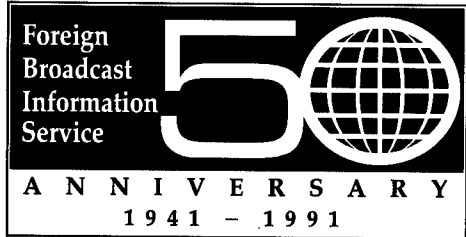


JPRS-CEN-91-009  
17 SEPTEMBER 1991



# *JPRS Report*

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# Science & Technology

***CHINA: Energy***

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# Science & Technology

## China: Energy

JPRS-CEN-91-009

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### **Energy Minister Discusses Outlook for Energy Sector in Next 5 Years**

916B0065A Beijing LIAOWANG ZHOUKAN  
[LIAOWANG WEEKLY] in Chinese 6 May 91 pp 4-5

[Article by staff reporter: "New Steps for China's Energy Resources in the Next 5 Years—Interview With Energy Minister Huang Yicheng"]

[Excerpts] Speedy success has been won in China's energy production for the first quarter of the Eighth 5-Year Plan. The authoritative figures of the State Statistical Bureau show that: from January to March of 1991, there was overall growth in the production of coal, electricity, oil, and gas throughout China as compared to the same period last year. How China will alleviate the energy shortage and adapt to the needs of national economic development is a problem of general concern. For this reason, this reporter interviewed Energy Minister Huang Yicheng who is in the process of intensely devising strategies for the realization of the "Eighth 5-Year Plan" of the energy industry.

### **Energy Is Still an Important Factor Restricting Economic Development**

Huang Yicheng, former Assistant Director of the State Planning Commission, is very clear about the energy situation in China. He first introduced the advances made during the last 5 years in the energy industry.

Serving as a basic industry of the national economy, there has been great development in the energy industry in China since reforms and liberalization. During the Seventh 5-Year Plan, the production of both primary and secondary energy sources attained planned targets 1 year in advance. In 1990, the total output of the primary energy resources of China reached 1.4 billion tons of standard coal, of which 780 million tons were coal, 138 million tons were oil, and 15 billion cubic meters were natural gas; as regards the secondary energy resource of electric power, the electric power output in 1990 was 615 billion kilowatt-hours. At present, the annual output of coal in China has leapt to first place in the world, electric output occupies fourth place, and the annual output of oil occupies fifth place, so that China has become a major energy resource nation which has attracted attention throughout the world. The rapid development of the energy industry has provided powerful evidence of the development of the national economy of China over the last 5 years.

Huang Yicheng stressed that, although the overall rate of growth of China's energy resources has been fast in recent years, the rate of growth of the national economy has been even faster. However, the tense situation of supplying energy has not yet changed. For example, during the last 5 years, the average annual increase of primary energy resources was 4 percent, and there was an increase of 8.5 percent in electric power output; however, the total national output value and the total production value in agriculture and industry separately

increased 7.7 percent and 10 percent, even though coal and electric power supplies decreased throughout China last year owing to the slowing of the rate of economic development and the weakening of the market. However, this is only a temporary phenomenon. Beginning this year, the supply of electric power in many areas has again become tense. It should be said that energy resources are still one of the important factors restricting China's economic development.

### **Plan for the Development of Energy Resources in the Next 5 Years**

Faced with this situation, how should China's energy industry develop during the Eighth 5-Year Plan? Huang Yicheng considers that it is first necessary to conscientiously absorb past experiences and lessons, as well as employ all possible means in plan preparations to guarantee that the growth rate of energy resources and the growth rate of the national economy are mutually adapted, and no gaps are left.

Based on inference of a 6 percent average annual growth of the total national output value and a 6.1 percent average annual growth rate of the total output value of agriculture and industry in 10 years, the average annual growth rate of primary energy resources will reach at least 3 percent, and correspondingly, by 1995, the total output of primary energy resources throughout China will reach 1.2 billion tons of standard coal. At the same time, during the 5 years, the entire nation must strive to economize on and use 100 million tons less of standard coal, and conscientiously implement the policy of "stressing both liberalization and economizing."

Based on this objective, the future strategic distribution and measures of the development of China's energy resources are mainly as follows:

In the area of coal, it is necessary to promote the construction of unified distribution coal mines. At the same time, the reconstructing and improving of local mines as well as village and town mines, and working hard to increase the average national output of coal approximately 40 million tons are also needed. The focal points of coal development are the three areas of Shanxi, Shaanxi and the western part of Inner Mongolia. It is necessary to continue to construct large-scale open-pit mines in Huolinhe, Yimin, Yuanbaoshan, Jungar in Inner Mongolia, as well as those in Pingshuoanjiang and Antaibao in Shanxi, and the Shenfu Dongsheng Mining Area; at the same time, accelerate coal development in the Northeast, and as much as possible reduce the allocation and transport of coal inside Shanhaiguan. It is also necessary to pay close attention to carrying out the projects under construction in the Yanzhou, Huainan, and Yongcheng coal areas. It is also necessary to strengthen the technical reconstruction of existing coal mines, and put forth great efforts to raise the level of mechanized coal production.

In the area of electric power, it is necessary to adhere to the policies of suiting measures to local conditions and

the simultaneous development of water, thermal and electric power. It is especially necessary to accelerate the construction of hydroelectric stations with focus on handling the construction of medium- and large-scale hydroelectric stations on the upper reaches of the Yellow River, the mainstreams and tributaries of the Chang Jiang, the Hongshui He Basin, and on the Wu Jiang and Lancang Jiang where there are abundant water resources. During the "Eighth 5-Year Plan," we will strive to add medium and large-scale hydroelectric installations which can generate over 10 million kilowatts. In the area of thermal power plant construction, it is necessary to give priority to the construction of electric power stations in mining areas, and transform the transport of coal into the transmission of electricity so as to lighten the pressure of transporting coal by railway. Thermal power plants should naturally also continue to be constructed in harbors along oceans and rivers, along railway lines, and load centers. At the same time, it is also necessary to actively develop the co-generation of heat and power. In the next 5 years, focus of construction will be on large-scale hydroelectric power stations at Ertan in Sichuan, Yantan in Guangxi, Manwan in Yunnan, Gehedang in Hubei, Wuqiangxi in Hunan, Yangzhuoyonghu in Tibet, and Liji Xia in Qinghai, thermal power plants in Yimin, Yuanbaoshan, Suizhong, Waigaoqiao in Shanghai, and Gaoshou, the nuclear power secondary project at Qinshan and strive to have additional installations in China with annual average output of above 10 million kilowatts. While arranging the construction of sources of electricity, also work hard to handle electric network project construction and electric power construction in rural areas. It is necessary for the power output to reach 810 billion kilowatt-hours by 1995, an increase of 192 billion kilowatt-hours as compared to 1990.

