中国替代能源的发展及国家石油公司应起的作用

The Development of Oil-Substitute Energy in China and the Function of National Oil Companies in It

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I. The Characteristics of Energy in China and the Situation in the Future

- **The characteristics of energy supply and demand in China**

  - **The total production of all types of energy can meet the needs of China's economic development**

  - **There is a structural unbalance between energy supply and demand**

Characteristics and Situation

Primary Energy Production and Its Composition

	PRIMARY ENERGY PRODUCTION (10^4tce)	AS PERCENTAGE OF PRIMARY ENERGY PRODUCTION(%)			
		RAW COAL	CRUDE OIL	NATURAL GAS	HYDRO POWER
1980	63735	69.4	23.8	3	3.8
1990	103922	74.2	19	2	4.8
1995	129034	75.3	16.6	1.9	6.2
1996	132616	75.2	17	2	5.8
1997	132410	74.1	17.3	2.1	6.5
1998	124250	71.9	18.5	2.5	7.1
1999	109126	68.3	21	3.1	7.6
2000	106988	66.6	21.8	3.4	8.2
2001	120900	68.6	19.4	3.3	8.7
2002	138369	71.2	17.3	3.1	8.4
2003	160300	74.2	15.2	2.9	7.7

Characteristics and Situation

Primary Energy Consumption and Its Composition

	TOTAL ENERGY CONSUMPTION (10^4tce)	AS PERCENTAGE OF PRIMARY ENERGY CONSUMPTION (%)			
		RAW COAL	CRUDE OIL	NATURAL GAS	HYDRO POWER
1980	60275	72.2	20.7	3.1	4
1990	98703	76.2	16.6	2.1	5.1
1995	131176	74.6	17.5	1.8	6.1
1996	138948	74.7	18	1.8	5.5
1997	138173	71.5	20.4	1.7	6.2
1998	132214	69.6	21.5	2.2	6.7
1999	130119	68	23.2	2.2	6.6
2000	130297	66.1	24.6	2.5	6.8
2001	134914	65.3	24.3	2.7	7.7
2002	148222	65.6	24	2.6	7.8
2003	167800	67.1	22.7	2.8	7.4

Characteristics and Situation

The Situation in the Future

- Among all types of primary energy, coal and electricity can be totally self-supplied in the future.
- The main problem for China's future is the shortage of oil and gas.

The Situation in the Future

Forecast of Oil Consumption in China

(100 million tons)

CHINESE ACADEMY OF ENGNEERING（中国工程院）	2010	2020	2030
IEA（国际能源机构）	3.3-3.5	4.0-5.0	
ERI(国家发改委能源研究所)	4.04	5.42	6.8
CERA(剑桥能源研究中心)	3.35-3.57	4.3-4.75	
EIA（美国能源信息署）	—	4.3-5.3	
IEA（国际能源机构）	—	4.7	

The Situation in the Future

Forecast of Oil Production before 2020 in China

(100 million tons)

	2010	2015	2020
TOTAL PRODUCTION	1.77–1.91	1.82–1.99	1.81–2.01

The Situation in the Future

Forecast of Domestic Gas supply and Demand (2010-2020)

(100 million cubic metres)

	2010	2015	2020
CONSUMPTION	1000	1500	2000
PRODUCTION	800-900	1000-1200	1300-1500
UNBALANCE	100-200	300-500	500-700

Characteristics and Situation

The Situation in the Future

- According to some experts estimate, after the year of 2040,China's economy will be getting moderately mature. The growth of oil consumption will also be getting flat.

- Both the consumption and production of natural gas increase with very high speed. There is also a gap between supply and demand. The gap will be made up by importing LNG and pipelined natural gas.

