeared.

Oil and gas exploration, development, and production construction in Xinjiang's three large basins have a good situation of having taken off in unison that is an achievement of reform and opening up and promoting S&T progress. The two new exploration regions in Tarim and Turpan-Hami Basins have broadly absorbed and matched up with utilization of advanced technology from China and foreign countries and studied and borrowed from management methods in petroleum companies in foreign countries. The primary technical economics indices from drilling exploratory wells in Tarim have caught up with advanced levels in foreign countries. Shanshan Oil Field built and placed into operation in Turpan-Hami Basin has achieved automated management and the production and operations personnel are just one-tenth of oil fields of equivalent scales in old oil regions.

On the Diversification, Internationalization of Oil and Gas Enterprise Management

926B0098A Chengdu TIANRANQI GONGYE [NATURAL GAS INDUSTRY] in Chinese Vol 12 No 3, May 92 pp 86-91

[Article by Bai Lanjun [4101 5695 0689] and Liu Mingke [0491 2494 4430], Enterprise Management Office, Sichuan Petroleum Bureau]

[Text] Abstract: The history and present status of management diversification and internationalization of enterprises in China and abroad are analyzed. Chinese and foreign oil companies, in terms of their economic position, resources, and market advantages, are compared. Based on these analyses, we have concluded that oil enterprise should diversify and internationalize their management in order to accelerate development. We advocate an active, prudent, yet timely development in an internationalized management.

Fundamental Production Objectives of Socialist Enterprises and Development Strategy in Business Management

In the "Enterprise Law" it is stated that: "The fundamental mission of an enterprise is to develop and produce the commodity according to the state's plan and the market need, to create and accumulate wealth, and to satisfy the increasing material and cultural needs of the society." The law clearly spelled out the fundamental goal for production management of an enterprise and the approach and practice for achieving this goal. The basis for production is plan and market, and they must be sensibly combined. Oil and gas field enterprises should follow this basic regulation of the Enterprise Law in organizing their production management.

Development Experience of Foreign and Domestic Companies as Lessons to Oil and Gas Field Enterprises

1. Management Development Practices of Foreign and Domestic Companies

In 1960, Comrade Mao Zedong inspected the Wuhan Steel Works and proposed "multiple management" as a strategy. Since the economic system reform, domestic enterprises have been gradually pushed into the tide of commodity economy. Faced with increasingly fierce competition on the market, many enterprises have successfully got on the path of multiple management (or diversified management).

Diversified management of enterprises in China may be divided into two types. The first type involves producing serialized products and providing diversified services that are intimately tied to the unique manufacturing characteristics of the enterprise. The second type involves targeting a short-term market need and establishing a new entity to manufacture products not related to the main business of the company but are needed on the market. For example, the Capitol Steel Works, under the support of a preference policy of the state, devoted great efforts in management diversification and internationalization; it now owns 13 joint venture enterprises and 12 enterprises abroad. In 1990, it created $64.42 million of foreign exchange and sold its products to 18 countries and regions. It is currently striving for the new goal of multi-national management.

An important trend in today's world economic development is the internationalization of production and capital. This trend manifests itself in diversification and deepening of management of the company and the great development of multi-national companies after the war. Nestle's Switzerland produces mainly food and drink, but also operates in cosmetics, pharmaceuticals, and hotels. The Toyota Motor Corp. also manufactures residence housing as a "second business." The Matsushita Electric Industrial Co. produces more than 60,000 types of products, including electrical appliances, electrical machinery, batteries, office machines, medical and exercise devices, precision optical instruments, and bicycles.

Foreign petroleum companies in the same business as Chinese oil and gas enterprises are far more diversified in products than their Chinese counterparts. The Exxon Corporation, first in sales in 1983, was in oil and gas prospecting, mining, refining, transporting and sales. In recent years, Exxon has become more diversified and extended its business into coal, uranium, electronics, and even tourism. Exxon opened dozens of large hotels in Europe. In 1983, Mobil Corporation, the second largest oil company in the U.S., operated 60 chemical companies, 142 container companies and the largest retailer in the world. Mobil has a large variety of business and mail-order services. In the United States alone Mobil has 419 retail companies in 42 states, with installation and repair services. In addition, Mobil also has business in real estate, restaurants, and hotels. The original name of the company was New York Mobil Oil Company. In 1974 Mobil took over Marcus, one of the largest department stores in the U.S. Since the term "oil company" in the name no longer suited the changed business direction, it changed to its current name in 1975.

The development process of business diversification is also part of the strategy toward internationalization. The process exploded after WWII. Today there are 12,000 international companies in 80 countries and regions that operate 110,000 subsidiary companies; 8000 of them are in developing countries and 720 in the former Soviet Union and Eastern Europe. The effective business organization of international companies has certain advantages that we should learn from.

2. Companies of Oil and Gas Enterprises in China and International Oil Companies in terms of Economic Status

In 1980, eight out of the ten largest international industrial companies in the world were oil companies. Of the top 100 companies, 29 were oil companies. In 1990 the top 10 companies of the Fortune 500 companies in the United States included 3 oil companies. In 1988, the top ten of the 500 largest companies in China included two oil and gas enterprises; 8 of the top 100 companies were oil and gas enterprises. If petrochemical companies are also counted, then 6 of the top 10 companies and 32 of the top 100 companies in China are oil and gas enterprises. This shows the importance of the petroleum industry in the world economy.

The oil and gas enterprises in China have a strong material and technology base and business management base. They enjoy high economic efficiency and are the "national team" of China. It is therefore particularly important for the national economy that the oil and gas industry remain healthy.

3. Lessons Learned by the Oil and Gas Industry From the Development Experience of Domestic and Foreign Companies

The diversification process of domestic and foreign companies and the impressive development of international companies after WWII taught us that China's national economic development must rely on the development of these "national teams" mentioned above. The market risks have prompted people to develop more markets. The theory of product life cycle also taught us that products and services must be diversified even for businesses of the same size. Differences in technologies, facilities, wages, policy, and resources have lured enterprises into active participation in international business in order to make a profit and to develop further. The unique nature of microscopic investment and production mechanisms in the oil and gas industry forces us to diversify and to internationalize. The oil and gas industry should therefore establish the following mode of operation: Laterally, business should spread out over energy, materials, and other fields; vertically, business should span the processing and reprocessing of oil, gas, and mineral resources, and even the "third industry" [tourism]. In terms of location, we must start from the reality of the local region and move toward other provinces in China and toward other countries so that we may make use of both domestic and foreign resources. We should develop both domestic and foreign markets. By so doing, China will be in a no-lose situation when changes occur in the tumultuous economic climate.

Diversification Is the Business Foundation for Oil and Gas Industry

1. "Diversification"—Contents and Extension

"Diversified operation based on one major business" is a business policy and management strategy. In certain cases, diversified business refers to various services as opposed to the major business. In terms of the role played by diversified business, it has a critical effect on the survival and growth of the enterprise group. Although certain diversified businesses and services belong to the principal business, this relationship may change under certain circumstances. Since oil and gas resources are non-renewable, this change is objective and irresistable.

