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CHINA: Energy

Deepening Reform, Accelerating Energy Development

40130066 Beijing KEJI RIBAO in Chinese 5 Jan 89 p 3

[Text] **Reform Promotes Rapid Development of Energy Resources**

Since 1979 China has carried out a new national policy of openness toward the outside and rejuvenation at home and a situation has appeared in national economic development which is rare in history for its promise. The positive economic development situation has advanced the growth of the energy industry, while conversely, the rapid rate of increase in energy production has provided a material foundation for national economic development. The overall amount of energy produced nationwide for 1986 was equivalent to 881 million tons of standard coal, an increase of 236 million tons of standard coal over the 645 million ton total of 1979. This represents an average annual increase of 4.6 percent. The production of raw coal in 1986 totaled 894 million tons, an increase of 259 million tons over that of 1979. Crude oil production rose from 106 million tons in 1979 to 131 million tons in 1986, an increase of 25 million tons, ranking fifth worldwide. Electric power generation reached 449.5 billion kilowatt-hours in 1986, an increase of 167.5 billion kilowatt-hours compared with 1979, representing an average annual rise of 6.9 percent. Simultaneous with the strengthening of energy growth, energy conservation work was also increased. During the 8-year period from 1979 to 1986, the energy conserved nationwide was equivalent to 160 million tons of standard coal. The basic factors behind these achievements of the energy industry lay in adherence to reform. In general, implementation of reform proceeded from the following points:

1. Reform of management of the economic plan. First, with respect to that investment for energy construction which is included in state planning, a change has occurred from the uncompensated use of the past to compensated use, and different interest rates are set for different businesses. This not only increases the responsibility of the enterprises, it also brings pressure and incentive to bear on construction and on production management. Second, mandatory plans have been gradually cut back and guiding plans have been expanded. Unified state planning and distribution targets for coal, crude oil (finished petroleum products), and electric power have been reduced. More and more energy products are entering the market and undergoing adjustment according to the economic laws of the market with the state providing macroscopic and business-oriented guidance. Third, preparatory work for middle to large-sized energy construction projects must be well executed, including preliminary feasibility studies and feasibility studies. Also, the project must be evaluated by an engineering consultant organization before the state can carry out examination and ratification. In these ways, the lopsided approach of the past which stressed only technological issues while ignoring economic and social benefits, has been greatly changed.

2. Reform of mechanisms. In the past, investment and construction to provide the energy needed by each province, municipality or industry was basically arranged by the state. Distribution and supply was the responsibility of the state. At present, apart from continuing investments in energy construction projects by the state, localities, industries, enterprises, companies (conglomerates) and private individuals are being actively encouraged to participate in energy construction. In accord with reality a multi-industry, multichannel and multilevel situation in the growth of the energy industry has been created. The electric power industry has long emphasized concentration and unification, i.e., the traditional approach of the Ministry of Water Resources and Electric Power having sole responsibility for electric power while the power was consumed by everyone. Presently, each province and municipality is actively raising funds for the construction of power plants. Shanghai's Baoshan steel mill, Nanjing's Yangzi ethylene chemical plant, Shandong's Qilu ethylene chemical plant, the Daqing ethylene chemical plant in Heilongjiang and others have all built their own electric power facilities. The Huaneng International Electric Power Development Company uses foreign investment to purchase advanced foreign technology and power generation equipment. Absorption of domestic investment from localities to build a new group of power plants is yet another new approach to electric power.

3. Reform of design and construction work. In recent years, egalitarian treatment regardless of performance has been eliminated in the design and construction of coal, electric power and petroleum construction projects and a competitive bidding contract responsibility system has been actively promoted. This has yielded clear results. For example, the Lubuge hydropower station has utilized foreign investment from many channels including World Bank loans and aid from the Governments of Norway and Austria. Foreign specialists and high-level consultant groups were recruited, and advanced equipment and construction machinery from nearly 10 foreign companies of 7 countries has been purchased and introduced. Single project international competitive bidding on the water diversion project was implemented and the contract was ultimately awarded to the Taisei Company of Japan. The effectiveness of this method is very obvious.

4. Implementation of open policies toward the outside and exploration of all types of cooperation between the energy industry and foreign interests.

1) Foreign investment is actively exploited to compensate for inadequacies in domestic power industry funding. Examples include the use of World Bank loans in the construction of the Beilungang and Wujing thermal

power plants, the Shuikou and Daguangba hydropower stations, the Changcun coal mine in Shanxi and the exploration and development of the Jinzhou 20-2 oil fields.

2) All approaches to the introduction of advanced foreign technology, equipment and production management techniques are adopted such as using the goods exchange trade of the Soviet Union and East European countries to purchase 300,000-, 500,000- and 800,000-kilowatt generating equipment and delegating the design and feasibility studies of China's energy projects to foreign interests.

3) Exportation of coal as compensatory trade. An example is the construction of a power plant at Ligang in Jiangsu by the China International Trust and Investment Corporation and the Electric Light Company of Hong Kong in which China's side made remuneration in coal.

4) Chinese-foreign joint financing of energy project construction. For example, the Chinese-American joint financed and managed Pingshuo Antaibao surface coal mine (annual production capacity 15 million tons) which was completed and commenced production in July 1987.

5) Implementation of technological and scholarly exchange with foreign countries.

6) Export of energy. In 1986, 33.96 million tons of petroleum (including refined petroleum products) were exported along with 9.9 million tons of coal. China encourages the export of coal to earn foreign exchange.

In addition, there is the implementation of input-output general contracting in the coal industry, the implementation of output distribution with respect to petroleum and natural gas and the reform of electric power management mechanisms.

The Energy Situation Is Serious

Although China's energy industry has made a great deal of progress, it remains a limiting factor in the growth of the national economy and has not adapted to the power consumption requirements of economic growth and the lives of the people. The national per capita energy consumption for 1986 was equivalent to 800 kilograms of standard coal. On average, each person used 400 kilowatt-hours of electricity. This is relatively low when compared to world energy consumption levels. The electric power shortage in particular, has become extremely prominent. The electric power shortage has existed for over 10 years and has increased, not decreased in both scope and depth.

In the future, the energy problems will continue to be prominent. It is estimated that in the year 2000, the country will require the equivalent of 1.4 to 1.5 billion tons of standard coal. When analyzed from the energy supply side, at the time, production will be the equivalent of 1.4 billion tons of standard coal. If this target is to be realized, regardless of whether it is in coal, petroleum, natural gas, or electric power, the task will be formidable, a great deal of work is required. Apart from quantitative shortage, China's energy problem also includes poor quality (i.e., the proportion of secondary energy sources is small) and problems with the energy structure. Based on this characteristic of China's energy resources, at present coal accounts for over 70 percent of total energy production and consumption. It is estimated that by the end of the century this kind of energy structure centered around coal will be difficult to change. Coal is a solid fuel and difficulties of processing and use are greater. Its efficiency of utilization is low and serious environmental pollution is created through its development and exploitation. At the same time, the distribution of major deposits is located in the Shanxi, Shaanxi, and western Inner Mongolia regions which contain roughly over 60 percent of national coal resources, while the economically developed East China, North China and other eastern regions lack coal resources and have great need of them. This creates the necessity of transporting large amounts of coal from Shanxi, Shaanxi, and Inner Mongolia to the east. The pressure this places on transportation is very great. From a farsighted perspective, by the end of the century, the environmental effects and transportation problems brought about by this kind of energy structure centered around coal may be even more serious, even to the point of becoming intolerable.

Deepen Reform and Accelerate Energy Development

1. Research and formulate an industrial structure and policy which is in accord with China's national circumstances. An analysis from the perspective of the role of energy yields the following: An indicator of a country's economic efficiency is the energy consumed per unit of gross national product. According to statistics, for every 10,000 U.S. dollars of gross national product, energy consumption in China is equivalent to 27.5 tons of standard coal, while in industrially developed countries this figure is 4 to 5 tons of standard coal. An important factor in China's high energy consumption is incomplete rationalization of the industrial structure and inadequate coordination of development between the different industries. Therefore, in the process of deepening reform, an industrial structure in accord with national circumstances must be researched and formulated, and the guidance of industrial policy and market adjustment relied upon to rationally apportion resources. In this way, for an equal amount of energy consumed, the creation of more output value and higher economic returns can be realized.

2. Rely upon technological progress and take the route of beneficial development of the economy. Energy consumption is high and waste is serious. In the future, those routes to economic development which pursue only output value and speed without stressing benefit should be changed, along with the purely intensive form of

reproduction. The way to extended reproduction should emphasize internal factors. Within each business, reliance should be upon scientific progress; new technology and new materials should be adopted to reduce energy demands.

3. Adjustment and development of energy pricing. That China's energy pricing is low is generally recognized worldwide. Due to low pricing, the entire coal industry is suffering serious losses. These losses totaled 114.9 million yuan in 1986. The investment-to-profit ratio of the electric power industry is falling sharply, already dropping from 11.2 percent in 1980 to 5.6 percent in 1986. If this were to continue for several more years, this entire industry will also show deficits. The petroleum industry is also facing losses. Under these circumstances, it is very difficult for the energy industry to progress, therefore, adjustment and reform of energy pricing is essential to bring into better balance the price ratio between energy products and other products.

4. Investment reform. Presently, a major problem in energy development is inadequate funding. The cycle of energy construction is long and investment concentrated, therefore, its production and construction require stable sources of funding. If the energy investment situation is to be improved, China's fixed asset investment mechanism must be thoroughly transformed. This will involve the investors, investment policy, financial markets and investment and bankruptcy laws. A new and complementary system must be researched and created.

5. New concepts must be established and problems of reform and deregulation under the new circumstances researched. Energy issues involve each sector of the economy, the construction period for energy projects is lengthy and the investment is large, these characteristics necessitate a systematic, long-term, benefit-oriented and global conceptualization when studying energy problems.

Economic Growth Far Outstrips Capacity of Energy Sector

40100033a Beijing XINHUA in English 1552 GMT 20 Jan 89

[Text] Beijing, January 20 (XINHUA)—China has to take effective steps to resolve the problem of energy shortages mainly caused by economic overheating.

This was the assessment of Zou Jiahua, state councillor, addressing a national meeting on energy production today. He said that energy shortages have resulted in particular from the rapid growth of processing and rural industries.

Minister of Energy Resources Huang Yicheng said: "For many years, the increase of energy production has been left far behind that of economic growth in China."

During the first 2 years of the Seventh Five-Year Plan (1986-1990), Huang said, overall production rose by 34 percent while the production of energy resources like coal, oil, and gas increased only by 3 percent a year.