II. The Development of Oil-substitute Energy in China

- Coal-to-Liquids
- Alcohol as Car Fuel
- Methanol and Dimethyl Ether as Car Fuel
- Gas-to –Liquids
- Biodiesel
- Oil-shale

II. The Development of Oil-substitute Energy in China

- **Coal-to-Liquids**

- **On August 25,2004,Shenhua Group started the construction of a plant for coal -to-liquids located in Erdos city, Inner Mongolia.**

- **The total production of oil products from coal of the project will be reached to 5 million tons each year.**

II. The Development of Oil-substitute Energy in China

- **Coal-to-Liquids**
  - **It will consume 9,700,000 tons of coal as row materials annually.**
  - **The total investment of the project will be reached to 24.5 billion RMB Yuan.**
  - **According to Shenhua Group' plan, the total production of oil products directly liquified from coal will be reached to 15,000,000 tons annually by 2010 only in the same place of Erdos. Until 2020, the scale will be 20,000,000 tons.**

II. The Development of Oil-substitute Energy in China

- **Coal-to-Liquids**
  - **There are also many other energy corporations plan to start the business of coal-to-liquids by means of the directly liquefied technology.**
    - **The Xianfeng project in Yunnan Province, its scale is 1,020,000 tons of oil products**
    - **The Yankuang Group's project, designing capability of the first stage will be 3,200,000 tons and the final capacity will reach to 9,600,000 tons.**
    - **Yilan and Shuangyashan projects in Heilongjiang Province, Liupanshui project in Guizhou Province. Those projects are in the level of million tons each year.**

II. The Development of Oil-substitute Energy in China

- **Coal-to-Liquids**
  - **China is also searching for the opportunity to import Sasol's low-temperature Fischer-Tropsch technology.**
    - **Sasol Synfuels International(Pty) Ltd. and two chinese partners--Shenhua Group and Ningxia Coal Industry Group let a contract to Foster Wheeler Energy Ltd. and China Huanqiu Contracting & Engineering Corp. for a first-phase feasibility study of two 80,000b/d(3,000,000 tons/y) coal-to-liquids projects in the Ningxia Autonomous Region and Shanxin Province in western China.**

II. The Development of Oil-substitute Energy in China

- **Alcohol as Car Fuel**

- **Alcohol to be used as car fuel is an aid-the-poor project supported by the central government to resolve the problem of relative overproduction of grain in some area of China.**

- Until now, there are 5 provinces and 27 cities in other 4 provinces to conduct the extending test of using alcohol to substitute a sum of normal gasoline as car fuel. Four plants are authorized by the government to produce car-fueling alcohol. The total capacity at the four Plants is 940,000 tons yearly. There is another 720,000 tons of capacity which is under the construction now.

II. The Development of Oil-substitute Energy in China

- **Alcohol as Car Fuel**

- **The supply of raw materials is affected greatly by the agricultural production.**
- **Until 2020, China will face a problem of structural shortage of grain.**
- **It is very difficult to depend on the alcohol made from grain to substitute normal gasoline in a large scale.**

II. The Development of Oil-substitute Energy in China

Methanol and Dimethyl Ether as Car Fuel

- China now has an ability of 4,400,000 tons of methanol production each year.
- Until the end of 11th Five Plan, the whole country will have a total capacity of methanol of 25, 000,000 tons. Among the total, 80% are based on coal, others are based on natural gas.
- Until now, only a few cars and public vehicles are tested to be fueled by methanol in fewer cities. There is no any determined plan to expand the use of methanol as fuel of vehicles.

II. The Development of Oil-substitute Energy in China

Methanol and Dimethyl Ether as Car Fuel

- The development of DME in China starts very lately. But great progress has been made since then. The production capacity of DME has reached to a level of 50,000 tons each year.
- The biggest production line is located in Shandong Province and operated by a private corporation named Shandong Jiutai Chemical Technology Ltd.
- It is also under the testing phase to substitute diesel with DME. Only a few cars are testing DME as fuel.

II. The Development of Oil-substitute Energy in China

- **Methanol and Dimethyl Ether as Car Fuel**

  - Though it is suitable with China's energy characteristics to substitute gasoline and diesel with the coal-based methanol and DME. But the implement of the strategy must be well coordinated with the development of auto industry of China. It also needs the supports from government.