In the area of oil, implement the policy of holding ground in the Eastern China and developing in Western China. Focus should be placed on handling well the exploration and development of the main oil fields of Daqing, Shengli, and Liaohe, and guaranteeing the stable increased production of crude oil in Eastern China. Concentrate energies and strengthen the exploration and development of oil gas resources in Western China with major focus on Tarim, actively create transportation conditions, and work hard to increase production. At the same time, actively carry out the exploration and development of oil gas fields which are in offshore, very shallow sea, and shoal areas. In the production and construction of natural gas, Sichuan will be the focal point, and there will be further exploration and development in the Shaanxi-Ningxia-Gansu Basin, the Zhongyuan area of Henan, the Songliao Basin of the Northeast, and the sea area of Nanhai. It is required that, during the "Eighth 5-Year Plan," the average national output of oil be increased 2 million tons annually, and at the same time, continue to implement the policy of reducing the burning of oil, using 2 million tons less of oil annually, to meet the needs of economic development. [passage omitted]

### Raise the Tapping of Potential of Economic Benefits

In his introduction, Huang Yicheng said that during the period beginning from this year up until 1995, the energy industry in China must complete each of the production and construction targets stipulated in the "Eighth 5-Year Plan." Efforts must also be made to raise labor productivity and economic benefits. This is not only an economic problem, but a political problem as well. The present situation of economic life in China, which is a great deal of investment, low productivity, poor product quality, high material consumption and low economic benefits, has basically not changed. Although our development is rapid when compared to the past and that of the third world, however, if compared with the level which we should or could reach, the superiority of socialism is still far from being brought into full play. We still have great potential to be tapped.

Huang Yicheng said that during the past 5 years, the electric power industry has installed several tens of millions of kilowatts in installed capacity. In the first 5 years of the 1980's, the capacity of single generators increased 27 percent. Without even making comparisons with advanced nations but rather among the domestic electric power plants, the noticeable disparity can also be seen. The situation is similar for both coal and oil. Whether from the point of view of material consumption, the time for construction projects, investment benefits, or production costs, there are disparities in each of these areas, and the disparities represent potential. Therefore, energy departments shall make an effort to handle and use various types of existing equipment, strengthen management, tap potential and, based on reforms and policies, try every possible way to raise the labor productivity and economic benefits of energy enterprises so as to ensure that the energy industry will take new steps during the period of the "Eighth 5-Year Plan," and make contributions to the overall development of the national economy.

### Shanghai Becomes Production Base for Large-Scale Power Facilities

916B0081B Shanghai JIEFANG RIBAO in Chinese  
27 Jun 91 p 2

[Article by Fudan coop student, Jiang Jian [5592 0256]]

[Text] The Shanghai Electrical Joint Corporation has digested and absorbed imported items and has technologically advanced the entire industry. It has achieved an annual power generating capacity of 2.5 million kW, or 25 percent of the annual generating capacity of the whole country. "Shanghai Brand" import-type 300,000 kW thermoelectric power generating units are abreast of advanced international ranks. Shanghai has become an important large-scale power plant production base for China.

As a Chinese industrial base, Shanghai, as early as 1954, began producing electric power generating facilities. In

1981, the Shanghai power generating facilities manufacturing industry imported production technology from the U.S. for 300,000 and 600,000 kW thermoelectric generators, and by 1985 test-manufactured the first imported technology 300,000 kW unit. In this period the Shanghai power plant industry studied foreign advanced management experience, and set up a quality control system for measuring product quality at international standards. In the Seventh 5-Year Plan the Shanghai Electrical Joint Corporation invested 210 million yuan, built and expanded six world class workshops, and worked up 137 technological reform items. Improvements of facilities and technologies have boosted the production capability of the import-type 300,000 kW units up to 5 per year. The production rate for primary equipment made in China rapidly rose from an initial 37.6 percent to a present 85 percent. Large-scale power plants made in Shanghai are now at the Shandong Shiheng power plant, Hubei Hanchuan power plant, Shanghai Wujing power plant, Guangdong Shajiao power plant, and other key national energy resource construction projects where they are employed in normal operations or are being installed for testing. Shanghai built a 300,000 kW unit for the Qinshan nuclear power plant, which is in the final test stage, and it is hoped, will be in normal operation within this year.

The sudden rise of the technological level of the Shanghai power plant industry has got the attention of several internationally well-known corporations. The Swiss ABB Corporation and the Suershou [5685 1422 1108] Corporation have passed international bids for production rights for the Shidongkou 2nd power plant 600,000 kW supercritical thermoelectric power unit. These two companies passed examination and decided to sub-contract a good portion of unit components to the Shanghai Electrical Joint Corporation, and Shanghai will proceed with the manufacturing according to their standards. This will, once again, afford the very capable Shanghai power plant manufacturing industry an opportunity to keep pace with advanced world levels.

It is reported that an Eighth 5-Year Plan target for Shanghai will be to produce three 600,000 kW units (a 600,000 nuclear power unit, a 600,000 kW critical unit, and a 600,000 kW supercritical unit). Its increased pace of importation and absorption will further increase its competitive strength in the world market in its role as China's production base for the manufacture of large-scale units.

#### **New Energy Base To Be Built in Yan'an**

*916B0081A Beijing RENMIN RIBAO in Chinese  
30 Jun 91 p 3*

[Article by reporter Meng Xi'an [1322 6007 1344]]

[Excerpts] On the sacred ground of the Revolution in the Yan'an area of Shaanxi, after the establishment of

reforms, industrial and agricultural output quickly rose, and the area is now becoming a burgeoning energy base. [passage omitted]

What is especially satisfying is the abundance of underground natural resources which present broad prospects for the economic development of Yan'an. The entire area has proven and discovered deposits of 13 different kinds, including coal reserves of up to 430 million metric tons, natural gas reserves up to 3.3 billion cubic meters. The Prefectural Party Committee administrative office has made the energy industry the key strategy for economic development. Now, the whole area has 20 state-operated coal mines, and 242 village and town coal mines. Coal output last year was 5.8 million tons; 9 oil drilling corporations and 3 refineries have been set up by counties (municipalities). Last year's crude oil output was 6.4 million tons, and the annual processing capacity is now 7.5 million tons.

In order to drive the development of the energy industry, cadres and masses in the Yan'an area found the way to develop the energy and chemical industries through self-reliance, joint development, reliance on natural resources, market guidance, prioritizing, focusing on breakthrough points, stressing of profits [and various other gyrous Cheopsian ascensions]. In the near future, emphasis will be placed on developing capability for 300,000-ton catalytic cracking, 500,000-ton atmospheric pressure forming, and a 20,000-ton polypropylene facility as part of six technology transformation projects, as well as creating a natural gasification industry and making preparations for urban gasification. In the Eighth 5-Year Plan coal output for the whole area will reach 10 million metric tons, and will earn 5 million U.S. dollars in foreign exchange through exports, petroleum output will reach 1.2 million metric tons, and a 1.5 million ton crude oil processing capability will be built up. The Nanniwan oil field was discovered in 1989, and that year 5,650 tons of oil were produced. [passage omitted] This year, output may exceed 15,000 metric tons. The general manager of the company said, "This year Nanniwan can become the Jiangnan of northern Shaanxi, and this year we should let the oil flow at Nanniwan!"

