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Foreword

China's energy issue, which has long been closely watched by the government and broad-based people from all walks of life, is now becoming a focal point of international concern. All the authors for this book, with varied experiences and backgrounds in China energy research, have the common desire for raising the public awareness and interest in this increasingly important topic through the release of this publication.

This book is the first volume of the "China's Energy Outlook" series, which is expected to be released every two years on a regular basis.

China's energy supply and demand, energy rules and laws as well as environmental impacts of energy development over the recent two decades have been largely reviewed, and some insights and analyses have been offered with respect to the slack energy demand at the end of last century and the near-abnormal growing trend over the recent two years. Three topics such as China's power shortage, rural energy and long-term energy development strategy have been particularly discussed, and the prospect of China's energy supply and demand in 2030 has been envisaged. On top of that, China's role in the international energy markets as well as possible interactions between China's domestic and international energy markets has been analyzed.

The contents and comments in this book are presented from a non-governmental point of view, with some arguments representing only the authors views.

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Executive Summary

Over the recent years, China's ungrowth growing energy demand rate, along with extensive power shortages and soaring oil imports, has posed such a serious question: Where does China's energy go? China's energy consumption was 1.678 Gtce in 2003 (NBS 2004a), with the oil imports reaching 91.12 Mt, 13.2% and 31.2% (Tian 2004) up respectively from the year earlier. Meanwhile, the growth rate of power generation reached 15.5% (NBS 2004c) and China's top leadership attaches great importance to these two digital growth rates. At the same time, China's energy issue is becoming an extremely "hot" topic, which has aroused worldwide attention and broad concerns: Does the nation secure enough energy to support its fast economic growth in the future? Great energy demand, particularly in the petroleum industry is expected to raise the already volatile oil price at international markets, and large quantity coal consumption would contribute to climate change and global warming.

The energy industry in China has experienced significant developments ever since the 1980s, with dramatic changes in the industrial structures, energy regulations and policies as well as environmental protections. At present, China's energy industry ranks the second in the world, supporting the country's rapid economic growth and sustaining the huge demand for 1.3 billion people.

Coal dominates energy consumption in China and accounts for around 70% of its total energy consumption over the past two decades; this figure is well above the world average of 26.5%(NBS 2004a, BP 2004). Coal consumption is primarily driven by the energy demand, and is supposed to be an important barometer for China's total energy consumption. However it is not so easy to obtain a complete and accurate dataset to measure the real amount of coal use, the statistics for coal production from small-scale coal-mines still remains to be improved.

The towns and villages owning coal mines have played very important roles in alleviating the energy shortages in the past. However, problems such as low efficient exploitation of resources, frequent work-place safety accidents and serious environmental pollutions, have resulted in huge costs in China. The trend for oil consumption increasing over time and has sped up recently due to the development of the automobile industry and increase in energy consumption for transportation services. Simultaneously, the domestic crude oil production is at a slower rate than that for oil consumption thus causing fast growth in oil imports. China is still at its preliminary stages of natural gas development and this consumption is effected by several factors such as resource development, infrastructure construction and market prices, and although natural gas consumption accounts for less than 3% of the total energy consumption, it contributes a lot to environmental improvement. Primary power mainly comes from the hydroelectric plants, while nuclear power accounts for only a small percentage of power generation. In addition the share of power from wind, solar and other renewable sources is growing but still only at a very small rate. Other than coal, other sorts of primary energy are far lower than the world average and China could not change this situation of coal-dominated dependency by developing any single form of energy source.

Although the growth of final energy consumption in transportation is the fastest one among all sectors, the industrial sector is the main consumer. The share of coal decreased from 59% in 1995 to 39% in 2002, while the share of oil and electricity reached 31.1% and 18.2% respectively in 2002 (NBS 1998, NBS 2004b).

The environmental pollution caused by energy production and consumption is a great challenge and although the trend of enlarging the areas affected by acid rain has stopped due to many measures adopted, acid rain has become more serious in some regions. Carbon dioxide and exhaust emissions from automobiles have received broad numerous attention and further efforts should be made in the future.

China has formed a better legal framework on energy aspects, and the year 2003 was special in terms of the energy-related legal system building. Revising the "Law of Electricity of People's Republic of China" (simply called "Law of Electricity") and drafting a "Law of Renewable Energy of People's Republic of China" will have major repercussions on energy development in the future.

