ENERGY SUPPLY AND DEMAND

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Contents

1. Introduction
1.1. Energy and Sustainable Development
1.2. History, Present Situation and Future of Energy Supply and Demand
2. The General Situations and Features of Energy Resources
2.1. A Complete Variety and Considerable Total Quantity
2.2. Per Capita Quantities of Energy Resources less than the World Average
2.3. The Irrational Structure
2.4. The Uneven Distribution
3. The General Situations and Features of Energy Production
3.1. Quantity and Quality
3.2. The Structure
3.3. The Elasticity Coefficient for Energy Production
4. The General Situations and Features of Energy Consumption
4.1. The Quantity and Quality
4.2. The Structure
4.3. The Elasticity Coefficient for Energy Consumption
5. Energy Demand Forecasting
6. Present Policies for Energy Supply and Demand in China
6.1. The Synopsis of Strategy
6.2. The Main Countermeasures
6.2.1. Utilizing Overseas and Domestic Resources and Markets
6.2.2. Improving the Structure and Distribution of Energy Production
6.2.3. Progress in Science and Technology, Diversifying Supply, and Energy Saving
6.2.4. Developing Clean Energy Technology and Enforcing Environmental Protection
6.2.5. Speeding up the Exploitation of Natural Gas and Improving Energy Structure
6.2.6. Realizing the Rationalization of Energy Price
Glossary
Summary

The industrialization process in China is undergoing rapid development. As a result, the success of future economic growth requires a great deal of energy consumption. But the structure of energy production and consumption must be optimized. It is the only path for realizing sustainable development, to establish the clean and sustained systems of energy supply and consumption. The leading ideas in China's energy strategy are as follows: utilizing overseas and home resources and playing these two markets; guaranteeing supply and rationalizing consumption; improving structure and raising efficiency; avoiding and curing pollution, protecting environment, and generally gearing the energy supply and demand system towards sustainable development. The development strategies of China's energy industry are the following sides: using electricity as the power and coal as the main energy source; positively exploiting oil and natural gas; devoting major efforts to developing hydro-power and nuclear power; expanding new energy and renewable energy strategically, and speeding up the construction of the rural energy infrastructure and electrification. By 2010, energy supply should meet the needs of national economic development; the energy system of sustainable utilization must be established step by step. Energy technology and equipment should reach or approach an advanced international level, and energy exploitation and environment protection should be coordinated.

1. Introduction

1.1. Energy and Sustainable Development

Energy is the basis for all human activity. Its exploitation and utilization has promoted social development and global economic prosperity. On the other hand, it can do a great deal of damage to the natural environment on which the existence of humankind relies.

In China, the industrialization process is at a stage of very rapid development. As a result, the success of future economic growth depends on a great deal on energy consumption. While the growth of primary energy demand is met by fossil energy, the pressure on China’s environment become ever greater. The energy industry has to face the dual pressures of developing the economy and protecting the environment. Only by insisting on harmonious developmental policies of exploitation and protection, can sustainable development be realized.

1.2. History, Present Situation and Future of Energy Supply and Demand

The production and consumption of primary energy in China is increasing rapidly. In 1949, the output was 23.74 million tons of coal equivalent (Tce) and in 1997 it amounted to 1319.89 million Tce, an annual growth rate of 8.7%. Consumption in 1949 was only 23.97 million Tce but by 1997 it amounted to 1420 million Tce, an 8.8% annual growth rate (see Table 1).
With the discovery of oil and natural gas, there have been outstanding changes in the structure of China's energy production and consumption. In 1997, 19.7% of primary energy total output and 20.8% of primary energy consumption was shared by oil and natural gas, compared to only 1.3% and 3.4% in 1952. The proportion of coal in primary energy supply reduces every year.

Today, China's industries are taking off, with an annual growth rate of GNP of about 8%. Therefore, energy demand will rise continuously. In addition, due to the needs of sustainable development and environmental protection, the structure of energy production and consumption must be optimized. The only path of realizing sustainable development is to establish a clean and sustainable system of energy supply and consumption.