It has been reported that construction of a railroad from Xi'an to Yan'an has been stepped up, which will reach Yan'an by year's end, and will begin normal operations next year; a 330 kv power line is being built and may reach Yan'an by the end of 1992; a 5000 gate programmable telecommunications line has been completed and is now in use. In addition, the Xi'an to Baotou secondary highway has been improved, and a highway has been extended beyond the Yan'an Municipal District limits to the Yan'an heat and power plant. Other construction projects are in planning stages.

**Power Plants To Use Local Parts**

40100081 Beijing CHINA DAILY (ECONOMICS AND BUSINESS) in English 28 Aug 91 p 2

[Article by staff reporter Huang Xiang]

[Text] Production at the country's largest coal-based electric power generating units is being expanded, with the emphasis of locally supplied components.

Production of the third 600,000-kilowatt generating unit was launched recently by China's major generator producers, following the smooth running of two already in service.

Sources close to the Ministry of Energy Resources said key components of the machine will be manufactured by three firms in Harbin, in northeast China's Heilongjiang Province while more than 100 others will be responsible for other supplies.

The new undertaking signals the government's further commitment to have domestic firms produce the large-capacity and high-efficiency units, rather than solely relying on imports.

In the past decade, millions of kilowatts of large-capacity generating equipment were bought abroad, leaving much of the domestic production capacity idle.

Manufacturers had not been able to produce electrical generation equipment of such capacity until the introduction of American technology in 1981. But they still have to rely on imports for many parts.

Construction of China's first 600,000-kilowatt units was completed in 1986, with one third of components supplied by foreign firms.

The industry recently started up its second 600,000-kilowatt units, with foreign-supplied parts reduced to 15 percent.

Sources said the government required that domestic sources should supply at least 88 percent of the parts, thus reducing the cost by \$20 million.

The move is part of the industry's development programme which has targeted local component supplies. The ministry plans to raise the local percentage to 90 percent during the Eighth 5-Year Plan (1991-1995).

The ministry said the three firms in Harbin were now capable of undertaking the project after a 300-million-yuan technology updating programme, completed in 1990.

Thanks to the introduction of latest technology, according to the ministry, a 600,000-kilowatt thermal power unit consumes an annual 210,000 tons less coal than three 200,000 kilowatt units working together.

At present, 200,000-kilowatt units form the backbone of the industry's generation equipment, the world's fourth largest. Total installed capacity was 140 million kilowatts by the end of this June.

The government plans to put into operation another 10 million kilowatts a year up to the year 2000, most of which should be equipment over 300,000 kilowatts in capacity.

The three plants hope for a foothold in international market. In the past five years, the power plants had won 11 contracts from 37 bids to participate in the construction of power generating stations throughout the world, earning about \$400 million in foreign exchanges.

They have also sold a 210,000-kilowatt generating unit to Pakistan, the first time such Chinese-made equipment has been exported.

### Major Emphasis on Development of Southwest Hydropower Resources

916B0082C Beijing RENMIN RIBAO HAIWAI BAN  
in Chinese 10 Jul 91 p 3

[Article by reporter Xi Nan [1153 2809]: "China To Focus on Developing Southwest Hydropower Resources, Major Step To Open Up Energy Resource Treasure-House, Panxi Region Has Over One-Tenth of China's Developable Hydropower Resources"]

[Text] China will focus during the 1990's on developing the abundant hydropower resources of southwest China. The largest hydropower project approved for construction so far, Ertan Power Station, has now completed preparatory work and construction is imminent.

Ertan Power Station on the Yalong Jiang in southern Sichuan, which will have a total installed generating capacity of 3,300MW, will be China's first huge hydropower station with an installed generating capacity greater than 3,000MW. The biggest hydropower station China has completed so far is Gezhouba Power Station, with an installed generating capacity of 2,715MW, on the Chang Jiang. The second largest is Longyang Gorge Power Station, with an installed generating capacity of 1,890MW, on the upper reaches of the Huang He.

When it is completed, Ertan Power Station will generate up to 17 billion kWh of power a year, equal to one-half the amount of power generated in all of Sichuan Province during 1990. Besides being able to supply power to the important nearby Panzhihua iron, steel, vanadium, and titanium industry base area, it will also substantially reduce the severe long-term power shortage in southwest China.

General manager Yao Zhenyan [1202 2182 3508] of the State Energy Resources Investment Company said, "the start of construction at Ertan Power Station will be the first step to open up China's biggest hydropower resource treasure-house".

The "treasure-house" referred to by Yao is Sichuan's Panxi region, where the Jinsha Jiang on the upper reaches of the Chang Jiang and its largest tributary, the Yalong Jiang, flow together. This region is the world's richest in coulsonite and titanomagnetite ore and other important resources and is the leader among China's large hydropower "motherlodes", much larger than the upper reaches of the Huang He and the Hongshui He at the Yunnan-Guizhou-Guangxi border now being developed.

Information provided by the State Energy Resource Investment Company indicates that this region has over one-tenth of China's developable hydropower resources and could have a total installed generating capacity of as much as 34,554.5MW. If developed completely, it could generate 194.7 billion kWh of power a year, far greater than the total amount of developable hydropower resources in the 15 provinces and municipalities in the

three big north China, east China, and northeast China regions and more than the total for the five provinces and autonomous regions of northwest China. This region has developable yearly power output of 2.92 million kWh per square kilometer of area, 3.7 times as much as Switzerland, which has the densest hydropower resources in the world.

Ertan Power Station is just one cascade of the 11 cascades planned for the Yalong Jiang. This river has 24,910MW in developable hydropower resource capacity. The first phase development would involve a total of five cascades with Ertan Power Station serving as a tap and could have an installed generating capacity of 10,900MW.

Yao Zhenyan revealed that the Yalong Jiang and Jinsha Jiang, as well as another primary river in Sichuan, the Dadu He, have been included as the three largest base areas among the 10 big hydropower base areas planned in China. Evidently, the total investment in Ertan Power Station will be 10 billion yuan renminbi, 60 percent of it coming from joint investment by the central government and Sichuan Province and 40 percent from foreign loans.

To enable the Chinese and foreign businesses with contractual responsibility to move into the main part of the project immediately, the Ertan Hydropower Development Company spent 400 million yuan renminbi over the past 4 years on preparatory work and completed 46 large and small projects including communication, communications, reserve base area construction, some preparatory engineering and excavation, and so on, equal to 5 percent of the total amount of engineering and excavation. General manager (Tuomi) from Italy's (Yingbojieluo) Company said in praise after inspecting the site that "the quality of the basic facilities provided by the proprietors (Ertan Hydropower Development Company) is world class".

### State Approves Construction of Daxia Station

916B0082B Lanzhou GANSU RIBAO in Chinese  
25 Jun 91 p 1

[Article by reporter Shang Kefu [1424 0668 4395]: "State Approves Preparations To Build Daxia Hydropower Station, Total Investment 983 Million Yuan, Yearly Power Output 1.465 Billion kWh"]

[Text] The State Planning Commission formally approved preparations for project establishment and construction of Daxia Hydropower Station, located on the section of the Huang He running through Shuichuan Township in Baiyin City and Qingcheng Township in Yuzhong County, Gansu Province in April 1991. Preparatory work for this project is now basically finished. By the end of May 1991, 40 million yuan of construction tasks for the highway, bridges, power transmission lines, and other things had been completed.