The goal of diversification is to have the principal business and the diversified business promote each other in coordinated development to solve the many problems faced by the oil and gas enterprise today. The goal is not merely to produce some extra pocket-money to improve the benefits of the employees.

In terms of ownership mode, diversification of the oil and gas industry goes beyond the development of collective economy; the development of diversification in the whole population must bring along and promote the development of the collective economy.

In terms of the time periods, "diversified operation based on one major business" is not a period of temporary measure; rather, it is a period of profound changes in management concept, strategy, target and mode of operation. It is a strategy policy to be adopted by the enterprises in the early phase of socialism.

The concept of "diversified operation" has different contents for business at different levels. The contents are different for general companies, oil and gas enterprises, and secondary enterprise units. Diversification refers not only to products and services but also to the extension of management range and style, and the diversification of the economic nature.

2. Focusing on the Main Role of Population-Wide Diversification

The population-wide diversification has accompanied the development of the main oil and gas industry. It was formed over a long period of time with large amounts of investment. It has become and will continue to be the main body of diversification.

Attention should be given to the main body diversification in the whole population and to the guiding role it plays. The goal is to let the diversified business exploit its unique advantages and to have a thriving development.

3. The Petroleum Industry Should Actively Develop Collective Economy

Active development of a a collective economy is not only common to all large and medium enterprises in a whole population ownership system, but also a decision based on the unique characteristics of the oil and gas industry. The basic national situation in the early phase of socialism requires and decides that the various forms of economy should coexist and complement each other. Collective economy has enjoyed rapid development in the various enterprises because of the following characteristics. Collective economy is broad and receptive to different personnel and facility. Its management policy and system are relatively versatile, it is strongly adaptive to market changes, and, as managed by the enterprise, it is supplementary to the popular industry. There are now more than 400,000 collectively owned enterprises. Their products and services account for more than one-third of the total value of sales on the Chinese market.

The petroleum industry is characterized by its wide geographical distribution, large variety of business, variety of resources, large investment, wide range of products, scope of operation, risk of production, and the heavy burden it places on society. In solving the associated problems in assignment, efficiency, and benefits, the advantages of the collective economy really manifest themselves. However, in the practice of collective economy, the petroleum industry still follows the beaten path of other enterprises in terms of technology and product structure. Few are competitive on the market. While we encourage development, there should also be timely adjustments of the product structure.

The petroleum industry has a historical responsibility to develop prudent and timely internationalized operation.

1. The necessity for large enterprises to enter a higher level of internationalized operation in view of the experience of economic development strategy in developing countries.

When China and other developing nations practice elementary product export strategy, import substitution strategy, and export targeting strategy, there are pros and cons. Exporting elementary products has the advantages of accumulating capital, expanding the job market, increasing foreign exchange income, and promoting the development of the national economy, but also has the disadvantage of subjected to fluctuations of the international market. China does not have rich natural resources on a per capita basis and therefore cannot make exporting elementary products its long-term strategy.

Import substitution strategy must be accompanied by a trade protection policy and is not good for domestic labor productivity or industrial technology progress; it is also not good for the export of products. Hence, an import substitution strategy is on the whole incompatible with reform and openers.

Export targeting strategy has its pluses and minuses. The main drawback is the strong dependence on the world market and the strategy will be severely affected when developed nations practice trade protectionism.

The strategies described above may be implemented selectively and flexibly to a certain extent. In the meantime, larger domestic enterprises with relatively strong base and advanced technology and management should be encouraged by national policy to gradually enter a higher level of international business. The success of the Huarun Group, the Zhongxin Company, the Capital Steel Works, and the No. 2 Automobile Plant in their development of international business has long validated the strategy.

2. The petroleum industry should take the lead in internationalized management.

(1) Hardship over the years has made us realize the importance of the urgent need for outward, diversified management. Due to changes of the development in the petroleum industry itself and changes in the external environment, there have been severe structural problems in the petroleum industry. First, there are problems in resource structure, namely, the current verified reserve cannot guarantee the rate of production growth in the national plan. Next, there are problems in the investment input and production output structure, namely, the investment input cannot guarantee the work volume in the development plan. We put our hope on the national oil and gas price adjustment, but the state has its difficulties and it takes time for the price adjustment to lead to a healthy cycle of investment input and production output. Historical experience and the law of economic development tell us that inconsistencies between price and value exist widely in the economic world. Even if the prices of oil, gas and other energies are all set according to the cost, it would be inevitably followed by adjustments in the prices of finished industrial goods. Before long, the impact of these adjustments will be reflected back to the energy departments. Even if the input price in the petroleum industry remains constant, the degree of difficulty in prospecting and development is continually going up, which will be pushing up the production price year after year and again leads to discrepancies between price and value. Today the petroleum industry needs the state to adjust the oil and gas prices in order to help it overcome its difficulties, but the oil and gas field enterprises must not tie themselves in one way of thinking. In the long run, diversified management and outward development may help us out of the quagmire. As stated above, they will create complementary relationships between domestic and international, upstream and downstream, and between various industries in their products, technology, service and benefits. Losses suffered by upstream industries may be made up by downstream industries so that the raw material supply for the downstream industries can be better guaranteed and the efficiency may be improved. With the improved efficiency, the industry will not be constrained to the political, economic, and natural conditions and the risks will be reduced and spread out.

(2) The domestic resource and market conditions prompted us to consider the gradual use of foreign resources in our development of international business. The current status is that in 1990 China ranked fifth in the world in crude oil production, but ranked only 10th in cumulative verified reserves among the top 15 oil-producing countries. The ratio of 1990 production to the cumulative reserve was only 1:23.9, also ranked 10th. (These data were taken from the 31 December issue of the American magazine Oil and Gas and differed from the Chinese statistics). The average ratio for the top 15 countries was 1:45.3. Because of the large population of China, the per capita oil reserve is only 2.9t, which is 10.6 percent of the world's per capita oil reserve of 27.3t. Energy utilization in China is also very poor. The shortfall of oil and gas in long-term needs is becoming evident and recognized by more and more people.

Much of China's oil and gas resources, especially gas resources, have not been determined; the development prospects for petroleum industry are very bright. New oil and gas fields and reserves will be found and verified. However, we must recognize two facts; first, it is unlikely that China's per capita oil reserve will exceed that of the world and more efforts are needed for the energy utilization rate to reach world standards; second, the input and output of the oil industry are determined by objective rules and there is a changing functional relationship. Generally speaking, the input required to produce a unit production will gradually increase. Sooner or later we must face the economic problem of domestic oil versus imported oil.

The Gulf War forced us to pay more attention to the strategic value of oil resources. We should increase our investment, enlarge our scope of prospecting, and form a greater production ability so that we may continue to avoid the adverse effects of sudden changes in international politics and economy. Inevitably we must consider the advantages and disadvantages of a higher versus a lower rate of energy usage, and of relying only on domestic resources versus opening up more sources. Planning ahead, we should internationalize the petroleum business as soon as possible in order to give the state more freedom in determining its energy policy.

(3) China's petroleum industry is in a position to internationalize its operations. From the beginning, the oil industry has been closely related to the international economy. After decades of accumulation and with the support of the national policy, China has amassed a great deal of assets, but many facilities are underutilized due to a lack of resources and money. Some of the survey and operating equipment, and equipment-manufacturing facilities are of advanced world standards. We do have the facility and technological basis for internationalized operation.