II. The Development of Oil-substitute Energy in China

Gas-to –Liquids

- **GTL is a technology to converts natural gas into very clean fuels and petrochemicals.**

- By statistics, there will be at least 41 GTL installations located in 10 countries to be got into production by the year of 2007. The capacity will reach to 30,780,000 tons each year or 68400 b/d.

- In China, because the proved natural gas reserves are not very rich, there is no condition to develop the GTL technology. So, there is no any plan to use the technology right now. In 2004, from August to October, a test of using GTL clean fuels supplied by Shell was exercised in Shanghai.

II. The Development of Oil-substitute Energy in China

- **Biodiesel**

- **Biodiesel is made from oil-bearing crops, oil-bearing woods, oil-bearing water plants, animal fat and waste oil from restaurants through transesterification reaction.**

- **This industry is developing very fast in many oil consuming countries .**

II. The Development of Oil-substitute Energy in China

Development of Biodiesel in some Countries

	NUNBER OF PLANTS	CAPACITY (10^4tons/y)	SUPPORT BY GOVERNMENT
U.S.A	4	30	
GERMANY		55	
FRANCE	7	40	ZERO TAX
ITALY	9	33	ZERO TAX
AUSTRIA	3	5.5	LOW TAX
BELGIUM	2	24	
JAPAN		40	

II. The Development of Oil-substitute Energy in China

Biodiesel

- **The industry of biodiesel in China also started very lately and is in the phase of studying and experiment. There is no any installation to produce biodiesel in a relative quantity.**
- **The central government of China has drawn up a strategy of the development of renewable energy.**
- According to the strategy, the industry of biodiesel will be developed in a fast speed. Until 2020, the scale of production and consumption of biodiesel will be reached to 1,000,000 tons each year.

II. The Development of Oil-substitute Energy in China

Oil-shale

- **Strictly speaking, oil-shale is not a substitute of oil but a supplement to the shortage of conventional crude oil.**
- **Oil-shale used to be the main oil resource during the 50's and 60's of the 20th century. It was exploited and processed in a large quantify. After the discovery of Daqing oilfield, the development and processment of oil-shale were stopped.**
- **The reserve of oil-shale is very rich in china.** The proved reserve of oil-shale in China will be at least 30 billion tons plus 700 billion tons of probable reserve. From this quantity of reserve, we can extract about 14.2 billion tons of oil. This quantity is nearly equal to the quantity of recoverable reserve of conventional oil in China.

II. The Development of Oil-substitute Energy in China

Oil-shale

- **Fushun Coal Group in Liaoning Province has a set of installations to process oil-shale. About 100,000 tons of oil is produced by these installations.** The company is planning to import some advanced equipments from abroad to expand the capacity to 500,000 tons annually.

- Some corporations in Jilin Province in which the oil-shale resource accounts for nearly a half of China, has signed a co-operate agreement to develop the oil-shale resource by using Shell's patent technology.

- **Otherwise, in Shandong Province and Guangdong Province, some projects of the development of oil-shale are also under disscussion.**

Ⅲ.The Strategic Position and Transform of the National Companies

- The national companies are special corporate system with specific interests seeking.
- For a country, the purpose to establish national oil companies is either to control the oil resource of the country or to safeguard the oil supply by preventing the monopoly of the oil market by foreign investment. The core purpose is to safeguard the domestic interests.
- The national oil companies naturally have the economic, political and social attributes.

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- The national oil companies naturally have the economic, political and social attributes.
- There are four national companies in China-- CNPC, Sinopec, CNOOC and Sinochem. Their core businesses are still relied mainly on oil and gas now.