Moreover, overloaded railways have added to the demand for energy and utilized valuable coal supply routes, he said.

Last year, the four national electricity networks only received 92 percent of the coal which they had planned for.

Huang said that many places are facing shortages of coal, oil, and electricity.

The Ministry of Energy Resources suggested that the government should improve coordination of coal production, transportation and supply. The ministry said it would aim to increase production of coal in eastern China where transportation problems are not so acute.

The minister called on all electricity power stations to upgrade their generating equipment to economize on the use of coal.

He also called on local governments to rectify those smaller enterprises with high energy consumption but with low efficiency.

As to the future, Huang said, "China will continue to develop coal production as the main means of generating electricity, but will also develop oil and gas, and nuclear and hydropower."

Huang said that China has to produce 1.4 billion tons of coal, 200 million tons of crude oil, 30 billion cubic meters of gas, hydropower equal to 90 million tons of coal, nuclear power equal to 12 million tons of coal, and 1,200 billion kilowatt-hours of electricity by the end of this century to meet the needs of industry and agriculture. These are planned to increase by about 6 percent a year.

The proportion of coal in energy production will be reduced from the present 73 percent to 70 percent, he said.

Curb in Industrial Growth Urged To Ease Energy Shortage

40100038 Hong Kong CHINA DAILY in English 21 Mar 89 p 4

[Excerpt] Effective measures must be taken to support the development of energy, transport, communications and raw materials industries, Premier Li Peng said.

He stressed that, during the current period of economic retrenchment, construction of key projects must be speeded up to build up these industries to make best use of China's limited financial and material resources.

In the energy sector, Li said, equal importance will be given to development and conservation.

In the coal industry, priority will be given to the construction of new mines whose products are solely distributed by the State. The Government also will support and guide a sound development of local coal mines, Li said.

In the petroleum industry, Li called for maintaining the output of existing oil fields while exploring for new deposits and opening up new oil fields.

Li, who once served an electrical engineer, called for all quarters to contribute to the development of electric power which is now in short supply.

Iron and steel producers should, while expanding production, readjust their product mix, improve quality, add varieties of products, raise the rate of up-to-standard products and lower consumption, Li said.

He said that the strain on transport is a severe problem in China's economic and public activities and that development in this sector should be placed high on the agenda.

Li said an increase in the capacity of railways and highways for the shipment of coal out of Shanxi Province is urgently needed.

In the construction of highways, Li said, more trunk highways will be built and the upgrading of existing highways will continue.

He said attention also will be paid to the expansion of port facilities, inland water transport, civil aviation and posts and telecommunications. Li also told the session that the growth of processing industries in China must be curbed to suit the growth of agriculture, energy, raw materials and transport capacities.

[Passage omitted]

Energy Industry To Lay Equal Stress on Growth, Conservation

40130068b Beijing RENMIN RIBAO in Chinese 24 Jan 89 p 1

[Text] State Council Premier Li Peng today, while listening to a status report on energy work at the National Energy Conference in Zhongnanhai, pointed out that China's energy development strategy should lay equal stress on growth and conservation to maintain the steady development of the energy industry.

Comrades Yao Yilin, Zou Jiahua and others also attended today's conference.

After listening to Minister of Energy Resources Huang Yicheng's report concerning the present energy situation and development plans for the energy industry, Premier Li Peng said that the energy industry has achieved a great deal in the past several years, particularly last year's construction of 10 million kilowatts of total installed capacity. Even from a worldwide perspective this is impressive. The accomplishments of the energy industry have supported reform, deregulation and national economic construction while, at the same time, reform and deregulation have brought vitality to the energy industry. In recent years the petroleum industry has implemented an industry-wide, all-round contract system. The coal industry has adopted large, medium and small-scale policies of simultaneous development. State-run coal mines have also implemented an all-round contract system. With respect to coal supply, unified accounting methods have been implemented which cover production, transportation and sale. In the field of electric power construction, concentrations of funds for projects have been created and management system reform is being executed. These reform measures have effectively advanced the development of the energy industry.

According to Li Peng, the causes of the present energy shortage are very complex. The coal mines, railroads and power plants all have problems, however, the major contradiction is still inadequate rail transport capacity.

Li Peng also pointed out that unified accounting must be implemented with respect to the transport of coal from Shanxi Province. Regardless of whether the coal is that which is planned or falls outside of planning, it all must be included in national transportation planning. In this way, not only can consumers be supplied but also the corrupt practice of using railroad cars for private gain can be eliminated.

It was particularly emphasized by Premier Li Peng that the fundamental problem at present is the imbalance between the manufacturing and energy industries. The expansion of China's capacity for electricity consumption has greatly outstripped the expansion of its electric power generating capacity. Manufacturing industries should expand in accord with the capacity to supply energy. To expand industrial output value, many localities pressure the power plants by demanding more power generation. At times this violates regulations. The power network is an independent accounting economic entity which should generate electric power in a planned fashion. In the future, all levels of government must support the power network and must not interfere in its business of normal production.

How should the current tight energy situation be regarded? According to Li Peng, to say that the power industry has retarded national economic development is certainly not entirely accurate. The pace of China's economic development has been exceptionally rapid in recent years. The current controlled rectification appropriately reduces the rate of economic growth. The rate of growth of the national economy should be maintained at between 7 and 8 percent. This pace can guarantee a four-fold increase by the end of this century. Growth of

the energy industry should proceed based upon this pace, otherwise, it will exceed the national capacity. The state and each province, municipality and autonomous region should devise programs based on this principle.

Li Peng indicated that in the future, with respect to the energy industry, we must with one hand grasp growth while with the other we grasp conservation, equal stress should be placed on each. This policy should be thoroughly carried out over the long term.

Li Peng said that there is too great a disparity between our energy consumption levels and those of the advanced countries. This constitutes waste, but it is also where potential exists. In the future, conservation should be included in the contract targets of enterprises, reform of energy conservation technology should be emphasized and an atmosphere conducive to energy conservation should be created in the society. Energy conservation should concentrate on key areas. Nationally, there are 400,000 small boilers which burn 300 million tons of coal per year. Thermoelectric unified production, concentrated heat supply and other methods should be used to upgrade small boilers. This can save coal and reduce pollution.

While discussing ways in which to develop the energy industry, Li Peng said that in the future, the coal industry will continue to rely on two legs for its progress: One is the growth of state-run coal mines and the other is support for local small to mid-sized coal mine production. Many problems were encountered in the development of middle and small-sized coal mines, however, we cannot allow difficulties to dissuade us from pursuing something worthwhile. The development policy must be further perfected and given a legal framework to better support the growth of small coal mines. Nevertheless serious detriment to resources or to the welfare of workers must be resolutely suppressed. The petroleum industry must maintain and strive to surpass its growth rate of 3 million tons per year, relying primarily on newly discovered reserves in the eastern oil fields to raise production. The nuclear industry in this century will be in a formative period. We should strive for quality in the construction of the two large nuclear power plants, thereby ensuring the quality of nuclear power construction.

In conclusion, Comrade Li Peng said that the most important instrument in controlled rectification is contraction of the scale of capital construction. That which should be cut back must be resolutely cut back. This year the energy industry also must do its utmost within the scope of existing plans. He requested that everyone take a clear view of the situation, work hard, bear the difficulties together and effectively execute the work of controlled rectification.

Conversion From Oil to Coal Said Successful

40130060a Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 5 Jan 89 p 1

[Text] In the past 7 years, China's work to convert from oil to coal has yielded an accumulated savings of 43.3 million tons of oil, more than fulfilling the oil conservation plan as set forth by the State Council. Beginning in the 1970's, due to mistakes in policy-making, China's oil consumption increased abruptly. At its peak, annual oil consumption reached 40 million tons. Based on the difference between oil and coal prices at that time, this was equivalent to the useless burning of 5 billion U.S. dollars. In order to reverse the irrational condition of the energy consumption structure, in 1981 the State Council established the coal conversion specialized fund office and decided that within 10 years, oil consumption should be reduced to 20 million tons. In 1985, nine Huaneng power companies were also set up, to transform oil-burning machinery to conserve fuel oil and to develop electric power, coal, steel and concrete resources. Today, these nine companies have accumulated 16.5 billion yuan in funding and have earned 3.2 billion U.S. dollars in foreign exchange. It is reported that the State Council has decided to extend the mission to convert from oil to coal to the end of this century, further reducing oil consumption by 10 million tons. Part of the oil which is saved will be exported, while part will go to increasing domestic supplies. The accumulated funds will be utilized for development of the energy and transportation industries.

Key to Three Gorges Decision Said To Be Population Resettlement

40130060b Beijing BEIJING KEJI BAO in Chinese 5 Oct 88 p 3

[Article by Ministry of Water Resources and Electric Power Senior Engineer Li Yupu; first paragraph is BEIJING KEJI BAO introduction]

[Text] The scale of flooding caused by Three Gorges Project and the number of dislocated people which will result is second to none in the world. Based on the analyses of experts, if the water impoundment level is 175 meters, the population directly affected by flooding will total about 730,000, while those actually in need of relocation will number close to 1.2 million. The cost of this accounts for 34.6 percent of overall project cost (in the 170-meter plan) and for every year of delay, without considering price increase factors, relocation costs increase by 7.6 percent. However, the relocation task of the Three Gorges Project is not an insurmountable obstacle. With appropriate policy, suitable methods and through the cooperative efforts of the cadres and people of the vast reservoir district, it can be accomplished.

The scale of the Three Gorges Project has captured the world's attention, the flooding and the relocation of people which will result are second to none in the world. In all the arguments concerning the Three Gorges Project since the founding of the country, the problems of inundation by the reservoir and resettlement of the people have invariably been placed in a position of extreme importance in the considerations.

Because of economic and cultural development factors, the Chuanjiang region's densely populated areas are all concentrated on the banks of the Chang Jiang. This is exactly the area to be flooded by the reservoir. The population density in the area to be flooded exceeds 1,000 people per square kilometer. Sixty percent of the population below the flood line is urban. Apart from the population of those areas to be submerged, a second dislocated population from land occupied by the resettlement of people from flooded areas; an increased urban population due to adjustment of city functions; a population of urban residents who, due to problems handed down by society, have no permanent residence; workers and families who must follow factory relocations and a newly added population during the construction period, are all included in the program. According to the analysis of specialists, the actual population in need of resettlement will exceed the statistical population of the area to be flooded by about 50 percent. For example, at a reservoir level of 175 meters, those people directly affected by flooding would total 730,000, while the actual number in need of relocation would approach 1.2 million.