This power station is the third project among 56 key projects the state has approved for project establishment

and construction in 1991. It will be built by an investment of 983 million yuan, with Gansu Province and the state each providing one half, and will be a riverbed-type power station with an installed generating capacity of 300MW and yearly power output of 1.465 billion kWh. It will go into operation and generate power during the Eighth 5-Year Plan and will add new hydropower energy resources for Gansu Province.

Daxia Hydropower Station has undergone several inspections of the survey and design and the project's geological and construction conditions are good. It is also suitably located for load centers. It has abundant water and stable flow rates. There will be little reservoir inundation and no population resettlement tasks. It is just 32 kilometers from the Bao-Lan [Baotou- Lanzhou] highway, which runs through the Baiyin City area, so it has convenient communication. The main dam in this project will be 24 meters long and 70 meters tall and will be a steel-reinforced concrete gravity dam. The normal water impoundment level will be 1,480 meters above sea level and the reservoir capacity will be 90 million cubic meters. Preparatory work for Daxia Hydropower Station began on 16 May 88. Construction is now being speeded up on the 12 kilometer long reserve highway, three 20 meter span highway bridges, the 160 meter steel-reinforced concrete dual-arch bridge which is the largest single span over the Huang He, a microwave communications project, and 16 kilometers of power transmission lines, and they will be completed during the third quarter of 1991. The bids have already been announced for the open diversion canal project on the left bank at Daxia and bids are now being negotiated for the plant building and main dam projects and the generator installation projects, and the central plant base area office and living facilities have been prepared. The relevant areas are now actively creating the conditions to lay the foundation for a full start of construction at Daxia Hydropower Station during the third quarter of 1991.

#### Taipingyi Update

916B0082A Chengdu SICHUAN RIBAO in Chinese  
28 Jun 91 p 1

[Article by Peng Datong [1756 1129 0681] and SICHUAN RIBAO reporter Xia Guangping [1115 0342 1627]: "Construction Begins on Main Projects at Taipingyi Power Station, Completion of This Power Station Will Reduce the Electricity Shortage in the Chengdu Region and Promote Economic Development in Aba [Ngawa] Autonomous Prefecture"]

[Text] Preparatory engineering on a key construction project in Sichuan Province during the Eighth 5-Year Plan, Taipingyi Power Station, was basically completed

in early June 1991 and work on the water diversion tunnels, flow diversion tunnels, and other main parts of the project has begun.

This power station is located in Wenchuan County, Aba Autonomous Prefecture and will divert water from the Min Jiang for runoff-type power generation. It will have an installed generating capacity of 260MW and generate 1.53 billion kWh of power annually. It is being built and managed via a joint investment by the China Huaneng Energy Group Company, the Aba Autonomous Prefecture government, and the State Energy Resource Investment Company. The total investment is 678 million yuan and over 44 million yuan of the investment has now been completed. This power station is one of the key projects where construction has started in Sichuan Province and it is implementing a project supervision and management system and a construction bid solicitation system, which have strengthened scientific management of project progress, quality, and investments.

Since beginning preparatory engineering in March 1990, builders from the six units responsible for construction, including the 10th Hydropower Bureau in the Ministry of Energy Resources, the Tunnel Engineering Bureau and 18th Engineering Bureau in the Ministry of Railways, and others have arrived at the site and are pushing forward with "three openings and one levelling" projects. Over 300 builders from the Chengdu Railroad Engineering Corporation's 1st Company have braved cold and winds working at the river and are pushing to complete the framework for the large 90-meter span Futangba highway bridge before the flood season to ensure that the construction machinery can cross the river and the work on diversion tunnel construction can proceed smoothly. The conditions have also been created for opening the rebuilt Cheng-A [Chengdu-Aba] highway to traffic. The plant building's exhaust tunnel, 119 meters long and over 6 meters in diameter, has now been completed through the efforts of employees of the Tunnel Engineering Bureau in the Ministry of Railways. The water diversion tunnel, over 10 kilometers long and 9 meters in diameter, will involve a great deal of engineering and complex tasks. The Tunnel Engineering Bureau and 18th Bureau in the Ministry of Railways have overcome difficulties and are now focusing on four branch tunnel excavation projects.

The first generator at Taipingyi Power Station is expected to begin operating and generate power at the end of 1994 and the three other generators will be completed in succession in 1995. When all of them go into operation, it will play an important role in alleviating the electric power shortage of the Chengdu region and promote economic development in Aba Autonomous Prefecture.

### **World's First Evaporation-Cooled Turbine Generator**

*916B0084A Beijing ZHONGGUO KEXUE BAO in Chinese 25 Jun 91 p 1*

[Article by reporter Huang Xin [7806 6580]: "World's First Evaporation-Cooled Steam Turbine Generator Connected to Grid and Generating Power in Shanghai"]

[Text] After several years of struggle by S&T personnel in the Chinese Academy of Sciences Electrical Engineering Institute, Shanghai Electrical Machinery Plant, Shanghai Ultra-High Voltage Power Transmission Company, and other units, they have successfully developed a key state industrial pilot project, the "50MW evaporation-cooled steam turbine generator", and connected it to the grid to generate power at a transformer station in the western suburbs of Shanghai. It is the first evaporation-cooled steam turbine generator in the world and is an indication that China has attained advanced international levels in this technical field.

Evaporation cooling of electrical machinery is a highly efficient cooling technology that has major significance for improving the operating efficiency of generators and it has attracted universal attention from international electrical machinery experts. Many developed nations have also invested substantial manpower and materials in research but work in most foreign countries at present is still at the laboratory stage.

The experts said that China's generator employs a new evaporation cooling technology. Compared with conventional generators, it has high reliability, convenient operation, evenly-distributed cooling temperature, fire-proof and explosion-proof, and other irreplaceable advantages. Its manufacturing cost for materials alone is 5 to 10 percent lower than other types of generators but its power generation efficiency can be 0.1 percent higher, so it has enormous economic benefits and broad extension and applications prospects.

### **Work Begins on Major Jungar Project**

*916B0084C Hohhot NEIMENGGU RIBAO in Chinese 10 May 91 p 1*

[Article by reporters Baoyinmanduhu [1405 7299 3341 6757 0729] and Jirumutu [0679 0320 2606 0956]: "Construction Begins at Jungar Power Plant, A Key State Construction Project, Inner Mongolia Autonomous Region Deputy CPC Secretaries Pei Yingwu [5952 5391 2976] and Liu Zuohui [0491 0155 2585] Attend Foundation Laying Ceremony"]

[Text] On 9 May 91, colored flags fluttered, drums rolled, and the sound of fireworks shook the heavens and earth in Xuejiawan Town located in the eastern part of the Ordos Plateau in a festive atmosphere. A grand ceremony was underway to mark the start of construction on Jungar Power Plant, a key state project to be built in conjunction with Jungar coal field. Inner Mongolia

Autonomous Region CPC deputy secretaries Pei Yingwu and Liu Zuohui along with others made a special trip to cut the ribbon marking the start of construction.