In past decades, especially in the 1960s, the petroleum industry absorbed a large number of high school, college and vocational school graduates. Over the years, great efforts have been devoted to personnel training, which produced a large number of key personnel in the 40 to 50-year-old age group. Foreign contracts for drilling and operation have also exhibited competitiveness on the international market. It is fair to say that we have the personnel base for international operation, but we lack the business training.

(4) Through international operation, we can train the much-needed technology management staff. The abundance of oil and gas resources in China is usually not high and new technology and new methods are needed in their prospecting and production. The approach we took over the years has been to export crude oil in exchange for foreign currency, to send personnel abroad to learn and observe, to buy advanced foreign technology and equipment, to import foreign technical service. In recent years there were also some joint venture enterprises but not many. The approach

is following the route of selling elementary products in exchange of equipment, technology and management knowledge. While we are in possession of considerable material and technology base, we should be following the route of technology and labor exporting, participating or implementing the management of foreign projects, exchanging foreign currency or oil and gas products, acquiring technology and management knowledge through practice, training the staff, and purchasing the necessary technology and equipment. This is a route of exchanging technical equipment and knowledge with money and a labor force with a certain level of technology and management know-how. We should also actively pursue joint operation abroad and gradually move into multinational operation. This is a brand new concept of taking the advantage of the socialist system to develop the economy at a faster pace than capitalism.

(5) The structural organization of the petroleum industry is conducive for multinational operation. The organization of multinational companies is a highly concentrated economic structure, characterized by a prominent internal vertical unification. The petroleum industry still has a strong vertical administration. Introduction of the multinational organization structure is in keeping with the tradition and there are no difficulties. The petroleum industry may start at a higher point and compete with other nations.

Necessary Steps

The state should investigate from a strategic viewpoint the relationship between the petroleum economy and the entire national economy, and make the following policy decisions:

1. solve the severe under-price problem of oil and gas as soon as possible. In the short term, price adjustments should be made based on the total cost so that the pricing structure can gradually approach that of the world. This will gradually move the oil and gas industry from under their burden of debt and into a healthy cycle of operation. This will also allow the industry to quickly accumulate the resources needed for international operation.

2. Further improve the contract system of oil and gas, gradually eliminate contract quota, implement tax waiver and risk supplement. Perfect the pricing structure based on the costs of prospecting, mining, purification, transport and storage. On the large scale there should be a control of the total volume and a dynamic link between the market and the plan. On the small scale, there should be opening and invigoration so that the petroleum industry has an external pressure and internal vitality and momentum.

3. Give the oil industry permission and assistance to implement a unified system from within. At an opportune time, restore the system that combines oil and gas, and land and ocean. Encourage the oil industry to diversify. On the one hand we should cut the reliance of the oil industry on the national treasury because of the under-pricing of oil, on the other hand we should allow the socialist oil companies to possess greater resources and freedom of operation. By doing so the companies will become more competitive on the international market and the oil industry will be on its way toward diversification and internationalization.

4. Being a national organization and a reform test point, the China Oil and Gas General Company should be given greater autonomy than that given ordinary enterprise groups. Such autonomy could include internal fund transfer, establishment of an oil bank at the proper time, sales rights for oil and gas, permission for price negotiation, retail, and special operation sales within a certain range for oil and gas products not under obligatory projects, and the right to import and export. These changes will make the China Oil and Gas General Company a full-fledged national oil company. There should be more favorable policies toward the Chinese oil industry in businesses involving foreign countries in terms of price, commerce, tax, and labor wages. This would allow the oil industry to compete more effectively with foreign oil companies.

The oil industry and oil and gas field enterprises should do the following:

1. Have new concepts—Diversified operation is the foundation of enterprise. Commodity economy is the general rule of the economy of civilized society. Generic management methods developed in capitalist society may be used in a socialist economy. The organization mode of multinational companies is suitable for petroleum enterprises in a socialist society. We should liberate ourselves from the concepts formed under a long history of emphasis on planned management.

2. Delegate power and perfect the contract system—while requesting more management autonomy from the state for the general company, power should be suitably delegated to oil and gas field enterprises. The goal is to make oil and gas field enterprises vigorous subsidiaries and to put the contract system on solid basis. Under the unified strategic guidance of the general company, the potential resources at the oil and gas fields should be fully utilized. The task of two-tier accounting should be accomplished and efficiency should be improved at various levels.

3. Reform the structural organization and improve the management of diversified and internationalized business—The main task today is to strengthen the integrated management of the collective petroleum industry and the diversified petroleum business. There is still not a powerful, high efficiency management organization that can coordinate the various professions and the different property systems. With a severe shortage of money and a heavy load of assignments, diversified management and international management cannot succeed quickly. The enterprise leadership must spend more efforts and deliberately assign special personnel to this task.

4. Formulate the strategy and proceed surefootedly—Concurrent to oil and gas prospecting and development, some efforts must be spent in the search and development of substitution industry. Gradually, the upstream and downstream industries in the oil and gas field should be unified. Diversified management should aim high and aim broad. The starting point should be high, the verification should be solid and the steps should be steady. Business scope and market competitiveness should be considered from the very beginning. Participation in international operation must begin with the reality at home. The market situation should be carefully grasped and analyzed, the opportunity of reform and openness and foreign affair organizations should be relied upon in the practice of ocean company type joint venture. Experience and capability

should be accumulated so that a transformation from labor export to project management and from low risk to high risk may be made. Perfect the project management and coordinate the forces of the entire industry so that the main force of the oil and gas enterprises—the prospecting, development and research teams—may enter the international market.

The management style should be flexible and there should be a difference between domestic and foreign management. Depending on the situation, the investment may take the form of money, technology, equipment, manpower, or management method. As long as there is a benefit, the input can be energy, raw material, or other substitutions and intangible assets. We should make use of foreign resources to extend the prosperous life period of China's oil industry. New businesses should be established to benefit the people, the state, and socialism.

5. Cultivate talent and look toward the future—Management personnel and foreign affairs personnel are the weak points in our training programs. In order to implement the development strategy, we should look toward the future and make a major effort in personnel training.

References

1. Compiled by the editorial staff of the Chinese Encyclopedia for Enterprise Management, published by the Enterprise Management Publication Company, Beijing, February 1984.

2. "A New Step Every Day", Capital Economic Report, 28 February 1991.

3. Lin Jingcheng and Gong Weijing, The Largest 100 Companies in the World, Shanghai Fudan University Press, March 1986.

4. Ye Gang, Multinational Companies in the World, Shanghai Fudan University Press, March 1989.

Eastern Oil Areas Open to Foreign Prospectors

40100079B Beijing CHINA DAILY (Economics and Business) in English 1 Sep 92 p 2

[Article by Chang Weimin]

[Text] China is planning to open untapped petroleum reserves in the eastern part of the country and areas surrounding existing oilfields to foreign firms to accelerate petroleum exploration.

Wang Tao, President of the China National Petroleum Corporation (CNPC), briefed hundreds of petroleum industry representatives on the plan last weekend, saying international bidding will be adopted for the areas to be drilled.