Compensation for flooding by the Three Gorges reservoir accounts for a very large proportion of total project investment. Based on analyses of initial design information, at a water level of 150 meters, relocation costs account for 22.5 percent of total project investment, equal to 2.6 times the cost of the large dam. At a water level of 160 meters, the percentage becomes 27.3 percent, or 3.4 times the cost of the large dam. At 170 meters, the figures become 34.6 percent and 5 times, while at 180 meters (flood control limits water level of 150 meters) the figures are 38.7 percent and 6 times. As the water level is raised, the proportion of total investment accounted for by relocation costs becomes larger.

It must also be pointed out that relocation costs increase with time. Analyzed on the basis of a preliminary investigation by the author, for every year of delay the relocation costs of the Three Gorges Project, without considering price increases, will rise by 7.6 percent. The reasons for this are as follows: First, whether or not the project is begun, the population of the areas to be flooded and the quantity of goods produced in those areas increases day by day. Second, as the lives of the people are improved, the compensation cost for each flooding index increases correspondingly. Third, as the economy and culture becomes more developed, the task of resettling people becomes more and more complex and the cost of handling these problems becomes higher and higher. The currently stated relocation cost of over 10 billion yuan refers to the quantity of goods produced in 1985. For 1986 the price was not changed and in 1988 these numbers no longer apply.

Because of the formidable nature and complexity of resettling people, the number of people to be moved and the difficulty involved have become a major limiting factor when deciding the water level of the Three Gorges Project. In 1956, when key planning and research on the Three Gorges was carried out, the plans considered were for water levels of 200, 220, and 235 meters. Plans for levels below 200 meters were not considered at the time. At a meeting of specialists in May 1983, the primary level considered was 150 meters. From this it can be seen that the range of choice of water levels for the Three Gorges Project will shrink with the passage of time. Now if one were to suggest a scheme for over 200 meters, everyone would certainly consider it a joke. During debates hosted by the State Planning Commission and the State Science and Technological Commission, those comrades who did not advocate the Three Gorges Project humorously termed their plan the "Zero" plan. It seems to me that if this stalemate continues, there will come a time when the "Zero" plan will have to be implemented.

Since the resettlement of people is the key to deciding policy for the Three Gorges Project a highly responsible attitude should be taken in carrying out practical and realistic debate. It should be remembered that during the debate hosted by the State Planning Commission and the State Science and Technological Commission, the leadership proposed the "Three Responsibilities." It was required that participating specialists strive to achieve "Responsibility to the People, Responsibility to Science and Responsibility to History." In the course of the Three Gorges debate over the past 5 years, I have learned that fulfilling the "Three Responsibilities" is definitely no simple matter. I am willing to frankly and sincerely indicate here that the resettlement work of the Three Gorges Project is not an insurmountable obstacle, that with appropriate policy and suitable methods and through the energetic cooperation of the cadres and the people of the vast reservoir area it can be accomplished well. However, our minds must be clear and sober, we must fully appraise the complexity and enormity of the Three Gorges resettlement problem. At present the primary danger is blind optimism and allocation of inadequate resettlement funds. In 1983, it was estimated that for the 150-meter plan, resettlement costs would total 1.67 billion yuan, while in 1985 the resettlement costs under the same 150-meter plan had increased to 3.547 billion yuan. Current estimates place resettlement costs for the 175-meter plan at over 10 billion yuan, the difference over time is very great. There are many aspects to the cause of this, but it cannot be denied that funding is too tight and advantageous elements receive estimates which are biased upward (such as developmental resettlement rolling appreciation functions and assessment of environmental capacity). Inadequate estimation for disadvantageous elements is also an important factor. As specialists participating in the debate on the Three Gorges Project, the state has entrusted us with a mission of such importance that proposed arguments must be tenable and must stand the test of time.

The resettlement of residents of an area to be flooded by a reservoir, the towns and cities, factories and mines, enterprises and business organizations and the many

rural villages, their compensation and the recovery and perfecting of the function of the entire society is a worldwide problem. The issue of compensation for reservoir flooding has become a limiting factor in the development of hydropower in a great many countries. In China, due to high population density, uneven socioeconomic development, a shortage of land, traditional customs, and other factors, resettlement difficulties are even greater. In the over 30 years since the founding of the country, China has constructed a total of 86,000 large, middle, and small-sized reservoirs, in all relocating over 10 million people. One-third of these people even today still have one or another type of residual problem. Their lives are relatively difficult. In the Three Gorges Project the population is of higher density and the difficulty is greater. During the peak years 100,000 people must be resettled annually.

In order that those in need of resettlement from the reservoir area will obtain better placement, the central leadership has proposed a set of new resettlement policies and tentative plans. These tentative plans, in broad outline, include the following features: First, implement a policy to guarantee food supplies, thus freeing the flooded-out farmers from the limitations of providing their own food and allowing them to engage in the development of a commodity economy, opening up their way of life. Second, fully exploit the resource advantages of the Three Gorges region. While the advantageous opportunity created by constructing the Three Gorges Project, and a concentration of state investment exists, the local economy should be promoted by development of industries such as crop and plant cultivation, the raising of fish and poultry, construction and construction materials, mining, food, tourism and its tertiary industries. Through these industries, income can be increased and investment accumulated. In the process of economic development the people can be settled and jobs found. Third, integrate the flooded regions and those areas receiving people for resettlement into a single socioeconomic system and bring the dislocated people into that system's social, economic and cultural development program. Fourth, the period from preliminary preparations for the Three Gorges Project to the time when water is stored in the reservoir and power is generated encompasses 10 to 20 years. Therefore, resettlement funds can be applied in two parts, one part to be used to compensate for movement of assets to be flooded and one part to be used for the economic development of businesses, causing it to appreciate in a rolling fashion, expanding the financial strength of the relocated people. Fifth, divide resettlement investment into two steps. The first, prior to the beginning of construction and during the construction period, would encompass that part of the total project investment devoted to resettlement. The other would be a manifestation of profit-sharing from income earned after commencement of power generation by the project. Profit-sharing from power generation would be distributed, according to the size of the losses incurred from flooding, to the counties and municipalities assuming responsibility for dislocated people and would be used as development funds. After this tentative plan was proposed it evoked a great deal of interest in the academic world. One after another, different opinions were advanced. I personally consider that, as with other complex socioeconomic systems, developmental resettlement has a rigid internal structure and stringent external conditions. Developmental resettlement is not such that it could be implemented under any conditions of reservoir dislocation and even less is it automatically effective upon adoption. I consider early investment in resettlement, a period of usable time prior to the storage of water in the reservoir, a scientific evaluation of exploitable resources and markets, a qualified labor force and qualified management to be five prerequisites for the realization of developmental resettlement. If any one of these is lacking, developmental resettlement cannot be realized. Second, in evaluating the success or failure of developmental resettlement, whether or not the economic results produced by the mutual function of the above five prerequisites is greater than the sum of the investment in resettlement plus the interest lost over the period of investment must be examined. If the former is greater the plan is successful while if the latter is greater the plan is a failure. Third, in addition to possessing the above-mentioned internal conditions, developmental resettlement also requires the following external conditions: 1) An effective, unified relocation management organization; 2) implementation of a unified program, a unified policy, unified leadership, unified execution and unified management; 3) implementation of strict control over each of the floodings and objectives in the areas from which people are dislocated; 4) prompt apportionment of resettlement funds; and 5) legal guarantees over the application of resettlement funds to put an end to all leakage.

At present, what a great many people of the reservoir region eagerly hope for is an early policy decision and program determination on the Three Gorges Project, that is an end, as soon as possible, to the situation of delay and indecision. The Three Gorges debate has gone on for 30 years. Whether or not to proceed, when to proceed and which areas should be flooded? These questions remain to be answered. Who would be willing to invest here? The result has been stagnation in energy, transportation, basic industry and the investment environment. The economy has been in a long-term condition of malnutrition, so, from where will come competitive ability? Economic development and the advancement of the people urgently require scientific evaluation and early policy decisions.

Reforms Give Boost to Shanxi Power Industry

40130065a Taiyuan Shanxi Provincial Service in Mandarin 2300 GMT 30 Jan 89

[Excerpt] Yesterday the province took a big stride forward in the structural reform of the power industry, with the official founding of the Shanxi Provincial Electric Power Company, an economic entity that practices the principle of separation of government administration and enterprise management.

The province's power industry has been developing quite rapidly in the last 10 years of reform. By the end of 1988 the province's total electricity installed capacity was 5,070,800 kilowatts, making the past year the period with the highest growth rate in the power industry in the province. In the wake of economic development, however, the serious shortage of electric power remains unsolved, and the gap between the demand for and the supply of electricity is still widening.

In the final analysis, in order to ease the shortage of electric power, we need to step up the capital construction of the power industry and to increase the province's electric power installed capacity and power transmission and transforming capacity. The founding of the Shanxi Provincial Electric Power Company is just one important step toward the implementation of the State Council's principle for the structural reform of the power industry, which advocates the separation of government administration and enterprise management, the establishment of economic entities, the construction of integrated power supply networks, centralized control, and the unified development of the power industry. The founding of this company will give full play to the initiative of various sectors of the community in developing the power industry; widely pool investment from all sectors; help develop the power industry through various channels, at various levels, and in various forms; speed up the capital construction of the power industry; and ease the shortage of electricity in the province. [passage omitted]

Shandong Output Up 12 Percent Over'87

40130065d Jinan Shandong Provincial Service in Mandarin 2300 GMT 14 Jan 89

[Excerpts] Last year, Shandong power grid created new records in fulfilling its main tasks and targets in power output, newly installed power generators, and per-capita labor productivity. The annual power output reached 34.963 billion kilowatts, an increase of 12 percent. In power construction, this power grid succeeded in fulfilling its power capacity installation task of 1 million kilowatts, ranking it first among all provinces and cities throughout the country. [passage omitted]

The 300,000-kilowatt No 4 power generating unit of the Zouxian power plant, and the power generating units of the Huangdao and Liaocheng power plants each with a capacity of 12,500 kilowatts and the supporting power transmission and transforming projects will be completed and commissioned this year. [passage omitted]

Small Stations Account for One-Third of Nation's Total Hydropower

40100033b Beijing XINHUA in English 1500 GMT 30 Jan 89

[Text] Beijing, January 30 (XINHUA)—China built 645 small power stations last year, increasing installed capacity by 700,000 kilowatts, an official of the Ministry of Water Resources said here today.

He said this pushed the total installed capacity of small power stations to 12 million kilowatts, accounting for one-third of China's total hydroelectric power.

Last year when it was dry in most of China's southern provinces, these small power stations generated 300 million kWh.

The official said: "This has increased the power supply for rural areas and helped ease the nation-wide power shortage."