The first phase of the Jungar Power Plant project, involving two 100MW generators, will be turned over for use at the end of 1993. This power plant will be an important regional power plant for the Western Inner Mongolia Grid and will be responsible for the dual tasks of providing electricity to the mining region and transmitting electricity to the electric power system.

Since March 1991, all the employees at the power plant have worked under horrible conditions to overcome short construction schedules, great hardships, heavy tasks, and other problems. The construction units participating in the battle have coordinated closely and completed the preparatory work quickly and with high quality.

Inner Mongolia Autonomous Region CPC deputy secretary Pei Yingwu spoke on behalf of the autonomous region's CPC Committee and Government. He said that Jungar Power Plant is one of the three main coal, power, and highway projects at Jungar coal field as well as a key trial project for economic reform. It has received substantial support from all levels of government. He called on all levels of government and all departments to complete their corresponding contributions to the key project on schedule.

Inner Mongolia Autonomous Region CPC Committee deputy secretaries Pei Yingwu and Liu Zuohui along with leaders from the relevant departments and bureaus participated in the ground breaking for the foundation.

After the ribbon cutting ceremony was finished, officials from the relevant departments and bureaus as well as officials from Jungar coal field studied problems that exist at present in the coal field's construction.

### **First Unit of Luohuang Plant Generating Power**

*916B0084B Chengdu SICHUAN RIBAO in Chinese 4 Jul 91 p 1*

[Article by reporters Pi Yunlu [4122 6663 4389] and Huang Jibai [7806 4949 0130]: "No 1 Generator at Luohuang Power Plant Generating Power, A Key State Energy Resource Construction Project in Sichuan Province"]

[Text] A key state energy resource construction project, the Luohuang Power Plant No 1 generator, was successfully connected to the grid and began generating power for the first time at 1458 hours on 28 Jun 91.

The Huaneng Luohuang Power Plant is located in Luohuang Town, Jiangjin County. The power plant's equipment is two complete 360MW coal-fired generators imported from the Alstom Company in France, and it has China's first flue gas desulfurization device imported from Japan's Mitsubishi Heavy Industry Corp., all of

which are at advanced international levels of the 1980's. After the generators are connected to the grid and generate power, they will produce 410 million kWh of power a year and will supply 360 million kWh of power, which can add over 10 billion yuan in new industrial gross output value. Formal construction of the plant began on 1 Sep 88. Under the leadership of the Chongqing City CPC Committee and City Government and the Huaneng International Electric Power Development Company, over 50 French and Japanese experts and more than 5,000 builders from the Sichuan Province No 1 and No 2 Electric Power Construction Companies, the Chongqing City No 9 Construction Company, and other units who participated in the construction struggled day and night to level 189 mountain tops and fill in 13 gullies

to make a smooth construction area with three terraces covering 600,000 square meters. The project headquarters organized the construction on the basis of five major battles for civil engineering, lifting, hydraulics, ignition, acid cleaning, and connecting to the grid and operationalization to ensure project progress. All the project's engineering and technical personnel coordinated closely with the foreign experts and the Northeast China Electric Power Debugging Research Academy in regard to the technical complexity of the imported generators, carefully did the debugging and overcame numerous difficulties, and eventually connected the No 1 generator to the grid and generated power without problems on the eve of "1 July" 91 [anniversary of the founding of the CPC in 1921].

### State Council Rectifies Private Coalmining

40100080 Beijing XINHUA Domestic Service  
in Chinese 14 Aug 91

[Text] Beijing, 15 Aug (XINHUA)—Recently, the State Council disseminated throughout the country a circular on screening and rectifying coal mining operations carried out by individuals. According to the circular, the past few years have seen the development of coal mining by individuals in our country. This undertaking has played a certain positive role in easing the strain in coal supply and in providing employment in some rural areas. At the same time however, coal mining carried out by individuals has brought about a number of problems. To protect the nation's coal resources, ensure the safety of the people's lives and property, and to guarantee the sound development of the coal industry, the State Council has decided to screen and rectify coalmining operations carried out by individuals.

The circular sets forth the demand that coalmining operations carried out by individuals be screened and rectified in strict accordance with the relevant laws and regulations. In doing this work, it is imperative to comply with the "Law on Mineral Resources of the People's Republic of China," "Regulations on Mine Safety," the regulations (measures) and provisions that standing committees of provincial (regional and municipal) people's congresses have enacted for the purpose governing mining enterprises owned by collectives and mining operations carried out by individuals, as well as pertinent regulations promulgated by the State Council and local people's governments.

The circular sets forth strict conditions for individuals to operate coal mines:

1. There must be a reliable resource. The area and boundary of the mineshaft and coalfield must be clearly defined by the legal department.
2. There must be a design drawing and a prospectus for the coalmining project approved by the coal industry department above the county level (including the county level) or by a government-designated department.
3. There must be personnel, capital funds, materials, and technology commensurate with the scale of operations.
4. Necessary safety control organizations and rules must be established. Every mineshaft must have two exits for miners to come to the ground safely.
5. Mineshafts must have mechanical ventilation devices. There must be a rational and independent ventilation system.
6. Fire-prevention systems and measures must be formulated for operations above and under ground. Those working in mineshafts must use up-to-standard mining lamps for lighting purposes.

7. To conduct explosions in the mineshaft, it is imperative to have an explosion-triggering device, and use safe explosives and detonators manufactured especially for coalmining.

8. There must be a reliable source of electric power. Electric equipment and cables used in mineshafts must be selected in accordance with the "Safety Regulations for Village and Town Coal Mines."

9. Each mineshaft must have full-time gas-testing personnel and gas-testing instruments. Rules for gas testing and control must be established.

10. Coal pits must have safety measures for the prevention and control of water disasters, and must be equipped with necessary water detecting and draining equipment.

11. Coal pits must be equipped with hoisting equipment and other facilities, such as steel cable, signal devices, braking devices, and safeguards against cable snapping, meeting the requirements set by the Safety Regulations for Village and Town Coal Mines.

12. Responsible persons operating a coal mine must acquire the fundamental knowledge about safety production in coal mines and operating and managing coal mines, as well as other relevant qualifications. Technicians and specialized working personnel working in coal pits must be trained in accordance with the relevant regulations of the state. Their qualifications must be evaluated, and they must carry their certificates of qualification when they come to work. New workers must undergo compulsory training.

13. In coal mining for use in the daily life of individuals, certain measures for safety production must be met. These measures shall be decided by local governments.

The circular calls for a strict examination and handling of existing individual coal mining according to category. It proposes:

(1) All individual mining which violates the Law on Mineral Resources and the regulations governing industry and commerce, and which has not been granted a mining permit and a business operating license must cease. If individual mines refuse to suspend mining operations, thus resulting in the destruction of resources, the responsible persons shall be made accountable for legal liability in accordance with the provisions of the Law on Mineral Resources. If the mines which have ceased mining operation wish to resume operation, they must submit an application. They may resume operation after they are examined by a relevant department and if they meet the necessary conditions for operating a mine and are granted a mining permit and a business license.