The bidding will be on newly-found oil-bearing areas in the country's eastern part and areas surrounding oilfields already in production, Wang said.

However, the president did not specify which areas will be opened or when the international bidding will start.

Reliable sources from the petroleum industry said CNPC has already delivered a draft plan to the central government on accelerating opening to the outside world.

China is likely to try more boldly to coax more foreign oil prospectors and developers into the country's inland areas, the sources said.

China announced the opening of the East China Sea to foreign oil firms in July, thus stretching the open areas to all seas surrounding the country.

Inland areas have also been opened to foreign firms in South China provinces but not in the North or Northwest.

Wang was speaking at the closing ceremony of a 10-day conference in Beijing gathering oil industry representatives to discuss measures to accelerate the industry's development.

Conditions are ripe for quicker growth, Wang said.

Wang said the growth of gross national product in China is likely to reach 9 percent in the following 3 years. "That requires the petroleum industry to provide more energy to support development."

Wang set forth new targets in production of crude oil and natural gas for this year and next, saying the industry will strive to pump 140 million tons of oil next year.

China produced 139.76 million tons of crude oil last year. This year's is predicted to be about the same.

Production has concentrated in the country's central and northeastern parts, but decades of exploitation seem to bring the fields into decline.

Wang urged stable production in the central and northeastern parts, saying lessons should be learned from the Northeast oilfield of Daqing, which has been the leading producer in the country for three decades.

He suggested that targets set for the year 1995 should be hit 2 years ahead of schedule.

If so, more funds and professional forces can be used for petroleum exploration to verify sufficient resources for petroleum development in the years after 1995, Wang said.

China has strategies for the industry. As decline occurs in production in the central and northeastern oilfields, proven reserves in three basins in Xinjiang Uygur Autonomous Region are expected to comprise the core production in the next decade.

Space-Based Remote Sensing Used To Probe Oil and Gas in Jianghan Basin

926B0112A Beijing GUANGMING RIBAO in Chinese 15 Jun 92 p 1

[Article by reporter Hu Youquan [5170 2589 3123]]

[Text] Chinese Academy of Sciences Geochemistry Institute Guangzhou Branch Remote-Sensing researcher Ting Xuan [0002 2537] and others accepted the responsibility for the project to "research the application of space-based remote sensing for oil and gas exploration in Jianghan Basin" and later received its technical authentication in Guangxhou not long ago. This project has now achieved excellent results. Major progress was made in utilizing the Landsat multiband color mosaic pictures by identifying and delineating ares of hydro-carbon seepage with ground anomaly. In addition, they have ascertained the nature and characteristics of the fault traps of the oil and gas basin and determined regional basement faults and a deep faulted trap trough. By combining geophysical and geochemical investigations and exploration data, they have determined the boundary of this basin and the reservoir areas and also revealed important Jianghan Basin Pre-Cretatious basement structure information.

Airborne Remote Sensing Achieves Good Results in Oil and Gas Search

926B0112C Beijing BEIJING KEJI BAO [BEIJING SCIENCE AND TECHNOLOGY NEWS] in Chinese 8 Jul 92 p 2

[Text] To expand the application of airborne remote sensing, the Ministry of Geology & Mineral Resources' Airborne Remote Sensing Center began in recent years an active oil/gas exploration program in cooperation with the Petroleum & Natural Gas Corporation. They have conducted survey flights of more than 600,000 kilometers and completed over 30 reports on the results. They have delineated many potential oil/gas reservoirs and reported on many local geological structures. In some areas, test holes resulted in oil flow of industrial quality.

The Center began this program in the early years of the Seventh 5-Year Plan. In the past, this technique was used only for exploration of solid minerals. With the advancement of sciences and technology, the Center thought that since it had the experience and experts, they would like to fill the void of high-precision, large-scale oil field magnetic survey reports. Accordingly, they requested the Shenli oil field authorities to set aside an area of 6,000 square kilometers for the Center to conduct, at their own expense, airborne surveys and to formulate geological explanations. The results were ideal. The Center's efforts not only agreed with the oil field's original ground survey reports but provided additional information as well. Since then, they have embarked upon closer cooperation with other petroleum organizations. From time to time, they have worked with Taqing, Shenli, Liaohe, Jianghan major oil fields as well as with Huanghai Continental Shelf and Takla Mahan Basin deposits employing this exploration technique. In order to collect the correct data, the Center's technical personnel overcame many difficulties including the ability of handling the main airborne sensing instruments and 16 other supplementary magnetic instruments as well as the digital magnetic recording system. Based on these reports, outstanding results and developments were obtained. For example, because this technique calls for the detailed description of the local geological structure, in-depth studies of the basement characteristics and the coverage's regional structure were conducted. These became the foundation for the long-range prediction of gas deposits. This technique also provided, through studies of magnetic field characteristics, a direct understanding of the oil field's fault situation and the necessary clues for delineating local structures favoring oil/gas deposits.

Xinjiang To Become Nation's Fourth Major Oil-Producing Region

926B0123E Beijing JINGJI RIBAO [ECONOMIC DAILY] in Chinese 16 Aug 92 p 1

[Article by reporter Ding Shi [0002 1102]: "Xinjiang Leaps To Become China's Fourth Main Oil Producing Region"]

[Text] The pace of petroleum and natural gas exploration and development has been significantly accelerated in Xinjiang, China's strategic replacement region for the petroleum industry. Crude oil output in the three big Tarim, Turpan-Hami, and Junggar basins may reach 8.7 million tons in 1992 and surpass 10 million tons in 1993. Xinjiang has now become our fourth main oil producing region after Daqing, Shengli, and Liaohe.

According to information provided by the China Petroleum and Natural Gas Corporation, oil and gas exploration in the three large basins of Xinjiang has advanced quickly. Based on the exploration undertaken in accordance with the need to locate high output large oil deposits, Tarim Basin has now basically clarified the regions for the primary attack and the oil and gas bearing strata for the primary attack. Over 10 oil and gas-bearing structures with good prospects have been discovered in the central Tarim, northern Tarim, and other regions, and they have gained a grasp of reserves and resources that can provide a 5 million ton crude oil production capacity for construction during the Eighth 5-Year Plan. It has been further confirmed in Turpan-Hami Basin that the Shanshan and Qiuling regions are an integral oil and gas-bearing structural zone and they have proven and controlled seven oil and gas deposits. They have also discovered several other new oil and gas-bearing structural zones and new oil and gas deposits nearby and it is expected that the proven reserves will increase substantially during 1992. While expanding reserves and resources in the old region at its northwestern edge, exploration work at Junggar Basin has also extended toward the central part. An integral oil deposit has been basically proven in the Cainan region and several 10 meters of oil strata have been found during exploratory drilling in the central part. A good momentum not seen in the past 10 years has appeared.

Along with increasing proven reserves, oil field development and construction has been accelerated. Daily crude oil output levels at Karamay Oil Field have already attained the requirements of plan indices for 1993 and construction of output capacity in the two new regions in Tarim and Turpan-Hami Basins has also proceeded very quickly. Total crude oil output from the three big basins in 1992 may be 1 million tons greater than in 1991 and will increase by an addition 2 million tons-plus in 1993. Experts estimate that by the end of the Eighth 5-Year Plan, there will be continued growth in crude oil output from the three big basins and they may move up in the ranks of China's oil fields.