The development of energy-intensive sectors is the direct reason for fast growing energy consumption and the recent supply shortage. Governmental decisions in other fields are the indirect reasons in the promotion of energy consumption,

for example, the government confirmed the auto-making industry as a pillar sector and promoted investment in its infrastructure construction to keep the economy on track with its rapid growth. In addition, improper decisions due primarily to inefficient communication and faulty data also account for the emerging energy shortage.

The hot issue of energy shortage has sparked a new wave of research activities on energy planning and development strategies, characterized by a strong government role and high-profile participation, as well as higher priority given for the energy conservation, petroleum security and strategic reserves than ever before.

Future energy demands will still be driven by the development targets of GDP increasing by four times and building a well off society in all round way. It is estimated that the primary energy consumption will reach 3.3 billion tce and 4 billion tce in 2020 and 2030 respectively, and it should be noted that China is still in the preliminary stage of industrialization and so before 2020 energy consumption will increase slightly faster. It is difficult to support this GDP fourfold increase, just by doubling energy consumption, but after 2020, China will enter a post industrialization phase and energy consumption will slow down to some extent.

China possesses a relative abundance of coal reserves, which could meet the fast growing demands on a short term basis, but there is no sufficient capacity to meet these demands from a long term point of view. The limitations from production capacity, transportation infrastructure and environmental quality make it impossible for coal to solve any problems, and it is also possible that China could be a net coal importer in the future.

Crude oil production is approaching its ceiling capacity and the main objective, for the oil industry is to stabilize the output and then attempt to slightly increase it. It is estimated that the domestic crude oil output will maintain at the level of 180 million tonnes and meanwhile the demand would reach 680 million tonnes in 2030. In other words, the oil import dependency will be over 70% and that is a serious threat for energy security, thus it is extremely necessary to build oil stock-piles immediately.

Natural gas is the best sort of energy to replace coal, especially for final use and power generation. The Chinese government intends to improve environmental quality by promoting utilization of natural gas, and it is predicted that natural gas consumption could reach 380 billion cubic meters in 2030. However domestic resource development is far from achieving this target and the importing of natural gas will meet 50% of total demands by trans-border gas pipelines and

liquid natural gas (LNG) receiver terminals.

Hydropower development is constrained by the availability of resources, long construction periods and huge investment required. It is expected the hydropower-installed capacity will be 270 GW in 2030, which is almost close to the capacity limits. Coal-fired power plants will still dominate electricity generation with a total installed capacity of 700 GW in 2030, while the coal demand for generating electricity will be 1.4 billion tonnes. Gas for power receives backing from the government that will encourage the development of the natural gas industry and provide environmental benefits. It is predicted that the installed generating capacity using gas will be 80 GW and will consume 65 billion cubic meters of gas. China has very high expectations of nuclear power and views it as a unique way to replace coal for power generation on a large scale, to reduce carbon dioxide emissions, and create a secure and available source. China has an ambitious nuclear power development plan, which would see a projection of the installed nuclear power capacity at 40 GW in 2020. However, great challenges loom ahead for the nuclear industry, since the construction of more than ten nuclear power plants is expected to be performed simultaneously over most of the coming decade.

The national long and medium term renewable energy development planning promotes using renewable sources by efficient and modern means, therefore great efforts must be made in reaching the target of renewable energy utilization (including renewable sources for power generation) with the aim of 200 million tce in 2020, which will account for 5% of total energy consumption.

China is playing a rising but modest role in the world energy market, and as it exports less and imports more coal, the coal price at Asian markets would only rise slightly over a short period, since other coal exporting countries in the Asia Pacific region could replace China in the market by increasing their level of exports. In order to meet the domestic coke demand, China will import coking coal for coke making, meanwhile, China will export coke to other countries and keep its dominant position in the international coke market over the coming two decades. China is not a key player in the international oil market, since the country mainly suffers from volatile oil prices and so does not actively affect the price. The oil import by China only accounted for 5.6% of the world trade total in 2003 and there is no doubt that the strong trend in oil demands in China would bring a negative and psychological impact on the world oil market, due to the result of high estimations of insecure oil prices.