At present, country areas consumed 17 percent of China's total electricity. Small power stations supplied 33 percent of the counties and 42 percent of the townships.

According to statistics from the Ministry of Water Resources, some 500 million people in rural areas have an electricity supply while 250 million don't.

Work Progresses on 500MW Dongfeng Project

40130068a Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 1 Feb 89 p 1

[Text] Yesterday afternoon at 12:20 p.m. when a dump-truck unloaded the last truckload of large rocks into the gap in the supporting embankment, the incessant, surging flow of the Yachi river was finally bridged. The damming of the river, part of one of China's major construction projects—a hydropower station on Guizhou Province's Wu Jiang was successful on the first attempt.

The Dongfeng hydropower station will be located on the Yachi tributary of the upper Wu Jiang in Guizhou Province on the border between Qingzhen and Qianxi counties, only about 88 kilometers from the provincial capital of Guiyang. It is yet another large-scale hydropower station in Guizhou on the Wu Jiang following the Wujiangdu hydropower station. Its total installed capacity will be 510,000 kilowatts and average annual generation will be 2.4 billion kilowatt-hours. After its construction the Dongfeng power plant will play an important role in advancing economic growth in Guizhou Province.

Contract responsibility for the construction of the Dongfeng hydropower station was assumed by the Ninth Engineering Bureau of the Ministry of Water Resources and Electric Power. The staff and workers of this bureau struggled day and night for 4 years, finally managing to dam the river 1 year ahead of schedule.

Work on 2600 MW Ligang Plant Begins

40130061a Shanghai JIEFANG RIBAO in Chinese 23 Dec 88 p 1

[Article by Cai Mingde [5591 2494 1795] and Chen Huizhong [7115 1920 5883]: "Construction Begins at Jiangsu's Ligang Power Plant, Now China's Largest Chinese-Foreign Joint Venture, Total Installed Generating Capacity To Be 2,600 MW"]

[Text] Construction of a key state project and China's current largest Chinese-foreign joint power venture, the Ligang Power Plant in Jiangsu, began on the morning of 22 December 1988 in Jiangyin City.

This power plant is located on the Chang Jiang and has convenient land and water communications. The planned total installed generating capacity at the power plant is 2,600 MW, surpassing China's largest power plant at present, the 1,000 MW Jianbi Power Plant in Zhenjiang. Construction of the project as a whole will be divided into two stages. The first stage will involve four 350 MW coal-fired generators. Two will be built during the first period of this stage of the project, involving an investment of more than 1.5 billion yuan. Two 600 MW coal-fired generators are planned for the second stage of the project. When the two 350 MW generators in the first period are completed, yearly power output will exceed 4 billion kWh. This can increase the value of industrial output in Jiangsu by 26 billion yuan and increase taxes and profits by 1.85 billion yuan.

This power plant is China's largest Chinese-foreign joint power project at the present time. It is a joint venture which will be managed jointly by the Xinli Energy Development Company of the Chinese Credit Corporation, the Jiangsu Investment Company, the Wuxi Local Power Company, and the Hong Kong Xinxiong Power Investment Company, Ltd. It will be built and run using advanced international technologies and scientific management methods. To assure that the Nos 1 and 2 generators in this project are completed and go into commercial operation in 1991, with approval by the state Ministry of Foreign Economic Relations and Trade, Chinese and foreign investors had discussions, after which they joined together to form the Ligang Electric Power Management Company for concrete responsibility over organization and guidance work related to construction of this project.

It also was learned that the main equipment at this plant, the gas turbine generators, electrical equipment, corresponding matching production equipment, boilers, and so on, will be imported from Italy, the United States and other countries. The Jiangsu Province Electric Power Construction Company has overall contractual responsibility for the project, and the Third Engineering Company of this company will be responsible for building the main part of the power plant.

Rong Yiren [2837 3015 0088], vice chairman of the Standing Committee of the National People's Congress and chairman of the board of the China International Trust and Investment Company, Huang Yicheng [7806 3015 6134], deputy minister of the Ministry of Energy Resources, Jiangsu Provincial Governor Gu Xiulian [7357 4423 5571], and others attended ceremonies marking the start of construction on 22 December.

Causes of Nation's Coal Emergency Explained

40130069a Shanghai WEN HUI BAO in Chinese
1 Jan 89 p 3

[Text] On 2 August 1988, the Jiangsu Provincial Government reported an emergency in electric power generation to the State Council: Electric power generating sets representing one-quarter of the entire province's total installed capacity had to be shut down due to a lack of coal.

Excepting the East China region, 15 or 16 provinces, municipalities, and autonomous regions including Beijing, Tianjin, Liaoning, and Guangdong all frequently experience emergencies. The coal shortage has captured the attention of the high-level leadership and economic circles. Why, in a half year's time, has China's coal supply suddenly gone from a relatively comfortable state to a shortage and the buyer's market turned round suddenly into a seller's market? In the 23d issue for 1988 of BAN YUE TAN an article by Cui Jizhe and Feng Yizhen offers some explanations.

As a result of the long-term shortage in China's coal markets, the East and South China regions which are economically developed and consume much coal were being very strict about coal consumption. For example, when coal was in short supply Jiangsu Province shut down those small thermal power plants of under 6,000-kilowatt capacity. Rural enterprises which lack electric power almost completely relied on diesel generators to compensate. The old mining districts of Xuzhou, Kailuan and others, which are well served by transportation, had not yet cut production. Small rural coal pits developed relatively rapidly. It is under just these conditions that a false impression of saturation appeared in China's coal markets and coal pricing continued to fall. This ultimately became a catalyst, luring industries into overheated growth. The floodgates controlling coal use had finally been opened.

At first, a considerable number of rural enterprises began converting from oil to coal. As of 1988, not only were those small thermal power plants which had been shut down reopened, but a large number of new such plants had entered production. Large generating sets in the East China region also commenced production one after another. The amount of coal required rose precipitously, reaching 40 million tons for the year. Estimated requirements for 1990 total 60 million tons. Even this kind of generating capacity is still hard-pressed to support the excessively rapid rate of industrial growth.

During the first half of 1988, the per-ton price of coal was generally between 130 and 140 yuan. During the fall it rose to between 180 and 200 yuan. The following winter, the upward trend was still strong. In the Taizhou area of Zhejiang, the price for 1 ton of high-quality Datong coal had reached 330 yuan and Shanxi's Jincheng lump coal prices had risen to over 400 yuan per ton, nearly a 10-fold jump over the price in the area where the coal was produced. Even with prices inflated to these frightening levels, some areas were able to buy coal but found it unavailable. From the military to the localities, from the state and collective organizations to individuals, everyone converged on the coal mines, railroads, and harbors to engage in speculative buying and selling.

It has been said that there were no less than tens of thousands of people involved. They were simply opportunistic. Coal which falls outside of state planning has had a great impact on that coal included in state planning, causing frequent emergencies in coal supply to key industries and for the people's daily needs which both must be protected by the state.

Someone has calculated that for 1 ton of coal not included in state planning, transported from Datong in Shanxi and with all the normal costs added in, on arrival in Shanghai its total cost would not exceed 119 yuan. However, the current selling price for this type of coal is generally between 300 and 400 yuan. This is to say that over three-fifths of this money has fallen into the pockets of individuals and organizations involved in coal speculation. In fact, only two railroad cars of coal need be resold to earn 10,000 yuan. Now, some people are simply reselling coal supply contracts, even to the point where one contract can be resold four or five times, the price increasing with each sale.

Apart from this, there are the numerous organizations and individuals along the way who seek to profit from coal. All types of surcharges emerge one after another, such as subsidy charges, handling charges, labor costs, referral costs, charges for preferential treatment, hardship costs and even railroad car purchase and rental charges, etc. Altogether there are dozens of these opportunistic surcharges. Moreover, for many of these surcharges only cash is accepted and no receipts are given. Little wonder that a state cadre remarked with some feeling that were Guan Yunchang still living, even he could not handle this situation.

Coal supply in each region is inadequate, resulting in frequent emergencies, while the floodgates of coal usage have been thrown open and waste becomes more serious by the day. The total installed capacity of the small thermal power plants of the East China power grid in 1987 represents about an 80 percent increase compared with that of 1983, while the increase in Jiangsu Province exceeds 100 percent. The coal consumed per kilowatt-hour generated by small thermal power plants is two to three times that of large thermal power plants. In some cases, due to obsolescence of the generating units and backward management, the situation is even more serious.

Just how much energy is wasted nationwide in a year? It is said that nobody can answer this.

Despite Huge Investment, Benefits From Big Nei Monggol Fields Said Disappointing

40130069b Shanghai SHIJIE JINGJI DAOBAO in Chinese 30 Jan 89 p 6

[First paragraph is SHIJIE JINGJI DAOBAO introduction]

[Text] The two surface coal mines of Huolinhe and Yiminhe in eastern Inner Mongolia cost several billion yuan and as yet, no returns have been seen. In western Inner Mongolia the coal quality is excellent and extraction cost is low, but it remains unexploited. Capital construction is a high task of the people. It cannot be initiated with enthusiasm only to be cut back across the board when funding, raw materials and energy become tight. After the Great Leap Forward, a major adjustment occurred. There were construction projects everywhere across the country. That shocking losses were suffered is known to everyone.

The Huolinhe and Yiminhe strip mines, both key state energy projects, have been under construction for over 10 years at a cost of several billion yuan. This has created an annual production capacity of only 4 million tons of brown coal, nearly 500 kilometers of railroad and 450,000 kilowatts of installed generating capacity. Because the coal quality is too poor, depreciation of imported equipment is high and other factors, at present the investment has still shown no returns and losses total nearly 200 million yuan. It is difficult to hope that in the short-term the investment will be recouped.

These two mines and the Yuanbaoshan strip mine begun last year are all located in northeast Inner Mongolia. According to state planning, they should be a complementary integration of coal, electricity, and railway components which, by the end of the century, will produce 100 million tons of brown coal annually to provide for the energy needs of the old northeast industrial base. Already there is no hope of achieving this target. Even if there were hope of attaining it, it would be equivalent to less than 40 million tons of standard coal, far short of the 100 million-ton standard coal deficiency which will exist in the northeast by the end of the century.

The Jike firm of statistical information for policy-making and the East China Regional Committee of the China Energy Research Society have jointly organized a group of specialists led by Professor Yang Jike, a member of the Standing Committee of the National People's Congress and director of the Jike firm, to take over from the State Scientific and Technological Commission the research task concerning the overall situation of energy and transportation development strategy.