(2) Where a coal mine has already been granted a mining permit but fails to meet the mine operating and labor protection conditions, it must try to meet the mine operating conditions within one year. If it fails to meet

the conditions in one year, its mining permit and business license will be revoked by the organs issuing the permit and license. Mining operation that crosses a boundary, particularly mining operation in an area within the boundary of local state-run coal mines and coal mines whose coal comes under the unified distribution by the state, must be ordered to withdraw. The responsible persons must be punished according to the relevant regulations.

(3) Industrial and commercial administrations shall issue business licenses, according to law, to individuals who have obtained a mining permit and who meet the mine operating conditions.

(4) Private coal mining enterprises, individual industrialists and businessmen operating a coal mine, as well as individuals mining a small amount of coal for personal use, must pay resource, product, and income taxes

according to law. Those who are guilty of tax evasion and who refuse to pay taxes shall be punished according to law.

In its circular the State Council points out that as the screening and rectification of individual mining involves various sectors and the implementation of policies, people's governments at all levels and various relevant departments must exercise their respective functions, coordinate closely and conscientiously, and draw up measures for carrying out this work well.

The circular says that the basic objectives of screening and rectifying individual mining are to put individual coalmining on a legal track, to put an end to illegal mining, to enable individual coalmining to meet the basic operating conditions, to improve measures for safety production, to enhance the rational utilization of coal resources and to markedly raise the rate of recovery of resources.

### **Oil, Natural Gas Enter New Surge of Development**

*916B0085 Beijing RENMIN RIBAO HAIWAI BAN in Chinese 1 Jul 91 p 3*

[Excerpt] In the first half of this year, China's petroleum and natural gas production has continued to grow in a stable manner. By the end of June, national onshore crude oil production had reached 68.07 million tons, an increase of 350,000 tons over the same period last year. Natural gas production reached 7.49 billion cubic meters, an increase of 156 million cubic meters over the same period last year. In the production of crude oil and natural gas, the goal of "fulfilling half the target by the time the year is half over" has been achieved.

At the same time that stable oil and gas production has been achieved from month to month throughout the nation, there has been continuous progress in oil and gas exploration, especially in new oil and gas provinces in the west. A number of new reserves have been found in old oil provinces in the east. Two high production oil and gas wells have been drilled on the northern slope at Chengdong in the Shengli oil field, and we have gained preliminary control over a considerable oil-bearing land area. Relatively thick oil layers have been discovered at each of the nine exploratory wells drilled in the northern part of the Jinjia-Fanjia nose of the Dongying depression. Thick oil layers were discovered at three consecutive exploratory wells in the Leijia-Lengdong region, further expanding the oil-bearing area in this region. Industrial oil flows have been obtained at three exploratory wells drilled at the Wumaying structure, which is in the southern part of Kongdian in the Dagang oil field. There have also been new discoveries inside and on the periphery of old oil regions in the Daqing, Huabei, Zhongyuan and Jilin oil fields.

Oil and gas exploration in the new oil provinces of the west has progressed very quickly. Exploration has been further expanded in the Lunnan and Donghetang areas of the Tarim Basin. At the newly discovered 61-square-kilometer oil-bearing structure in Jilake, seven exploratory wells have already hit oil and gas layers. In addition, in the Turpan-Hami Basin, a number of new oil-bearing structures have been discovered in an area along both banks of the Tarim River. A 21.5-square-kilometer oil field has been verified in the Shan-shan area, a 40-square kilometer oil field has been controlled in the Qiuling area, and five traps have been discovered in Wenjisang. High casing-head gasoline production has already been obtained at one of these structures, and a layer of oil and gas more than 100 meters thick has been discovered at another structure. An industrial oil and gas flow has been obtained at a pre-exploratory well drilled in Wucaiwan, which is in the eastern part of the Junggar Basin, and an oil layer has also been discovered at another pre-exploratory well.

Important progress has been achieved in natural gas exploration. A large gas field has been found in the northern Shaanxi part of the Shaanxi-Gansu-Ningxia

Basin. Its gas bearing area is still expanding, and it could become China's largest onshore gas field.

### **Eastern Hebei Field Taking Shape**

*916B0083B Shijiazhuang HEBEI RIBAO in Chinese 6 May 91 p 1*

[Article by reporter Wei Tihong [7614 7555 1347]]

[Text] It has already been 3 years since eastern Hebei oil field was established, and in the 3 years the oil field has undergone momentous changes. As of the present, proven petroleum geological reserves are 100 million metric tons, 5 developmental areas have been opened up, a crude oil production capability of 376,000 metric tons has been built up, annual output of crude oil has increased from 120,000 tons up to 350,000 tons, and arrangements for space and outfitting for an annual output of 1 millions tons is progressing. Living facilities have also greatly changed in appearance, more than 1,000 staff and workers having moved from shack dwellings into a new building.

Eastern Hebei oil field is one of the most complex geological fault-block oil fields in eastern China. The difficulty of opening up this area was very great. The Petroleum Prospecting and Development General Corporation decided to make two innovations in order to speed up the development of eastern Hebei oil field: make wide use of new technology, and experiment with a new oil corporation management organization structure with special Chinese characteristics.

In 3 years eastern Hebei oil field worked closely with the Petroleum Prospecting and Development Research Academy. They undertook the study of more than 200 technological problems concerning seismic geological prospecting, oil field development, and drilling technology, expanded the area and scope of eastern Hebei oil field prospecting and exploration, deepened their recognition of the complex subterranean conditions, and made preliminary models of the several special features of the oil and gas bearing area. They also integrated production and widely applied over 30 advanced technologies.

### **Big Field in Shaanxi-Gansu-Ningxia Basin Now Verified as Nation's Largest**

*916B0083A Beijing RENMIN RIBAO HAIWAI BAN in Chinese 22 Jun 91 p 1*

[Article by reporters Wu Guoji [0702 0948 3444] and Chen Zhiqiang [7115 1807 1730]]

[Text] Natural gas prospecting in the world famous Shaan-Gan-Ning Basin has made another strike, and it has proven to be China's largest gas field.

According to Shi Xingquan [0670 5281 0356], chief of the Changqing Petroleum Prospecting Bureau responsible for prospecting and developing the Shaan-Gan-Ning Basin, after opening up a new stage in the prospecting and development at northern promontory in the Jingbian-Hengshan area of the central basin last year, a major campaign was organized for a large scale prospecting and development this year, and news of success kept pouring in. Well after well of one batch of exploratory wells completed in the last 5 months has been repeatedly successful in producing gas. The highest yield for a single well was over 1 million cubic meters, exceeding all expectations.

Shi Xingquan said that as of the end of May this year, prospecting results have proved initially that the gas-bearing conditions of a 3,200-square-kilometer-area extending 80 km north-south and 40 km east-west in the Jingbian-Hengshan area is nearly 8 times that of the Weiyuan gas field in Sichuan, and as this represents only the deposits of a 1,200 square km of that portion initially proved, it is a very impressive find.

The entire gas field has not yet been explored to the outer rim. The gas bearing area expands continuously as the prospecting continues, and the gas bearing area is not only inside Shaanxi, but includes Nei Monggol and possibly extends to Ningxia as well.