Nation's First Desert Pipeline Now Operational

926B0123B Hohhot NEIMENGGU RIBAO in Chinese 8 Jul 92 p 3

[Article by reporters Han Zhiming [7281 1807 2494] and Li Xiaojian [2621 2556 1696]: "China's First Desert Oil Transmission Pipeline Goes into Operation"]

[Text] A key state construction project during the Eighth 5-Year Plan, the first long distance crude oil transmission pipeline for Xinjiang's Tarim Oil Field involving an oil transmission pipeline running from Luntai to Korla, was completed and placed into operation on 5 July 1992. This is an indication that petroleum development in western China has entered a new stage from exploration, drilling, and oil extraction to integrated matching outward transmission by pipeline. Compared to truck transportation, pipeline transmission of oil can save the state about 180,000 yuan in transportation costs per day.

The China Petroleum and Natural Gas Pipeline Bureau was responsible for design, construction, and management of the Luntai-Korla pipeline, which begins in the west at Lun 1 integrated station in the Tarim Oil Field in Xinjiang's Luntai County at the northern edge of the Taklimakan Desert and runs eastward to the oil storage facility where trucks are loaded at the Korla City West Railroad Station in Chongzhen Town north of the Great Wall. It runs for a total length of 192 kilometers and has a design yearly oil transmission capacity of 1 to 3 million tons. The total investment was 160 million yuan. Most of he area the pipeline as a whole passes through is a desert gobi and conglomerate rock section, and it also passes through a 14 kilometer salt marsh section. This was a first in the history of pipeline construction in China and it has provided a technical reserve for developing west China and building desert crude oil pipelines.

Potential for Gas in Major Basins of Northwest China Outlined

926B0105 Jiangling SHIYOU YU TIANRANQI DIZHI [OIL AND GAS GEOLOGY] in Chinese Vol 13, No 1, Mar 92 pp 78-84

[Article by Li Xuehui [2621 1331 1979], Huang Fulin [7806 4395 2651], and Liu Houren [0491 0624 0088] of the Ministry of Geology and Mineral Resources Comprehensive Petroleum Geology Brigade, Jiangling, Hubei 434100: "Natural Gas Endowment Conditions and Assessment of Long-Term Prospects of the Major Basins of Northwest China" (manuscript received 31 July 1991, revised and returned 17 October 1991)]

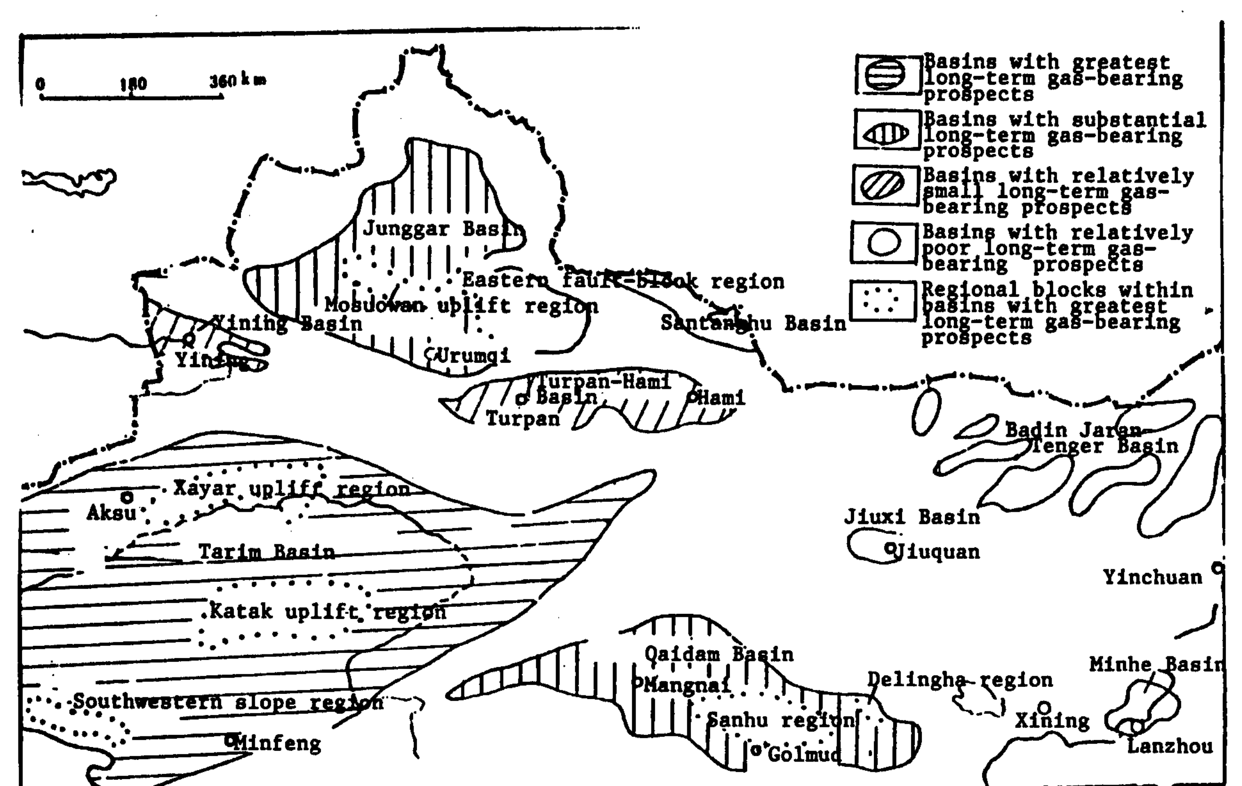
[Excerpt] [passage omitted]

II. Assessment of Long-Term Gas-Bearing Prospects (Figure 1)

A. Tarim Basin

This sedimentary basin has the largest area (560,000 km^2), longest development period (Sinian to Quaternary eras), and most integral preservation in northwest China. There are three sets of gas generating rock systems in the basin: the Cambrian-Ordovician system, the Carboniferous-Lower Permian series, and the Triassic-Jurassic system. The gas source rock has a total thickness of 1,500 to 5,000 meters. The primary accumulation strata are Cambrian-Ordovician system reef and beach facies limestone and dissolution hole limestone; Silurian system, Devonian system, and Carboniferous system littoral beach bar facies sandstone and delta leading edge facies sandstone; Permian system river channel facies sandstone; Triassic and Jurassic system delta leading