The final concluding opinion of the research report is that alleviating the coal deficiency in the northeast with a long-term steady supply of high-grade, high-energy coal from western Inner Mongolia is the best policy. The development of the Dongsheng field in the west should be accelerated while simultaneously, thoroughfares for the transport of coal are constructed, such as the Jitong railway from Jining in the west to Tongliao in the east. This could not only satisfy the northeast's appetite for energy and spur the economic prosperity of Inner Mongolia, but it would also benefit the invigoration of the nationwide energy situation and expand exports of high-grade coal. Actually, at one stroke a great deal would be achieved. This research report has already passed through technological appraisal by the State Scientific and Technological Commission which confirmed its practical value and recommended that responsible state departments consider its adoption.

The research report made use of facts and data to create proofs in many ways. For the foreseeable next several decades into the future, coal will continue to occupy the major position in China's energy consumption structure. Except for the reliance of South China primarily on Guizhou and the reliance of the Chang Jiang Basin primarily on western Henan for coal supplies, the Beijing, Tianjin, and Hebei areas along with East China all must rely upon Shanxi. Were North China to be added, it is feared Shanxi could not bear the burden. There are only three transportation corridors for Shanxi coal which lead east toward Beijing and Tianjin, the Jingbao line, the Jingyuan line, and the newly constructed Daqing line dedicated to the transport of Shanxi coal. By the end of the century, the capacity will have reached a maximum of 175 million tons. The Beijing, Tianjin, and Hebei areas along the lines will consume 80 million tons. The Jingtong and Jingshen lines will transport 25 million tons to the northeast. The amount reaching the transport line terminus at Qinhuangdao will only exceed 70 million tons. This is inadequate to supply the East China region alone, much less to have any available for export. Where is the Shanxi coal for the northeast?

Inner Mongolian coal reserves are plentiful in the west and in short supply in the east. Those discovered in the west account for 80 percent of the area's total. The reserves of eastern Inner Mongolia are small and completely composed of a very poor quality brown coal. Western Inner Mongolian coal is of exceptionally good quality. Dongsheng coal is superior to Datong coal, having an average caloric value of about 7,000 kilocalories per kilogram. This is 2.5 times that of eastern Mongolian brown coal, in other words, 1 ton of Dongsheng coal is the equivalent of 2.5 tons of eastern Mongolian coal. Moreover, coal extraction cost in eastern Inner Mongolia is 3 times the cost in the west. In other words, for the amount of money required to extract 1 ton of coal in eastern Mongolia, 6 tons could be extracted in the west.

It is true that the eastern Mongolian brown coal is located close to the northeast and that it can be used at the pits to generate electric power to be sent to the northeast, while the high-grade western Mongolian coal is over 1,000 kilometers from the northeast and rail

transportation must be built. However, according to calculations, the total cost of transporting electric power from eastern Mongolia is 4.5 times the total cost of rail transport for coal from western Inner Mongolia.

Based on the state's original program, the overall cost for development of the three large strip mines in eastern Inner Mongolia was to be 195 million yuan. However, according to the above comparison, investing a great deal in the development of eastern Inner Mongolian brown coal is not economically sound. If it is possible to accelerate the development and construction of a modern energy base, with an annual production capacity of 50 million tons of standard coal and upgrade the Jitong line to a 50 million-ton per year capacity national railroad trunk line for which a combined total investment of 100 million yuan is more than adequate, why not proceed?

On 22 January, Professor Yang Jike met with reporters from this paper in Shanghai and once again elaborated his views on the overall energy transportation construction strategy. He also expressed his appreciation for a 1983 "Daobao" report which stated that "The Jitong railroad is the key to the invigoration of the national energy situation." "It is unwise not to begin immediately, if it is not begun soon limitations will be encountered and if we wait too long we will only have our experience from which to learn."

Yang Jike said that capital construction is a high task which promotes the prosperity of the people, develops the nation and benefits posterity. It cannot be begun with enthusiasm only to be cut off across the board should funding or resources become tight. Following the Great Leap Forward there was a major adjustment. All throughout the country there were construction projects. That shocking losses were suffered is known to everyone. Thorough and objective advance certification must be carried out with respect to capital construction projects in order to choose the best program and make prudent policy decisions. Those which should be cut back, even if they are key state projects such as the eastern Inner Mongolian brown coal mines, should be resolutely cut back. Those projects which are worthy of consideration such as the Dongsheng high-grade coal mines and the Jitong railroad which are major elements of the energy base, should be considered for inclusion in state planning even when the battle is being fought to cut back on capital construction.

Energy Shortage Forces New Look at Lower-Grade Coals

40130044 Beijing RENMIN RIBAO in Chinese 3 Dec 88 p 2

[Excerpts] At present coal and electricity are in extremely short supply. The full exploitation of coal gangue low caloric value fuel in the generation of electricity is one method of solving the energy shortage.

According to statistics from relevant departments, the state unified distribution coal mines extract over 100 million tons of gangue from the pits each year. This has accumulated to the point where now there are over 1.3 billion tons sitting on 95,000 mu of land. It is both polluting the environment and occupying land.

Gangue contains substantial value as a fuel. Its capacity for heat generation is 500 to 1,500 kilocalories per kilogram, which can be used for the generation of electricity. Gangue can also be used as a construction material, in the production of bricks and cement, for road and dam construction, and as backfill. The large-scale utilization of gangue in China began during the late 1970's. Annually, 10 million tons of gangue are utilized, however, this represents only one-tenth of the amount extracted.

Exploiting gangue to the fullest extent requires that some problems of conception and awareness first be solved. Some comrades consider gangue to be an insignificant waste material extracted from pits during the mining of coal. This view is incorrect. Sichuan's Yongrong Mining Bureau converted four obsolete boilers into gangue-burning boilers. In 1 year over 400,000 tons of coal gangue were burned. The thermal efficiency of the largest of the boilers reached 78 percent and the capital required for electricity generation was reduced to one-half that required had raw coal been used, resulting in an annual net profit of over 3 million yuan. If all the coal mines nationwide were able to use coal gangue for electric power generation, the returns would be extremely significant.

In obtaining a given amount of electricity and heat, utilizing coal gangue and other low caloric value fuels in co-production could also reduce costs by about 40 percent when compared to using high-quality coal alone.

Employing coal gangue in heat and power co-generation can also reduce the land area occupied by gangue and reduce environmental pollution. [passage omitted]

Policies should be adopted which encourage and support the conversion of waste into wealth through utilization of coal gangue. In 1984 the state explicitly stipulated that newly constructed coal gangue power plants could benefit from low interest loans and exemption from industrial and commercial taxes on the links in electric power generation and sale. These power plants can independently provide electricity. After joining the grid, they need not carry on a business relationship with the electric power industry. In actuality and for many reasons, some districts have not earnestly and thoroughly implemented the policy. This is an important factor influencing the broad application of coal gangue plants.

This year the state has reiterated that, because the use of low-value fuels in electric power generation as a substitute for high quality coal has saved coal mine establishment funds, therefore, the use of the bulk of these funds

for the establishment of low caloric fuel thermal electric plants in existing mining districts should be considered. Newly established mining districts should include complementary low caloric value fuel thermal electric plants in their overall program and integrate them into capital investment. Advantages and support should be provided pertaining to start up power pricing, power usage quotas, peak compensation, taxation and other aspects. Each locality should earnestly implement the series of policies stipulated by the state to encourage the exploitation of coal gangue.

With respect to the utilization of coal gangue, the barriers between enterprises, businesses and localities must be broken down. An isolated existence within a delineated area is not possible. Enterprises should be encouraged to develop horizontal associations and establish all forms of integrated entities based on the principles of voluntary participation and mutual benefit. Technological and scientific research departments should focus on researching the integrated utilization of coal gangue so as to advance development of coal gangue exploitation.

The utilization of coal gangue in China has had an excellent beginning. In 1986, the State Planning Commission ratified the construction, within a 5-year period beginning in 1987, of a 330,000-kilowatt gangue-fired power plant. The scope of construction was planned outside of the "Seventh 5-Year Plan." For 1987 and 1988, state planning allocated 40 million and 50 million yuan respectively in loans and support for coal gangue power plants. Each region need only emphasize and resolutely carry out the application of coal gangue for its utilization to progress.

Coal Output Could Top 1 Billion Tons This Year

40100037b Beijing XINHUA in English
0713 GMT 13 Mar 89

[Excerpt] Beijing, March 13 (XINHUA)—Chinese Premier Li Peng has said he hopes coal output will increase to 1 billion tons or more this year, the Overseas Edition of the PEOPLE'S DAILY reports today.

Li made the remark when he met representatives at a meeting sponsored by the Ministry of Energy on safety in coal production.

Li said the State Council knows of the problems the coal industry faces, the paper reports, and it is seeking measures to solve them. Coal output last year was 970 million tons. [passage omitted]

Need for Coal-Slurry Pipelines Stressed

40100037a Beijing XINHUA in English
0858 GMT 10 Mar 89

[Text] Beijing, March 10 (XINHUA)—China should build coal-slurry pipelines and increase the number of pipelines for the transportation of refined oil, according to today's ECONOMIC DAILY.

The paper explains that China started construction of modern pipelines in 1949. Up to 1970, the country had built only 3 gas and crude oil pipelines with a total length of 373 kilometers, in Sichuan and Shandong provinces, and the Xinjiang Uygur Autonomous Region.

The number of pipelines has expanded rapidly since 1970. By the end of 1987, gas and oil pipelines throughout the country totalled 15,000 km.

Though China's pipeline industry has achieved good results, there are still quite a few problems to be solved. The ECONOMIC DAILY suggested:

—Building coal-slurry pipelines. China's coal output ranks first in the world and coal accounts for 76 percent of the country's consumption of primary energy resources. As the economically developed coastal areas have less than 5 percent of China's coal reserves and coal transportation has imposed great pressure on the already overloaded railways and highways, it is an urgent task to develop coal-slurry pipelines;

—Expanding refined-oil pipelines. The paper noted that 60 percent of pipeline capacity is designed for transportation of refined oil in the rest of the world, while China's pipelines are mainly used for transport of crude oil now. Refined oil is more often transported by rail, which has a higher cost, causes waste of light oil and pollution, and degrades the oil quality;

—Upgrading the machine-building industry. Though China has a strong machine-building industry and many plants have surplus production capacity, due to limited specifications and functions, the country has to depend on imports for pumps, valves, turbines, and centrifugal air compressors for the pipeline industry. Cooperation between the machine-building and pipeline industries may result in better utilization of imported technology and upgrading domestic machinery;

—Improving technology for the design and construction of pipelines. As China's petroleum output will increase by 40-50 percent by the year 2000 and more producers will be located in the western part of the country, the pipeline industry should study how to lay pipelines in deserts, establish unmanned pumping stations, ensure reliable telecommunications and improve equipment, and ensure flexible maintenance services in freezing, dry, windy, and other hostile conditions;

—Improving existing pipelines, upgrading out-of-date parts, increasing anti-corrosion measures and bettering safety monitoring.