III.The Strategic Position and Transform of the National Companies

- **The challenges that the national oil companies will be faced in the short term and long term**

- **For the short term, the oil and gas production provided by the national oil companies can't meet the needs of domestic demand and the R&D investments of the national oil companies are much lower than that of IOC$_s$.**

- **For the long term, the fossil fuel in the world is limited and unregenerated. The day of fossil fuel dried up must be come. But the intelligence and wisdom of humanbeings are unlimited. If the oil companies keep the fossil fuel as their sole business forever, they must be replaced by other new energy companies.**

III.The Strategic Position and Transform of the National Companies

- By the view of the trends of the IOC$_s$' strategic transform, we can find that most companies are starting to extend their business from oil and gas to another areas of new energy. The top 5 international oil companies all called themselves "energy company" or "energy and petrochemical company".

- **China's national oil companies should establish the strategic position of energy company as early as possible in order to fulfill the transform from oil companies to the integrated energy companies.**

Ⅳ.Conditions for the National Oil Companies to Fulfill Strategic Transform

- The national oil companies have accumulated a large amounts of funds because of the high bevel of global oil price.

- **For the IOC_s , the stock buy-back strategy that the IOC_s have implemented recently is questioned if it is good for the stable energy supply for the world.**

- **The reason why the IOC_s implemented the stock buy-back strategy is that there is a lack of attractive investment opportunities in the conventional oil and gas area and the investment decisions made by IOC_s are considered much more overcautious.**

- China's national oil companies are putting more money into the exploration and development of oil and gas both in domestic and abroad. Also they are going to put more money into the R&D of new energy and oil-substitutes .

Ⅳ.Conditions for the National Oil Companies to Fulfill Strategic Transform

- The energy market is very huge in China, and the national oil companies have already played an important role in the market. That makes the co-operation between China's national oil companies and foreign energy companies much easier.

- They have the marketing network of oil products. That makes them sell the new oil-substitutes with low cost.

Ⅴ.CNOOC's Development Strategy

- CNOOC has already established the strategy to build an international and integrated energy company with first class internationally.

- Except The business of offshore oil and gas, CNOOC vigorously expanded its mid and downstream business such as LNG and electricity, chemical business based on natural gas, etc. She will be become the biggest LNG supplier in China in a near future.

- The company is also paying close attention to the development of oil-substitutes.

Ⅴ.CNOOC's Development Strategy

- She is searching the opportunities to get involved in the coal-to-liquids business in Inner Mongolia, Yunnan Province and Shanxi Province.

- The judgement made by CNOOC is that it is nearly impossible for the global oil price to decline dramatically. The coal-to-liquids business is competitive in the condition of the oil price is above $23 per barrel. Even other risk factors to be considered, as long as global oil price is above $34 per barrel, the coal-to-liquids will be profitable.

- On the other hand, the resource of coal in China is sufficient to support the development of coal-to-liquids.

Ⅴ.CNOOC's Development Strategy

- CNOOC is also interested in the GTL development technology.
- If we will find a gas field with middle or large scale in South China Sea, we can use the technology to deal with the market problem of gas.
- According to some geologists' estimate, the natural gas resource in South China Sea is very rich. There exists a great potential to find some natural gas field with middle or large scale.

Ⅴ.CNOOC's Development Strategy

- In other area except the oil-substitutes, CNOOC is also considering to plan to build a wind power station on the sea and to be involved in the development of oil-shale.

- For the long-term, CNOOC will focus on the development of natural gas hydrate in South China Sea. She is now doing the technical research co-operated with related organizations.

Conclusion

- The main problem is the lack of oil. But even to the year of 2020, the self-supporting rate of oil will still be above 40%. If the oil-substitutes business is developed more rapidly, the rate will be much higher.

- China is also rich in renewable resources, such as wind energy, solar energy, tidal energy, hydro energy, etc. The development of those resources is much lower than the average level of the world.

- China has formulated a long-term plan to develop the renewable resources with more rapid growth. It is believed that once the implement of the plan, a large amounts of oil will be substituted indirectly.

Conclusion

- In addition, the potential of saving energy is also very huge in China.

- **To summarize these factors, the energy situation in China is not a threat to the world but an opportunity.**