Figure 1. Evaluation Diagram for Long-Term Gas-Bearing Prospects



edge facies, fan delta facies, and river channel facies sandstone; Cretaceous system river channel facies sandstone, and so on. The conditions of the capping strata in the basin are extremely superior. It has 4,000 to 10,000 meters of Mesozoic and Cenozoic era sandy mudstone that forms regional capping strata for the Paleozoic natural gas. Lower Cambrian series muddy shale, Middle and Upper Ordovician series muddy shale, Jurassic system shale, Lower Carboniferous series greasy mudstone, Cretaceous-Eogene system greasy mudstone, and Neogene system mudstone can all form capping strata over a substantial area. The basin has 10 gas-bearing reservoiring and capping combinations (Upper Cambrian-Lower Cambrian series combination, Upper Cambrian-Middle Ordovician series combination, Ordovician-Jurassic system combination, Carboniferous-Permian system combination, Paleozoic-Mesozoic era unconformable combination, Triassic system internal combination, Jurassic system internal combination, Cretaceous system internal combination, Mesozoic- Cenozoic era unconformable combination, and Miocene series internal combination). The degree of maturity of most of the primary hydrocarbon source rock, the Cambrian-Ordovician system and the Carboniferous-Lower Permian series, has attained the highly-mature to overly-mature stage, so it is in the peak period of gas generation. The Triassic-Jurassic system may also have attained the highly-mature stage in the center of depressions. The Triassic-Jurassic system is also a coal system and its Type III humic organic matter may also have generated even more gas in the mature stage, so it is an important gas source. Oil and gas traps are relatively well-developed in the basin. The paleouplifts include Xayar uplift, Bachu uplift, Katak uplift, and so on. Paleofractures include Shajingzi fracture, Aqal-Tumutik fracture, Luntai fracture, Tiklik northern margin fracture, and so on. Local structures formed during the Mesozoic and Cenozoic eras are more developed in rows and clusters in premontaine zones around the margins of the basin and in paleouplift and paleofracture zones. In addition, conditions like Paleozoic era platforms, basin transitional zones, and Upper Paleozoic and Mesozoic era delta leading edge zones that may have formed lithologic traps are very well developed in the northern, southwestern, and eastern parts of the basin. These paleouplifts, paleofractures, rock facies variation zones, local structures, and lithologically-formed secondary porous zones combined with fracture zones formed by tectonism created the conditions for the formation of multiple types of traps for the accumulation of natural gas. These superior geological conditions for natural gas endowment are an indication that Tarim Basin has the conditions for the formation of large gas deposits and will inevitably become the gas-bearing basin with the greatest long-term gas- bearing prospects in northwest China and even on the Chinese mainland. Xayar uplift zone, Katak uplift zone, and the southwestern slope zone in the southwestern depression are the regions with the greatest long-term gas- bearing prospects.

B. Junggar Basin

This is a sedimentary basin of northwest China that has a relatively long development period (Carboniferous to Quaternary), second largest area (130,000 km^2), and integral preservation. The basin mainly has three sets of gas generating rock systems: the Carboniferous system-Lower Permian series, Upper Permian series, and Triassic-Jurassic system. The gas source rock has a total thickness of 1,000 to 4,000 meters. The primary reservoir strata are Carboniferous system volcanic rock and volcanic clastic rock; Permian, Triassic, and Jurassic system delta facies sandy conglomerate and shore and shallow lake facies sandstone, and so on. The capping strata conditions are relatively good. The 4,000 to 5,000 meter Cretaceous-Tertiary system serves as regional capping strata, and the Upper Triassic series dark mudstone and Cretaceous system mudstone which have excellent physical properties are boundary capping strata that may play effective roles in sheltering natural gas below the Cretaceous system. There are five gas-bearing reservoiring and capping combinations in the basin (Carboniferous-Permian system combination, Lower Permian series combination, Upper Permian series combination, Triassic system combination, and Jurassic system combination). Most of the Carboniferous system source rock is in the highly-mature to overly-mature stage and there has been light metamorphosis of part of it. The Lower Permian series source rock is in the mature to highly-mature stage and most of the Upper Permian series source rock is in the mature stage. TTI computations indicate that the centers of depressions have already entered the highly- mature or overly-mature stage. Most of the Triassic-Jurassic system is in the low maturity stage, with only the center of the southwestern depression being in the highly-mature to overly-mature stage. These circumstances indicate that large amounts of natural gas will form in the deep parts of the depressions. Natural gas traps are relatively well developed in the basin. Mosuowan uplift and Dabasong uplift are paleouplifts in the middle of depressions and between depressions, while Songnan uplift is located at the northern margin of the northern part of the southern depression. The second- level structures that developed during the Mesozoic and Cenozoic eras include the Karamay fault-step zone, eastern fault-block region, and anticline zone running parallel to the margin of the basin. The draped anticlines combined with the uplifts are all favorable structural traps. There are also large numbers of lithologic traps in positions where deltas and fan deltas have developed in the transitional zones of the depressions and uplifts, and there are lithologic traps distributed in deep parts of the basin. These basic geological conditions show that Junggar Basin is a basin with substantial long-term gas-bearing prospects and has the conditions for finding moderate- sized gas deposits. The prospects are best in the Mosuowan uplift zone and eastern fault-block region.

C. Qaidam Basin

This is the third largest basin in northwest China and covers an area of 120,000 km^2. It is a late Paleozoic, Mesozoic, and Cenozoic compound basin (Carboniferous to Quaternary era). The Permian and Triassic are absent. The primary gas generating rock systems in the basin are the Carboniferous system, Jurassic system, Tertiary system, and Quaternary system. The primary reservoir strata are dissolution hole limestone at the top of the Carboniferous system, Jurassic system river channel facies sandstone, and shore and shallow lake facies sandstone. The primary capping strata are Jurassic system and Tertiary system shore and shallow lake facies arenaceous mudstone and Quaternary system saline mudstone. There are four main reservoiring and capping combinations in the basin: the unconformable combination of the Carboniferous with the Mesozoic and

Cenozoic eras, the Jurassic reservoiring and capping combination, the upper Eogene system-Neogene system reservoiring and capping combination, and the Quaternary reservoiring and capping combination. The extent of evolution of the basin's hydrocarbon source rock: the Carboniferous system is in the mature to overly-mature stage, the Jurassic system is in the mature stage, the Tertiary system is in the low maturity stage, and the Quaternary system is in the immature stage. The pyrolytic gas comes mainly from the Carboniferous system. The biogenic gas comes mainly from the Quaternary system and the associated gas comes mainly from the Jurassic system and Tertiary system. The primary categories of gas pool traps in the basin are anticline structural traps and lithologic traps. Mahai gas pool and Sebei gas pool have already been discovered and they have rather good gas-bearing prospects. It is a basin with relatively good long- term gas-bearing prospects and there is a possibility that medium-sized gas pools may be found. The long-term gas-bearing prospects are greatest for the Sanhu region (biogenic gas) and Delingha region (pyrolytic gas).

D. Turpan-Hami Basin

This covers an area of 48,000 km^2 and is a Late Paleozoic, Mesozoic, and Cenozoic compound basin. The primary gas source strata are the Upper Permian system, Triassic system, and Middle and Lower Jurassic system. The hydrocarbon source rock has a total thickness of about 1,200 meters. The extent of evolution of the hydrocarbon source rock: the Upper Permian series is in the mature to highly-mature stage and the Triassic-Jurassic system is in the immature to mature stage. The basin mainly generated only oil with some auxiliary generation of gas. It is a basin with relatively small long-term gas-bearing prospects.