Pudong Coal Gas Facility Passes Inspection

40130061b Shanghai JIEFANG RIBAO in Chinese
23 Dec 88 p 1

[Article by Yu Lingeng [0060 2651 1649]: "First Period of Pudong Coal Gas Plant Passes Inspection—Focus on Reinspection, Consolidation, and Reform, Manage Affairs on the Basis of Facts"]

[Text] After 3 months of reinspection, consolidation, reform, and item-by-item preinspection and acceptance,

the first period project at the Pudong Coal Gas Plant, a key state construction project, formally passed state inspection on 22 December 1988.

Production has gradually stabilized since completion and startup of the first period of the Pudong Coal Gas Plant on schedule at the end of 1987, and coal gas output and quality have continued to improve. Three months after going into operation, daily gas output surpassed the design capacity of 1 million cubic meters, and by 6 months after startup the main quality indices of the coal gas attained relevant state requirements. The State Planning Commission issued formal notification that the first period of the Pudong Coal Gas Plant project was included among projects which passed inspection by departmental and local organizations in the relevant fields during the fourth quarter of 1988, and it immediately established 10 item-by-item preinspection and acceptance leadership groups composed of leaders and experts from administrative departments at higher levels to examine and verify item-by-item work reports and construction reports for the first stage of the project. Beginning on 15 October 1988, the Construction Preparation Office as well as design, civil engineering, installation, municipal government, equipment manufacturing plants, and others among the primary units participating in the battle worked together to divide up problems encountered in the first period of the project for assignment to specific people for consolidation and reform on a limited schedule. After more than 2 months of work, 90 items were basically consolidated and reformed, equal to 93 percent of the opinions of the inspection groups, and consolidation and reform are now under way on seven items. This enabled most problems in the first stage of the project to reveal themselves during trial production, and the greatest part were solved quickly, assuring safe and stable production.

The Pudong Coal Gas Plant First Stage Project Inspection and Acceptance Conference was held on the morning of 22 December. Representatives from relevant state departments and commissions made special visits to Shanghai to attend the conference.

Shenfu-Dongsheng Coal Field Construction Under Way

40100034b Beijing XINHUA in English 1441 GMT 23 Feb 89

[Text] Beijing, February 23 (XINHUA)—Five major mines and some infrastructure projects including railway lines, highways, and power plants, are expected to go into operation in the Shenfu-Dongsheng coal field this year.

Located on the borders of Shaanxi Province and the Inner Mongolia Autonomous Region, the coal field covers an area of 700 square kilometers and has a verified reserve of 230 billion tons, making it one of the largest coal bases in the country.

It is to produce 10 million tons of coal when the first phase of construction is completed in 1992, and 100 million tons with the completion of the third phase, said a project official.

Construction is well under way on 11 mines, which have a combined annual production capacity of 6.6 million tons.

Of the 11 mines, the Majiata open-cast mine, which has an annual capacity of 600,000 tons, will go on stream this year, the official said.

A 172-km railway line between Baotou City and Shenmu County will open to traffic next month. About 10 million tons of coal will be shipped out to other provinces through the line.

A 200 km inner-coal field highway section is to be completed within the year.

Two power generating units have been installed at the Shenmu Power Plant and will start operation in September this year.

Construction of a 110 km 110-volt transmission line, which runs through from south to north, is to be completed in May.

To speed up construction, the Government invested 330 million yuan in the coal field this year, 30 percent more than last year, the official said.

Prerequisites for More Effective Oil, Gas Reserve Work Cited

40130016 Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 9, 13 Sep 88 pp 4-6

[Article by Zhang Wenzhao [1728 2429 2507]: "New Progress in Work on Oil and Gas Reserves"]

[Text] For a long time, China's oil and gas reserve calculations were made by Soviet techniques. In recent years, as oil and gas prospecting has progressed and as different types of complex oil and gas pools have been discovered, there has been new progress and improvement in oil and gas reserve calculations. Since the Third Session of the 11th Central Committee, foreign cooperation in oil and gas exploration and development and trips abroad by scientific and technical personnel for observation, exchange, and participation in international meetings have given us a new understanding of oil and gas resource valuation and reserves calculation.

1. Resource Evaluation and Reserves Calculation Permeate the Entire Exploration and Development Process

Oil and gas resource and reserve figures are the aggregate result of all stages of prospecting; they are important data that guide the planning of further oil field exploration and development, planning of the scale of investments, and drafting of medium and long-term state programs. Calculated resource figures and various types of reserve figures permeate the entire prospecting and development process, and every level of resource and reserve figures expresses the results of the corresponding stage of prospecting and development. For example, resource figures are the aggregate result of the basin survey and regional prospecting stage and serve as data for planning preliminary prospecting activities; prospective reserves are the aggregate result of structural-zone seismic surveys and serve as data for planning prospective or evaluative drilling; control reserves are the aggregate result of the prospective and preliminary prospecting stage and also serve as data for further planning and evaluation of exploratory drilling; and proved reserves are the aggregate result of the oil field evaluation drilling stage and in addition are important data for drafting development programs. After development of an oil field, follow-up surveys of reserves must be made at fixed intervals so that the figures gradually approach the real values and can be used to guide the drafting of revised plans until the oil fields are exhausted. The task of the oil prospecting and development departments is to gradually raise resources to the status of reserves and to raise low-level reserves to the status of high-level reserves. All oil regions must rigorously see to it that newly added proved and recoverable reserves exceed extraction every year, that newly added control reserves exceed proven reserves, and that prospective reserves exceed control reserves. This is the only way to assure a favorable cycle of prospecting and development, to guarantee that oil field development results in commensurate output, and to consistently increase output and recovery rates.

2. Establishment of Basic Proved Reserves

Basic proved reserves are estimated for complex oil fields with numerous oil-bearing sequences; they also constitute a systematization of experience in the exploration and development of complex oil fields in fault basins of the eastern part of the country. Because of the fracturing of fault blocks in complex oil fields with multiple reservoirs oil and gas pools in them are numerous and complex, and the geological characteristics of the oil fields cannot be fully clarified in a short time; but provided that the oil-containing area is basically controlled, it is possible to achieve rolling development (i.e., a correlation between prospecting and development), which is of great significance for speeding up prospecting and development, making the fields productive and recovering funds in timely fashion, decreasing expenditures and increasing output. If a fault block oil field is kept in the evaluation and exploratory drilling stage for a long period and cannot be made productive, the economic effect that is obtained is too small. Starting in the 1970's, other countries began to use this method. The United States used rolling exploration and development in the complex oil fields of the Gulf of Mexico to make them productive (the term used in the United States is "wells in the initial period of development"). In the 1970's and 1980's, the United States had a development drilling success rate of only 70-80 percent; but despite the few dry wells, it won time, achieved early formation of productive resources and maximized funds recovery, so that the overall economic effect was high.

3. Establishment of Control Reserves

In the exploration of new regions, once it is established that a well in a structural belt has commercial flows of oil, in order to gain a preliminary idea of the overall size of the oil field as rapidly as possible, during the initial period of evaluation drilling, exploratory or preliminary drilling with a rather large well spacing is used together with overall analysis for preliminary control of the oil field area and reserves; the preliminary calculated reserves obtained in this way during the evaluation process way are called control reserves. Control reserves represent a rather incomplete knowledge of reserves. They must meet three basic conditions: 1) trap identification must be based on commercial oil or oil flows; 2) the form of the trap must be determined and an initial oil pool type evaluation must be made in order to contour the oil-bearing area; 3) a preliminary understanding of the types of reservoirs is needed, which requires a small amount of rock cores or wall cores. These requirements must be met in order to assure that the error in determining reserves does not exceed 50 percent.

The primary task when prospecting in new regions is to drill more discovery wells and to increase the amounts of identified control reserves; this is essential for rapid discovery of large oil fields of simple structure and high-quality reserves and for detailed prospecting of the most promising locations in order to increase the cost-effectiveness of prospecting. When new oil fields are discovered we must at all costs avoid single-minded pursuit of proved reserves, leading to errors in the planning of prospecting and investment. Some control reserves can also be discovered by prospecting in older districts; new reservoirs are found by deep prospecting in old areas and by renewed surveys of the shallower strata, or by expanded prospecting that discovers new traps. In old oil fields with complex structure and multiple oil-bearing sequences, the search for unused potential and resurveying efforts may also lead to the discovery of numerous new oil and gas reservoirs, making it possible to calculate control reserves for them; this is the only way to achieve progress in evaluating old oil regions and discovering further potential.

4. Effective-Thickness Analysis in the Process of Calculating Reserves of Viscous Oil

In recent years, China has conducted preliminary research on the evaluation of viscous oil. This type of crude can be extracted normally in some regions, but in many regions thermal extraction processes are needed in order to produce economic benefits; and because conditions in regions containing pools of viscous oil vary widely, when calculating viscous oil reserves the effective thicknesses of the pay strata must be determined by analysis of geological conditions, subtracting from the effective thickness certain oil strata in which heat treatment produces little effect. Recent tests indicate that under current economic and technical conditions, viscous oil strata in which thermal extraction is economically beneficial generally must be shallowly buried, of high individual thickness, spaced closely together, and separated only by a few thin strata, and must have high porosity and a high degree of oil saturation.

5. Make Extensive Use of High-Precision Seismic Techniques and New Techniques in Order To Add Large Amounts of Reserves While Drilling Only a Small Number of Evaluation Wells

China has long "relied on the drill bit" to provide reserves and has evaluated the accuracy of reserves assignment in terms of the spacing of deep exploratory wells, has prescribed exploratory well spacing standards for simple and complex oil fields for the purpose of determining proved reserves; the result has been that numerous evaluation wells that have been drilled at high densities but have yielded very little data, few cores have been taken, little oil testing of them has been done, well logging data have been incomplete, and seismic exploration quality has been very poor. Although an evaluation has been made, actually the understanding of the oil pools has been poor, with the result that a great deal of exploratory drilling, done at high expense, has produced little understanding of the pools and yielded little economic benefits, resulting in inaccurate calculation of oil field reserves.