In only over one year the prospecting and development of this large gas field has progressed rapidly, with little investment and great results. It is believed the gas field is uniformly contiguous with stable pressure, has good gas quality of high commercial grade, and that its economic value is very obvious.

Concerned individuals consider that the preliminary verification and development utility of the Shaan-Gan-Ning Basin's major gas field have great strategic significance. First, it gives high hopes for the economic development of local and surrounding minority people's areas, the poor areas of Shaan-Gan-Ning, and also for the economic development of the northwest region; second, it can alleviate the energy supply problems for the major coastal cities of north China which will help the economic development of Beijing, Tianjin, Hebei, and Henan; third, it will propel the major development of China's gasification industry and chemical fertilizer industry; fourth, by replacing oil and coal with gas, it can improve China's energy structure, and relieve pressure on railroad transportation of oil and coal.

It is reported that the country will speedily open up this major gas field for production. The Changqing Petroleum Prospecting Bureau has now set up the first phase of a feasibility study for construction of an annual production capability of 3 billion cubic meters, and will begin trial exploitation projects within the year.

### Development, Conservation and Comprehensive Use of Coal Resources

916B0088E Beijing ZHONGGUO KEXUE BAO  
in Chinese 26 Jul 91 p 2

[Article by Qian Xinrong [6929 2450 2837], a researcher in the Chinese Academy of Sciences Shanxi Coal Chemistry Institute: "Combine Development and Conservation for Comprehensive Utilization of Coal Resources, Energy Resources Will Become the Main Factor Restricting Development of Our National Economy, The Energy Resource Configuration of 'Coal As the Main Force' Will Not Change for Quite Some Time, We Must Establish a Conservation-Type Energy Resource System"]

[Text] China holds third place in the world in total coal resources and we have leapt to first place in the world now in amount of coal extracted. Coal accounts for 96 percent of the total heat value of China's mineral energy resources (coal, petroleum, and natural gas). An energy resource configuration with "coal as the main force" will not change for quite some time into the future. Energy resources have now become the primary factor restricting the development of China's national economy. As a non-renewable natural energy resource, continued population growth means that China certainly does not have abundant per capita coal resources. Thus, future development and utilization of coal must adhere to the principle of combining development and conservation and establish a conservation-type energy resource system to increase energy resource utilization rates.

#### I. The Coal Resource Reserves, Distribution, and Utilization Situation

1. We are not extremely rich in coal resources. China had proven coal reserves of 874.2 billion tons at the end of 1987. This included about 260 billion tons in carefully surveyed reserves for per capital coal resources of 234.4 tons, which is less than the world average level of 312.7 tons.

2. The regional distribution of coal resources is extremely uneven. Shanxi, Shaanxi, and Inner Mongolia have 70 percent of our remaining reserves while the 10 provinces and autonomous regions of east China have just 5.5 percent. Our power coal resources are mainly distributed in a zone of west China and 63 percent of our coking coal is concentrated in a zone of central China. The main industry users are scattered in the southeastern coastal and northeast China regions. However, lignite, which accounts for 13.2 percent of our total coal reserves, is distributed through eight provinces of east China, Inner Mongolia, and other regions with energy resource shortages. These distributional characteristics make development and utilization very inconvenient.

3. A low degree of resource exploration. Insufficient funds for geological exploration mean a low degree of exploration for China's coal resources and our proven reserves do not include coal reserves discovered through

surveys which have not industrial extraction value. At present, only 260 billion tons of carefully surveyed reserves are available for utilization. Subtracting that already taken over and that which will be temporarily hard to utilize, this leaves just 37 billion tons, equal to 4.1 percent of our proven reserves. This cannot meet the needs of coal mine construction during the Eighth 5-Year Plan.

4. Limited coal resources for coking. Coking coal accounts for 31 percent of our available reserves and the total amounts of rich, coking, and lean coal grades are limited and product variety distributions are uneven. For example, there are shortages of rich, coking, and lean coal in eastern and southern China and shortages of gas coal in the Yunnan, Guizhou, and Sichuan region of west China. Coking coal resources in central and eastern China have already been completely explored and there cannot be any substantial increase in proven reserves. There have always been shortages of coking coal in southwest and west China.

5. Gradual degradation of development conditions. With the exception of a few areas like Shanxi, Shaanxi, and others, development conditions in existing mining regions are usually rather poor and our domestic conditions cannot be compared with coal mines in foreign countries. Moreover, as the degree of development is intensified, the conditions will become even poorer.

6. Low development and utilization rates for coal resources. With the exception of a small number of state-run unified distribution coal mines with advanced equipment and relatively high management levels, recovery rates in most of China's coal mines are all below 20 percent. Fixed quality and fixed site deliveries have still not been achieved for a large amount of coal and the quality of the coal used in much of our coal-burning equipment does not meet design standards. China produced 455 million tons of coking coal in 1987 but less than one-third of it was used for coking. Most of it was burned as fuel. At the same time, local coke production squeezed superior quality machine coke out of product markets and led to a rapid reduction in coking coal resources. The basic reason for this was the backwardness of coal utilization technologies. The proportion of raw coal washed and dressed in China was just 17.7 percent in 1990 and was basically limited to coal used for coking. Power coal and civilian-use coal was not dressed. Our coal is of poor quality and utilization rates are low, which has also increased the pressure on shipping and the environment. China's coal burning equipment is also rather backward, with an average thermal efficiency of just 20 percent. China has 400,000 industrial boilers and 30 percent of them are small boilers with a thermal efficiency of less than 50 percent. In 1987, China consumed an average of 431 grams/kWh of coal to generate thermal power, 100 grams/kWh more than the Soviet Union and Japan. There is also a low rate of popularization of centralized heating and gas burning in cities. At the end of 1987, the area heated by centralized heating facilities in China was only 8 million square meters and

there are only 4 million urban residents throughout China who cook with gas. The combination of all of these factors creates enormous waste of China's less than abundant coal resources.

## II. Effective Routes to Rational Utilization of Coal Resources

To increase utilization rates of coal resources, I feel that first we must strengthen scientific management of coal. Implement fixed quality and fixed site supplies, guarantee rational utilization; increase the proportion of raw coal that is dressed, improve coal quality and recovery rates; improve coal shaping technology, continually reduce the costs of shaped coal, and expand the scope of its use to effectively utilize powered coal and reduce environmental pollution.

Second, accelerate the development and utilization of lignite resources in energy-short regions. Establish lignite development and comprehensive utilization base areas; organize forces to develop large-scale equipment for strip mining of lignite and power plant boilers which can burn lignite; do research on lignite drying methods; improve pyrolyzation and bonding agent-free shaping technology, lignite gasification and liquefaction, and other comprehensive utilization technologies.

Third, improve coal burning technology, increase combustion efficiency. Some 80 percent of the coal consumed in China is burned directly. Of the total amount of coal consumed, 37.6 percent is burned in industrial boilers, 27.8 percent for power generation, and 20.1 percent for civilian use. Coal used in these areas is very important. Thus, we should abandon small boilers under 4 tons/hour, actively develop combined heat and power supplies and central heating, and extend circulating fluidized bed combustion technology; heat and power cogeneration plants should implement an advanced management system and burners with flame stabilizers to reduce coal consumption and achieve cascaded rational utilization of energy; actively extend gasification, boiler, locomotive, and other shaped coal for industrial and civilian use.