E. Yining Basin

This covers an area of 17,000 km^2 and it is a Late Paleozoic, Mesozoic, and Cenozoic compound basin. The gas source strata are the Lower Carboniferous series, Upper Permian series, Middle and Upper Triassic series, and Jurassic system. The primary gas source strata is the Upper Permian series. The extent of evolution of the hydrocarbon source rock: the Carboniferous and Permian systems are in the mature to highly-mature stage and the Triassic and Jurassic systems are in the low maturity to mature stage. This indicates that the Carboniferous and Permian systems may have generated oil and gas and that the Triassic and Jurassic systems were only capable of generating oil and associated gas, so it is a basin with relatively small long-term gas-bearing prospects.

F. Jiuxi, Santanghu, Minhe, and Badin Jaran-Tenger Basins

Because the extent of hydrocarbon source rock evolution is relatively low, these are mainly oil-bearing basins with rather poor long-term gas-bearing prospects, so they are not described individually.

Navy Researches Use of C5 as Fuel

926B0108B Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 15 Jul 92 p 3

[Article by Guo Xinzheng [6753 2450 1813]]

[Text]C5 home-use liquid fuel, unknown elsewhere in the world, has been for 3 years a research target for research scientists at the Shanghai Marine Energy Development Department of the PLA Navy. Research has been successful and its achievements have passed ministry level inspection. In mid-June, 4,000 residents of Shanghai have cast off the troublesome briquette stoves to become China's first happy users of C5 home-use liquid fuel. The leaders and specialists of the Ministry of Construction and the Shanghai Municipal Government have given their high praise for this scientific research achievement.

After the C5 home-use liquid fuel is extracted from a petrochemical fuel and made up by a special chemical formula, it is superior to other residential fuels, having a low boiling point, low pressure, high heating value, and is non-toxic and non-polluting.

C5 is a by-product of petrochemical processing, and because it does not evaporate readily under normal temperatures and pressures it remained for a long time of little use. Research scientists of the Navy's Shanghai Marine Energy Development Department conducted repeated practical testing, and in the end, several hundred Chinese households became the first to taste C5's. According to the findings of the Shanghai S&T Information Institute, this scientific research achievement is the first of its kind in the world.

Three Western Basins To Give Big Boost to Crude Production

926B0123D Shanghai JIEFANG RIBAO in Chinese 16 Aug 92 p 1

[Article by reporter Zhang Chaowen [1728 6389 2429]: "China's Crude Oil Output Increases Substantially, Oil and Gas Exploration in Three Big Basins Leaps Up to a New Stage"]

[Text] Oil and gas exploration in western China's three big world- renowned basins recently reported news of success. There have been successive discoveries of oil and gas-bearing structures with very good prospects at Tarim, Junggar, and Turpan-Hami. Crude oil production has begun leaping up to a new stage and the vast basins of western China have become realistic replacement regions for increasing oil and gas reserves and output in China.

According to the China Petroleum and Natural Gas Corporation, the successive achievements in oil and gas exploration in the three large basins of western China provide a reliable resource foundation for sustained growth of China's crude oil output. Output has been stable during 1992 at the old Karamay oil region in Junggar Basin and the production scale of newly developed oil deposits has continued to grow. Daily crude oil output levels have now attained the requirements in the production plan for 1993. Construction is proceeding quickly in two new regions in Tarim and Turpan-Hami Basins and daily crude oil output has risen substantially over the same period in 1991. Total crude oil output from the three big basins may reach 8.7 million tons in 1992, an increase of 1 million tons over 1991, and may increase again by 2.3 million tons during 1993, making it a new oil region in China with yearly output in excess of 10 million tons.

Huizhou Oil Fields Surpass Crude Oil Production Target for First Half of Year

926B0112B Guangzhou NANFANG RIBAO in Chinese 2 Jul 92 p 1

[Text] Up to 30 June, the total crude oil production of the Eastern Nanhai Petroleum Company in the joint exploration project with ACT at the Huizhou 21-1 and 26-1 oil fields reached more than 1.50 million metric tons, which fulfills 74 percent of the target for the year. Crude oil sales were close to 1.5 million metric tons. For this year, Huizhou crude oil production capacity has been strong, maintaining a high production time rate. At the Huizhou 21-1 oil field, after nearly 2 years of high production rate, the level of oil production management has been raised. Emphasis is now placed on the research of reservoir behavior and oil well production stimulation measures have been adopted with good results. The Field's cumulative oil production for the first half of this year reached 510,000 metric tons, fulfilling 64 percent of the target. For the Huizhou 26-1 field, the cumulative production broke the one-million-metric-ton mark, fulfilling 80 percent of this year's target.

Changqing Crude Oil Production Reaches Record Level

926B0114D Lanzhou GANSU RIBAO in Chinese 13 Jul 92 p 2

[Article by Yang Wenli [2799 2429 4409]: "Changqing Crude Oil Output Sets New Record, Scope of Oil and Gas Exploration Expanded, Several Prospective Wells Drilled"]

[Text] Changqing Oil Field relied on advanced science and technology during the first half of 1992 and used the motive power of reform to further expand the scope of oil and gas exploration, drill several prospective wells, and achieve the highest crude oil output level over the same period in past years.

Changqing Oil Field faced many unfavorable factors in production and while making a major effort to extend new technology and new techniques, it continually strengthened management of daily production, gradually perfected planning and management mechanisms, accelerated the course of reform of all systems at the oil field, implemented an economic contractual responsibility system at all levels, and motivated the labor and production initiative of employees. By June 1992, they had completed a total of 3,318 kilometers of seismic profiles and a drilling footage of 291,630 meters, equal to 58.7 percent and 54.5 percent, respectively, of the yearly plan. Total crude oil output reached 813,162 tons, an increase of 49,338 tons over the same period in 1991.

Erlian Field Takes Steps To Maintain Flow of Crude

926B0123C Hohhot NEIMENGGU RIBAO in Chinese 10 Jul 92 p 2

[Article by reporters Zhang Pingsuo [1728 1627 6956] and Long Man [7893 3341]: "Erlian Oil Field Adopts Measures To Increase Crude Oil Output"]

[Text] Faced with low pressures, low permeability, complex oil pool categories, substantial difficulty in development, and other problems, Erlian Oil Field fully mobilized the initiative of its S&T personnel and did conscientious analysis of strata conditions and adopted measures adapted to local conditions to open a positional war for comprehensive improvement at the oil field.

The four oil deposits and six oil pools that Erlian Oil Field has already developed have different lithologies. From 25 May to 10 June 1992, they first worked on unfavorable factors at the Mengulin oil deposit like thin strata, great difficulty in stabilizing output because of the lithology of the sandstone and conglomerate rock, rapidly increasing water content, and so on in adopting measures focused on small sandstone pressure cracking in conjunction with chemical reagents including going into operation and shifting to injection, supplementary boreholes, regulation of parameters to increase liquidity, chemical water blockage, and so on in undertaking a positional war with many types of troops by using S&T measures to increase oil output. During the implementation process, they handled matters strictly according to procedures, implemented on-site supervision, and ensured project quality.

By adopting a series of measures and doing the construction meticulously, they accelerated the pace of construction, conserved costs, increased economic benefits, and attained a 100 percent success rate for pressure cracking in 21 wells at Mengulin oil deposit. Average daily crude oil output increased from 780 tons during the middle third of May 1992 to the present 962 tons.