As a consequence of our cooperation with other countries in offshore oil field exploration, in which we have learned from foreign techniques and experience, we have made extensive use of high-accuracy seismic technologies and new technologies and have added large amounts of new resources while drilling few evaluation wells. There are eight basic techniques involved.

a. Determination of the contours of oil fields is not based on exploratory wells, but makes thorough use of high-precision seismic studies; all contouring wells are drilled in the oil-bearing area, so that no dry wells are drilled and expenses are saved.

b. High-resolution two- or three-dimensional seismic prospecting is used to clarify the form and characteristics of the trap; these data, combined with the drilling of exploratory wells, allow correct contouring of the oil-bearing area. Repeated seismic prospecting, a gradual increase in the density of the prospecting grind, drilling of new exploratory wells with reference to data from earlier wells, supplementary seismic prospecting with reference to the specific geological task after an exploratory well is drilled, and structural mapping of the top surfaces of reservoir subgroups, are techniques that give high accuracy.

c. New technologies for lateral forecasting, including vertical seismic prospecting, wave resistance profiling, three-time-point multicolor profiling and the like. Correct identification of the positions of seismogeological strata guarantees accurate determination of stratigraphic structure and gives information on the lateral variability of reservoirs and the distribution of faults.

d. Determinations of the oil-water contact surface are made in detail, and a variety of techniques are used to locate the oil-water surface of each group of reservoirs. One technique is repeated formation testing (RFT) to determine the oil-water contact surface; another is the use of Schlumberger combination logging data to determine the oil-water surfaces of reservoirs groups; a third is the use of drill stem testing (DST) data for verification. These approaches allow accurate delineation of the oil-bearing contour.

e. Interval-by-interval coring of evaluation wells, forming a complete core profile of the oil strata, with actual cores available for every reservoir assures correct determination of the reserve factor.

f. Group-by-group oil testing to form a complete productive-capability profile, so that test data on the actual oil-production capability and fluid characteristics are

available for every reservoir group. In particular, large numbers of high-pressure physical (PVT) samples, sufficient to meet the needs of oil field development, are used.

g. Recovery rates determined by numerical simulation and available oil field proved reserve figures must be used to calculate recoverable reserves in order to assure that the reserve figures are of high quality.

h. Calculation of proved reserves, feasibility studies and economic evaluations are integrated, and the economic value of reserves is evaluated in terms of oil prices at different times.

Offshore experience indicates that oil field evaluation on land should make use of 2 approaches and 10 new technologies. The two approaches are as follows:

a. The use of high-precision seismic data and lateral prediction to determine the oil-containing area and predict reservoir variation, thus decreasing the number of evaluation wells needed.

b. Use of well-bore technology for effective single-well evaluation, acquisition of large amounts of downhole information, and acquisition of more data with fewer evaluation wells, making it possible to determine oil field reserves and extraction characteristics and gain an understanding of the distinctive characteristics of the pools.

The 10 new technologies are as follows:

a. Early three-dimensional seismic prospecting or high-resolution two-dimensional seismic prospecting to determine clearly the nature of the trap.

b. Vertical seismic prospecting (VSP) for accurate location of seismogeologic intervals in order to allow short-range lateral forecasting.

c. Use of synthetic acoustic and wave resistance profiles for lateral prediction of reserves.

d. Expanded use of man-machine interaction for comprehensive seismogeologic interpretation and for three-dimensional structural and petrographic evaluation.

e. Widespread use of comprehensive well logging instruments and rapid on-the-spot analysis; comprehensive logging devices must be used on key wells, and gas measuring instruments must be used on all exploratory wells.

f. A full set of numerically controlled well logging facilities, including dip logging, fracture logging and the like, to track the vertical position of structures and identify the distinctive characteristics of the reservoirs.

g. More extensive use of repeated formation testing (RFT) technology, location of oil-water contacts and pressure anomaly zones, and preliminary elucidation of fluid characteristics.

h. Expanded use of drill stem testing and non-cable shooting (negative pressure shooting).

i. Vigorous expansion of the use of contour exploration tests (using high-precision pressure gauges), to identify the boundaries of rock strata and fault boundaries.

j. Introduction of oil extraction process technology to the prospecting field: e.g., expanded use of fracturing, acid treatment and other techniques to determine the true productive capacities of the oil strata and expand identified oil field reserves.

Complex small fault-block oil fields are numerous in eastern China, and the only way to increase the cost-effectiveness of prospecting is to rely on high-precision seismic prospecting and new prospecting technologies. The prospecting program should include the following:

a. Priority for the three-dimensional approach: Three-dimensional seismic prospecting arrangement must be used first if possible, and the placement of evaluation wells must be based on three-dimensional seismic structure maps.

b. Fault block evaluation: Because there are numerous, complex fault block types in complex fault-block oil fields, and since not all fault blocks necessarily contain oil, the blocks must be categorized and evaluated based on three-dimensional seismic structure maps.

c. Priority prospecting: The most promising fault blocks should be selected for priority drilling of exploratory wells.

d. Control determinations with few wells: Initially, only one exploratory well should be drilled per fault block. Advanced well-bore technologies should be used for effective single-well evaluation, which must include four types of data: RFT data, DST contour determination, dip logging, and VSP logging; a comprehensive study of these data should first be made in order to determine accurately the geological characteristics of the fault-block oil field, in order to allow a determination of whether additional exploratory wells should be drilled; if the fault block is very small, a single well is sufficient.

Exploration Greatly Increases Oil, Gas Reserves

40130061c Beijing RENMIN RIBAO in Chinese
12 Jan 89 p 1

[Article by reporter Zhao Mingliang [6392 2494 0081]: "Oil and Gas Exploration in China Greatly Increases Reserves, State To Invest Enormous Resources To Develop Tarim Petroleum"]

[Text] Wang Tao [3769 3447], general manager of the China Petroleum and Natural Gas Corporation, announced that after 2 to 3 years of efforts, it is very possible that China will experience a new high tide of growth in oil and gas reserves.

Oil and natural gas exploration work in the past few years has produced major discoveries in China in both new and old regions, and new advances have been made in east, west, and south China, indicating that a trend toward continued growth in China's oil and gas reserves has appeared.

In 1988, newly proven petroleum geological reserves were 540 million tons and recoverable reserves were 400 million tons, both figures up over 1987. There was a 52 billion cubic meter increase in geological reserves of natural gas, with recoverable reserves of 30 billion cubic meters, the greatest amount for any single year in history.

Information indicates that six new oil regions with rather substantial oil and gas fields have taken shape throughout China. They are the eastern Jungar Basin in Xinjiang, Chali He in Jilin, southern Kongdian at Dagang, Nanbao in eastern Hebei, Erlian in Inner Mongolia, and Gasi Kula in Qinghai. Projected reserves in these oil-bearing regions are 2.6 billion tons, with 530 million tons of reserves already proven, and predictions are that an additional 500 million tons or so can be proven over the next 2 years.

Even more gratifying is that major breakthroughs have been made in two of China's big potential strategic oil and gas regions. One is the Tarim Basin in Xinjiang, where oil-bearing strata with a total thickness of 155.6 m were discovered at the Lunnan No 2 Well. Two tests produced high-output oil and gas flows with daily crude oil outputs of 734 cubic meters and 510 cubic meters, respectively, and 110,000 cubic meters of natural gas. Moreover, the crude oil is of good quality and extraction is easy. The second area is the coastal and extremely shallow sea zone in the Bohai Gulf, where more than 100 million tons in recoverable petroleum reserves have been obtained, indicating the possible existence of a large oil field in this region.

Considerable progress also has been made in natural gas exploration. Large gas fields have been found in south-central Sichuan and in the eastern Jungar Basin in Xinjiang, with proven reserves of 25.3 billion cubic meters and 13 billion cubic meters, respectively.

Reporters learned from the National Petroleum Work Conference held in Beijing on 10 January 1989 that China will begin strengthening exploration work in the Tarim Basin in 1989. Under extremely difficult financial conditions, from 1.4 to 1.5 billion yuan will be invested in 1989 and 1990, and forces will be consolidated to accelerate exploration for oil and gas resources in this region.

Xinjiang's Tarim Basin is China's largest sedimentary basin, covering an area of 560,000 square km, and it is one of the few large sedimentary basins in the world which has not been fully explored for oil and gas.

The China Petroleum and Natural Gas Corporation has established the Tarim Petroleum Exploration and Development Guidance Department which will strive to prove and control oil and gas reserves on a substantial scale. Construction of definite forces of production in the future will increase oil and gas output capacity during the Eighth 5-Year Plan.

Zhongyuan Fields Now Nation's Fourth Largest Producer

40130056 Beijing RENMIN RIBAO in Chinese 5 Dec 88 p 1

[Text] As of 25 November, the Zhongyuan oil field had already produced 6.325 million tons of crude oil. Its crude oil production jumped into fourth place nationwide. Estimates for the year's natural gas production of over 900 million cubic meters rank second nationwide.

The geological structure of the Zhongyuan oil field is complex, there are many fault blocks and the oil reservoirs are deep. After development was begun in 1979, by 1987, annual production had reached 6.8 million tons with an average yearly increase of over 30 percent. This has made it one of the fastest developing large oil fields in the country. So far this year, the water content of this oil field has exceeded 55 percent and the oil reservoir surface has dropped over 40 meters. Under these difficult circumstances they rely on reform to spur development. Throughout the oil fields a wage and incentive program has been implemented based on meters drilled and tonnage produced, thus mobilizing the initiative of 70,000 petroleum workers. Daily production has reached 22,311 tons, setting the highest record in the history of crude oil production at this field. It is estimated that overall crude oil production for this year will reach 7.20 million tons, an addition of 1.5 million tons of new production capacity.

Xinhua News Agency, Hohhot, 4 December. In Inner Mongolia's Erlian Basin—one of China's nine large continental sedimentary basins—an oil field with good prospects for development, the Aershan oil field, has been discovered. This field has already passed from the geological exploration phase into the initial construction phase.

The Erlian Basin is located in the central section of the grasslands of Inner Mongolia, its elevation is about 1,000 meters, the ground surface is the well-known Xilinguole prairie, rich petroleum resources are present underground. This area's verified reserves total 100 million tons with even larger prospective reserves. Conditions now exist for the establishment of a 1 million-ton per year oil field and a refinery capable of processing 1 million tons of crude oil yearly.

Petroleum exploration of the Erlian Basin began in 1979. During September 1981, in the Aershan region 100 kilometers north of the city of Xilinhaote, the first oil-yielding well was drilled. This well yielded a 27.1 ton

per day flow of oil and gas. Thus the curtain was raised on oil discovery in the Erlian Basin. Following this discovery, the four fields of Menggulin, Abei, Anan and Hanan were discovered one after another in the Aershan region. Together they are referred to as the Aershan oil field.