Fourth, strengthen research on coal conversion technology. The average efficiency of energy resource utilization in China is too low, which is certainly related to our energy resource structure in which "coal is the main force". Coal-fired power generation is one important method of coal conversion. Moreover, coal gasification and liquefaction have real significance for making up for insufficient amounts of superior quality energy resources, meeting special needs of local regions, and serving as strategic national reserves. Thus, regions with more coal and little petroleum should use their inexpensive local coal to produce synthetic liquid fuels as a supplementary source to natural gas and petroleum.

In addition, we also can use coal slurry or coal gas as a substitute for burning oil and convert oil-fired industrial

boilers or power plant boilers to burn coal slurry. All these things are effective ways to increase the utilization rate of coal resources.

### Lanzhou's 'Sunshine Project' Outlined

916B0088C Beijing RENMIN RIBAO HAIWAI BAN  
in Chinese 24 Jul 91 p 3

[Article by reporter Chen Huiming [7115 1920 2494]: "Lanzhou Implements 'Sunshine Project' Plan, Will Build Several Applied Projects Over 10 Years"]

[Text] A large-scale "Sunshine Project" plan to develop and utilize new energy resources and reduce urban energy resource consumption and pollution was implemented recently in Lanzhou in northwest China.

According to this plan, over the next 10 years Lanzhou will build 6 million square meters of solar houses and energy conservation houses which will be heated by solar energy, and it will build a 17,500 square meter solar energy greenhouse, extend 63,500 square meters of solar powered hot water areas, and build several solar-powered comprehensive service centers to provide tourism, food and beverage, commercial, and many other types of services.

Lanzhou City is located in the Huang He valley on the loess plateau of northwest China and is surrounded by groups of mountains. During the 5 month-long winter each year, 2,000 heating boilers in the city "spray clouds and spit fog" all day, discharging large amounts of hazardous gases into the city. Measurements by the Lanzhou City Environmental Protection Bureau indicate that the city uses 960,000 tons of coal for heating each winter and discharges over 100,000 tons of soot and sulfur dioxide and 300,000 tons of slag. The city sends out 2,000 truckloads a day to haul the coal and slag and the large amount of slag from coal used in production and households and the exhaust from the trucks are seriously polluting Lanzhou City.

Wang Shengli [3769 0524 0448], an official in the Lanzhou City Government, told me that Lanzhou City began studying the utilization of solar energy in the early 1970's. Experts indicate that the Lanzhou region receives 1.3 million kilocalories per square meter of solar radiation each year, which is equivalent to the amount of heat generated by 1,500 kWh of electricity.

For many years, planning and construction units in Lanzhou City and the United Nations Development Program have cooperated with the Gansu Province Natural Energy Resources Institute to establish China's biggest solar energy experimental base area in the suburbs of Lanzhou City. They have studied a complete set of solar energy utilization technologies and developed several types of solar energy utilization equipment. Experts in Lanzhou have been the source of the designs for 44 percent of the houses and dormitories in China at present that are heated by solar energy. China's first

solar-powered photoelectric station was built in Lanzhou. Wang Shengli said that Lanzhou has excellent conditions and is capable of completing this plan.

#### **Tidal Power Station at Mouth of Pearl River Completed**

916B0088A Beijing ZHONGGUO KEXUE BAO  
in Chinese 9 Jul 91 p 2

[Article by special reporter Cai Aifu [5591 1947 1381]: "China's First Experimental Wave Energy Power Station Completed at Mouth of Pearl River, Gratifying News in Development of Marine Wave Energy"]

[Text] The Zhu Jiang [Pearl River] Mouth Experimental Wave Energy Power Station, the first in China to use the sea to generate power, whose development and construction was led by the Chinese Academy of Sciences Guangzhou Energy Resource Institute, has been completed on Guangdong's Dawanshan Island and successfully generated power in a test recently. An on-site report meeting was recently convened jointly by the State Science and Technology Commission and Chinese Academy of Sciences on Dawanshan Island.

Marine wave energy has characteristics like large reserves, no pollution, renewability, and so on and is one of today's potential substitute energy resources. At present, only Norway, Japan, and a few other nations of the world have built wave energy power stations. China has estimated useable wave energy resources of about 130,000MW.

Through more than 5 years of unified struggle, S&T personnel in the field of marine energy in the Chinese Academy of Sciences Guangzhou Energy Resource Institute developed and built this experimental wave energy power station, which uses a horn mouth front harbor shore-type oscillating water column wave system. This power station has one 3 kW wave energy generator. Tests indicate that with a wave height  $H1/10 = 1.3$  meters and a wave cycle  $T = 4.8$  seconds, it has an average power output of 3.9 kW.

Successful development and construction of this power station has provided rich experience for station site selection, design wave condition selection, experimental research on air chamber model properties, symmetrical wing air turbine and air chamber property matching and design, rocky bank blasting construction, wave energy power generator development, power station testing system development, and other areas.

#### **Wind, Solar Power Used in Mountain Villages**

916B0088B Beijing KEJI RIBAO [SCIENCE AND TECHNOLOGY DAILY] in Chinese 23 Jul 91 p 2

[Article by Qu Yao [1448 5069]: "Pianguan County Uses New Energy Resources To Provide Light in Mountain Townships"]

[Text] Using wind energy and solar power to generate electricity has reduced the daily inconveniences of the masses by using a small amount of capital and stimulated their enthusiasm for using new technology. This is a feasible way to solve the power use problems of distant mountain regions that Pianguan County in Shanxi Province has explored over the past few years.

Pianguan County is located in a distant mountainous region of northwest Shanxi Province. Because of its inconvenient communication and scattered residents, installing high-voltage power lines would be expensive and have low utilization rates. To convert the desire of the peasants to "light their lamps without using oil" into reality, the Pianguan County Science Association and Power Industry Bureau used the area's characteristics of being south of the Great Wall and having good wind energy and sunshine conditions as a basis for beginning in 1985 to explore ways to use wind energy and solar power to generate electricity and made significant accomplishments.

Over the past few years, they have installed a total of 46 wind-powered generators and 22 sets of solar energy boards ranging from 50 to 200W for the peasants with a total installed generating capacity of more than 6.8 kW, which solved the lighting problems of 28 villages and 115 peasant households. They also installed 37 televisions for them. At present, all this equipment is basically operating normally and the users have indicated that when the wind stops they still have lighting for 6 to 7 days. Projections indicate that it would only take 300,000 yuan to install this new energy resource power generation equipment for the more than 2,000 peasant households in Pianguan County which lack electricity, a savings of about 60 percent compared to the cost of installing power lines, so it is very appropriate for extension in distant mountainous regions.

To strengthen management and maintenance, the Pianguan County Science Association and Power Industry Bureau organized peasant electricians in villages using the power to establish training classes that focus on studying knowledge concerning maintenance and repair of wind-powered generators and protection and repair of storage batteries.

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