Pinghu Oil and Gas Field Development Enters Implementation Stage

926B0120A Shanghai WEN HUI BAO in Chinese 30 Jul 92 p 1

[Article by reporters Lu Yongfeng [4151 3057 6912] and Chen Wei [7115 1919]: "Pinghu Oil and Gas Field Development Enters Implementation Stage, After Project Is Completed It Will Lead the Way in Achieving a Complete Shift to Gas for Civilian Fuel in Pudong New Zone and Lay a Foundation for Basically Achieving a Complete Shift to Coal Gas for All of Shanghai Municipality"]

[Text] We learned on 29 July 1992 at a press conference at the Shanghai Petroleum and Natural Gas Company Ltd. (Preparatory) that after receiving approval by the State Council, the State Planning Commission has formally approved the "Project Proposal for Early Development of Pinghu Oil and Gas Field in the East China Sea To Supply Gas-Fired Projects in Shanghai Municipality". The Shanghai Public Utilities Management Bureau, Shanghai Marine Geology Survey Bureau, and East China Sea Petroleum Company signed the "Joint Management Contract" on 28 July 1992 to jointly establish the Shanghai Petroleum and Natural Gas Company, Ltd. and the establishment of the board of directors has been announced. This is an indication that development of Pinghu Oil and Gas Field in the East China has entered the project implementation stage.

Over the past several years, the Ministry of Geology and Mineral Resources has carried out a large number of oil and gas surveys and exploration in the marine area of the East China Sea and has discovered some structures at Pinghu and nearby (in the sea about 400 kilometers southeast of Shanghai) that have oil and gas reserves with development value. After the establishment of the Shanghai Petroleum and Natural Gas Company, Ltd., it will mainly be involved in developing petroleum and natural gas in the Pinghu Oil and Gas Field in the East China Sea (on the continental shelf of the East China Sea about 370 kilometers southeast of Nanhuizui at Shanghai). The total investment in this project is 2.2 billion yuan renminbi and an effort will be made to place it into operation by the end of the Eighth 5-Year Plan. Its daily output of 800,000 to 1.2 million cubic meters of natural gas (equivalent to 2 to 3 million cubic meters of urban coal gas) may provide stable supplies for 15 years, during which time 1.6 to 1.8 million tons of condensed oil and crude oil may also be extracted. According to the feasibility report, the capital construction program for Pinghu Oil and Gas Field is to build a fixed integrated platform on the oil and gas field. After the natural gas, crude oil, and condensed oil extracted from the well is processed on the platform, it will enter an oil and gas processing field on the upper bank of Nanhuizui at Shanghai via a 365 kilometer long seabottom pipeline and provide civilian fuel gas, liquified petroleum gas, stable crude oil, and other products.

After this project is completed, it will lead the way in achieving a complete shift to gas for civilian fuels in Pudong New Zone and lay a foundation for basically achieving a shift to coal gas for all of Shanghai Municipality by the end of the Eighth 5-Year Plan. It will also alleviate the energy resource shortage situation in Shanghai Municipality and make a transition of epochal significance in Shanghai's fuel structure, and it may reduce urban pollution and clean up the natural environment.

The establishment of this project has created a vanguard for local areas in leading the way in integrating with central enterprise and institutional units to engage in marine oil and gas development and will move Shanghai into the vanguard of high S&T for marine engineering.

Jinzhou 20-2 Field Now Producing

926B00119B Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 12 Aug 92 p 1

[Article by reporters Zhang Hongwen [1728 1347 2429] and Xu Qingliang [1776 3237 0081]: "Jinzhou 20-2 Gas Field Placed Into Operation, First Marine Gas Field Where China Did Its Own Exploration and Development"]

[Text] Petroleum and natural gas hidden at the bottom of the sea in Liaodong Bay in the Bohai Sea passed through a 48.6 kilometer seabottom pipeline on 10 August 1992 to a marine gas field oil and gas processing plant located in Xingcheng City, Liaoning Province. With this, the first marine gas field where China did its own exploration and development—Jinzhou 20-2 Condensed Gas Field—was completed and placed into operation.

This gas field can produce a daily output of 1.5 million cubic meters of natural gas and 413.6 tons of light oil.

As a key engineering project during China's Eighth 5-Year Plan, the total project investment was more than 2.4 billion yuan renminbi. The gas field is divided into three parts, upstream, midstream, and downstream. The upstream part is located in the sea in the northeastern part of the Bohai Sea and the gas field is distributed over an area of about 50 square kilometers. The midstream part is located at the oil and gas processing plant at the foot of Xia Shan in Xingcheng City, Liaoning Province and can do processing to produce six types of products: methane, ethane, propane, butane, liquified petroleum gas, and light oil. The downstream part is the large Jinxi Chemical Fertilizer Plant in Jinxi City, Liaoning Province. After being supplied with raw material by the midstream oil and gas processing plant, it can produce 320,000 tons of synthetic ammonia and 520,000 tons of urea a year.

The placing into operation of this marine gas field is an indication that China's marine petroleum industry has climbed up to a new stage and shows that China now has the capability of building marine oil and gas fields according to international regulations.

China Signs Nuclear Energy Pact With Iran

40100079C Beijing CHINA DAILY in English 11 Sep 29 p 1

[Article by Chang Hong]

[Text] China and Iran signed a nuclear co-operation pact yesterday in Beijing with both sides reiterating that their co-operation in the nuclear field will be solely for peaceful purposes.

Chinese President Yang Shangkun and visiting Iranian President Akbar Hashemi Rafsanjani last night witnessed the official signing ceremony held at the Diaoyutai State Guesthouse.

The pact states that the co-operation between the two countries in the field of nuclear energy will be wholly for peaceful purposes and such co-operation is an important factor contributing to the social and economic development of the two countries.

Both sides are convinced that wide-ranging co-operation in this field are good for their bilateral ties, the agreement added.

Meanwhile, Chinese Premier Li Peng told Rafsanjani that China is "willing to consider providing Iran with a 300-megawatt nuclear power plant" in light of its compliance with the terms of the International Atomic Energy Agency (IAEA) regarding inspection and safeguards as well as China's principle governing nuclear exports.

In his talks with Rafsanjani yesterday afternoon, Li said that China wishes to co-operate with Iran in the peaceful use of nuclear energy.

According to a Chinese Foreign Ministry official present at the talks, Rafsanjani said that Iran is a signatory of the Non-Proliferation Treaty of Nuclear Weapons and subjects all of its nuclear installations to the IAEA's inspection and supervision.

He said his country hopes that China will help in the construction of nuclear power plants and will work with Iran in the peaceful use of nuclear energy.

Their talks covered both Sino-Iranian ties and international issues of common concern, the Chinese official said.

On the international situation, Li said the world is in a turbulent state and hegemonism and power politics still exist.

On bilateral trade ties, Li said the Chinese Government encourages Chinese enterprises and relevant departments to talk about details with their Iranian partners on economic co-operation projects and trade.

In a related development, Rafsanjani met with Chinese Communist Party General Secretary Jiang Zemin in Beijing yesterday.