The verified oil-bearing areas of the Aershan oil field cover 61.9 square kilometers with reserves of 79.76 million tons. Today, 309 wells have been completed and 440,000 meters have been drilled. As of the end of September, crude oil obtained through trial extraction totaled 106,000 tons.

Plans originally called for the Aershan oil field to achieve its 1 million-ton annual production target in 1992, however, it is hoped that this will be realized by 1990. Next year's crude oil production will possibly reach 30,000 tons.

Xinjiang To Launch Major Oil, Gas Exploitation Effort

40130076a Urumqi Xinjiang Regional Service in Mandarin 1230 GMT 11 Mar 89

[Excerpts] The regional government and the Ministry of Geology and Mineral Resources held a gathering today to commend units concerned in major breakthroughs in prospecting for oil and natural gas in the northern part of the Tarim Basin. [passage omitted]

The meeting was attended by leading comrades of the regional party and government Song Hanliang, Tomur Dawamat, Huang Baozhang, and Jin Yunhui, together with leaders of the Ministry of Geology and Mineral Resources Sun Daguang, Zhu Xun, and Xia Guozhi, and (Zhou Yongkang), a responsible person of the Oil and Natural Gas Prospecting and Exploitation General Company of China.

A joint battle to prospect and exploit the oil in the Tarim Basin is about to get under way. Zhu Xun, minister of geology and mineral resources, pointed out at the meeting today: We now have full grounds for saying that the Tarim Basin is indeed a large basin with great oil and gas prospects. The initial outlines of a particularly large oil and gas field have been sketched. This is of very great significance for changing China's shortage of oil and gas reserves.

Regional party and government leaders Song Hanliang and Tomur Dawamat pointed out that the prospecting and exploitation of oil and gas in the Tarim Basin shows that the development of Xinjiang's oil industry and the region's economic invigoration have entered a new stage and a major turning point. This is the prelude to the exploitation of Xinjiang.

According to our information, a large geological and oil and gas prospecting force has arrived in Xinjiang. The work of supporting oil and gas prospecting and exploitation is also under way throughout the region. The Bayingolin Mongol Autonomous Prefecture has set up six service centers for repairing large drills, diesel motors, electric motors, and so on. Some of these are already in operation.

The regional government has called on all departments throughout the region to make plans for providing high-quality services for the oil and gas prospecting and exploitation effort.

Shengli Doubles Output in 7 Years

40130065b Jinan DAZHONG RIBAO in Chinese 2 Jan 89 p 1

[Summary] The responsibility system enforced in oil production has invigorated the Shenli oil field. During the 7-year period in which the responsibility system was enforced, the oil field has doubled its output and its volume is equal to that accumulated over the past 17 years.

Around 1980, the oil field showed a decrease in its oil output and it only realized 16.11 million tons of crude oil in 1981. By 31 December 1988, the oil field put more than 1,000 new oil wells into production and turned out 33,302,600 tons of crude oil which doubled the 1981 output of 16.11 million tons. Its annual average increase is 11.9 percent and accounts for 47 percent of the country's annual average increase scored in the same period.

Dagang Overfulfills 1988 Plan

40130065c Tianjin TIANJIN RIBAO in Chinese 10 Jan 89 p 1

[Excerpt] Dagang oil field produced 4,220,102 tons of crude oil in 1988, thus showing an increase of 4.97 percent over 1987. The oil field produced 390 million cubic meters of natural gas, thus overfulfilling the 1988 production plan by 8.49 percent. [passage omitted]

Evaluation of Superalloys for HTGR Steam Generators

40130052 Chengdu HE DONGLI GONGCHENG [NUCLEAR POWER ENGINEERING] in Chinese Vol 9 No 6, Dec 88 pp 66-73

[Article by Fu Hongzhen [0265 1347 6966]]

[Excerpts] Abstract: According to the demands of steam generators for materials, both foreign and domestic tested superalloys have been evaluated based on chemical composition, structures and properties. It is suggested that Incoloy 800H be selected as the material for steam generators when the outlet temperature of HTGR is 750°C. If GH181 superalloy is selected, not only can the service life of the steam generators be prolonged significantly, but the superalloy continues to be usable when temperatures rise to 1000°C. [passage omitted]

Table 1. Reactor Outlet Temperature and Thermal Utilization Coefficient

Reactor type	PWR	Fast neutron	HTGR	
Outlet temp, °C	300	550-680	750	900-1000
ε, %	30-33	38	40	50

[Passage omitted]

Materials Research for Steam Generators in China

China has not yet built a high temperature gas-cooled reactor; therefore, no research has been done on the material of steam generators. However, China has produced alloys studied by researchers abroad, including Incoloy 800H, Inconel 600, Inconel 617, Hastelloy X, and so on.

Incoloy 800H is widely used in petrochemical industry. It is used as a steam generator tubing material for HTGR in the United States and West Germany. To meet the urgent needs by the chemical engineering departments, the Steel Research Institute of the Ministry of Metallurgy and Fushun Steel Works developed the GH180 (Incoloy 800H) alloy. They investigated the production technique, chemical composition, and heat treatment of the alloy. They also identified the precipitate phases and the structural changes in long-term use and their effects on the performance. Welding tests were also conducted to determine the proper parameters. The mechanical, physical and corrosion resistance properties have all reached the Incoloy 800H standards. The alloy was used in the rapid cooling boiler of a petrochemical plant and in the nozzle of a crude oil gasification furnace. The service life in the nozzle application was 11 months, comparable to the international standard. The GH180 alloy passed ministry level validation in 1985.

GH22 (Hastelloy X) was developed jointly by the Shanghai Institute of Steel, Shanghai Steel Works No 3, and Shanghai Steel Works No 5. The development was done on a properly selected production line, the upper and lower limits of the chemical composition were investigated and the effects of long-term use on structure and performance were also evaluated. Test results showed that GH22 has reached the standards of Hastelloy X made in the United States. Cold rolled thin plates, hot rolled medium plates, forged parts and precision forged parts were made available to the users. The alloy was used in high-temperature components of aircraft engines and passed validation in November 1984. Inconel 600 and Inconel 617 are both in production.

The development of GH181 began in 1978. It was developed on the basis of high temperature alloys GH44, GH128 and GH170 used in the 900-1000°C range. The main composition is Ni-Cr-W and can be used at 1000°C for extended length of time. In the last 10 years, researchers have studied the chemical composition of Ni-Cr-W, the effects of W on the steady state creep and stacking fault energy of Ni-23Cr, heat treatment of the alloy and analysis of the precipitation phases, structural changes and effects on performance in long-term use, weldability of GH181, and corrosion of high temperature alloys in liquid sodium. Test results showed that GH181 has the following properties:

(1) Superior strength and plasticity, strong resistance to creep, oxidation resistant, and good cold-hot fatigue and welding properties. In addition, it is resistant to sodium corrosion. It is the best alloy in this class that does not contain cobalt.

(2) The general performance at high temperature is improved by adding W, the most efficient high temperature reinforcing solid solution, and trace amounts of elements to strengthen the grain boundary. The alloy may be operated between 900°C and 1000°C.

(3) At high temperature the alloy structure is stable. Precipitated fine α_w phase helps the creep resistance. Since the alloy does not contain metals not found in China such as cobalt or tantalum, the cost is not high. GH181 is therefore suitable for long-term uses in petrochemical, energy and power and metallurgy.

The chemical composition of GH181 is basically the same as Japan's Ni-Cr-W. The Japanese alloy was developed specifically for steam generator tubing of HTGR and has achieved a stress of 9.8 MPa for 10^5 hours in 1000°C helium gas. The service life is even greater at lower temperatures. GH181, with the same chemical composition as the Japanese alloy, is therefore suited for steam generator tubing of HTGR. [passage omitted]

Shanghai Steam Turbine Factory Completes 300-Megawatt Unit for Qinshan

40130064 Beijing ZHONGGUO JIXIE BAO in Chinese 22 Dec 88 p 1

[Text] The first 300-megawatt steam turbine for a nuclear power plant to be built in China was recently

completed by the Shanghai Steam Turbine Factory. The turbine, a symbol of the fact that China has reached the international level of the early 1980's in the manufacture of such equipment, will be delivered to the Qinshan Nuclear Power Plant.

The generator fills a gap for China in the area of nuclear power steam turbine [technology] including high- and low-pressure vessels and steam and water separation and reheating. Full-scale production tests on the unit began in 1986, during the course of which the factory tackled more than 40 key problems. One difficult problem they overcame was the low-pressure rotor finish turning project. The rotor, 1.7 meters in diameter, 7.5 meters in length, and weighing some 51 tons, was turned within a tolerance of 0.01 millimeters.

In order to assure quality of the nuclear power steam turbine and to guard against a Chernobyl-like disaster, the factory drafted a number of documents such as the "Factory Quality Assurance Outline," the "Nuclear Power Steam Turbine Quality Assurance," the "Manufacturing Quality Control Outline," and the "Nuclear Power Steam Turbine Inspection Regulations."

Equipment for Daya Bay Auxiliary Buildings Ready To Install

40130076b Guangzhou Guangdong Provincial Service in Mandarin 1000 GMT 13 Mar 89

[Text] The work of installing the DOP facilities for the Daya Bay Nuclear Power Station is to start tomorrow. This will be the prelude to the installation of a number of facilities for the plant, including the nuclear pile.

The DOP facilities, which include more than 20 items, are auxiliary installations around the nuclear pile and the conventional pile. The first equipment to be installed tomorrow is for the chemical water feeder shop. Later, some other equipment, all French-made, including a pipe system for the whole plant and pressurizers, will be installed one by one.

The installation work has been contracted to the Northeast Nuclear Power Development Company and seven American experts will give advice during the installation and management work. The whole project of installing all auxiliary installations will be completed within 3 and ½ years.

600MW PWR Chosen as Production Prototype

40100034a Beijing CEI Database in English 2 Mar 89

[Text] Beijing (CEI)—China will choose the 600,000-kW pressurized-water reactor [PWR] as a prototype for serial production to accelerate the development nuclear energy industry, according to Huang Yicheng, energy minister, at a ministerial meeting.

Huang said the 600,000-kW PWR carries a higher safety coefficient, and is relatively cheaper in production cost and more economical and efficient in operation.

Thus, he said, China is likely to adopt it as a prototype for serial production to bring down construction costs of nuclear power plants.

The minister urged [builders] of nuclear power plants to produce as early as possible China's own components for the 600,000-kW PWR.

Sources from the ministerial meeting said that China plans to save 12 million tons of coal in 2000 by nuclear power. The installed capacity of its nuclear generators will be 6 million kW at the time, capable of turning out 30 billion kWh of electricity each year.