2. The General Situations and Features of Energy Resources

The total quantities of energy resources in China are enormous. Proven coal deposits occupy second place in the world; oil ranks eleventh; natural gas is fourteenth; hydropower occupies first place. Solar energy ranks second. Nuclear power, biomass, marine energy, wind energy and geothermal energy are relatively plentiful as well.
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</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>23.7</td>
<td>48.7</td>
<td>296.4</td>
<td>188.2</td>
<td>309.9</td>
<td>487.5</td>
<td>637.4</td>
<td>855.5</td>
<td>1039.2</td>
<td>1290.3</td>
<td>1319.9</td>
</tr>
<tr>
<td>Consumption</td>
<td>24.0</td>
<td>47.0</td>
<td>301.9</td>
<td>189.0</td>
<td>292.9</td>
<td>454.3</td>
<td>602.8</td>
<td>766.8</td>
<td>987.0</td>
<td>1311.8</td>
<td>1420.0</td>
</tr>
</tbody>
</table>

Source: China Statistical yearbook 1998

Table 1. Energy production and consumption over the years in China (million Tce)
Owing to the vast land and sea areas, complete stratum and manifold sedimentary types, the energy resources in China have the following features.

2.1. A Complete Variety and Considerable Total Quantity

China's energy resources are complete. The proven routine energy reserves, including coal, oil, natural gas, hydro power (converting 1000 kWh into 0.35 Tce within one hundred years) and so on, add up to 191.8 billion Tce (1990). It is estimated that the proven non-renewable energy reserves except for uranium amount to about 11% of the world’s reserves and rank third. Calculating energy reserves by unit territory area, the energy resources per square kilometer is about 1.6 times the world average. China is therefore one of the countries with relatively rich energy resources in the world. In addition, there are rich renewable energy sources such as hydropower, wind energy, solar energy, biomass energy, etc. (see Table 2, Table 3).

<table>
<thead>
<tr>
<th>Energy types</th>
<th>Quantity</th>
<th>Converted into billion Tce</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>4500 billion tons</td>
<td>3214.35</td>
<td>88.5</td>
</tr>
<tr>
<td>Oil</td>
<td>94 billion tons</td>
<td>134.42</td>
<td>3.7</td>
</tr>
<tr>
<td>Natural gas</td>
<td>38,000 billion m³</td>
<td>50.54</td>
<td>1.39</td>
</tr>
<tr>
<td>Hydro-power</td>
<td>5290,000 kWh</td>
<td>232.66</td>
<td>6.41</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>3631.97</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Status and Development Strategy of China's Resources edited by He Xiwu, Yao Jianhua, etc.

Table 2. Breakdown of energy reserves in China

<table>
<thead>
<tr>
<th>Energy types</th>
<th>Quantity (million Tce)</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar energy</td>
<td>396,421.37</td>
<td>99.43</td>
</tr>
<tr>
<td>Wind energy</td>
<td>80.15</td>
<td>0.02</td>
</tr>
<tr>
<td>Geothermal energy</td>
<td>2000</td>
<td>0.5</td>
</tr>
<tr>
<td>Tidal energy</td>
<td>23.58</td>
<td>0.01</td>
</tr>
<tr>
<td>Biomass energy</td>
<td>175.69</td>
<td>0.04</td>
</tr>
<tr>
<td>Total</td>
<td>398,700.79</td>
<td>100</td>
</tr>
</tbody>
</table>

Sources: Status and Development Strategy of China's Resources edited by He Xiwu, Yao Jianhua, etc.

Table 3. Potential renewable energy reserves and their proportions.

2.2. Per Capita Quantities of Energy Resources less than the World Average

China has a very large population of more than 1.2 billion and this number will probably reach 1.5 billion by the 2020s. As a result, per capita quantities of energy resources is 230 tons and only 51% of the world average, coal less than one half, oil less than one-eighth, natural gas less than one-twentieth, and hydropower about two-thirds.
2.3. The Irrational Structure

The energy structure in China uses coal as the primary energy source, representing 88.5% of total supply. Hydropower supplies 6.41%, and oil and natural gas 5.09%. The proportion of energy supply coming from oil and gas is very much less than the world average (25.3%).

Bibliography


Biographical Sketches
Y.H. Lang (male) is a Professor in the Institute of Geographic Science and Natural Resources Research, Chinese Academy of Sciences. His research interests include: regional economy and regional exploitation; resources economy and resources exploitation; industrial development and industrial distribution; industrial structure and planning; biological economy and environmental economy.

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