China and the Global Energy Crisis

Development and Prospects for China's Oil and Natural Gas

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Preface

For more than 15 years China has maintained a breathtaking rate of economic growth, averaging almost 10 per cent per annum. This growth has propelled China's energy demand to the point where a country that was a net exporter of oil in the 1970s cannot now meet its domestic needs from its own natural resources. Indeed, today's price of a barrel of oil ($60+) is attributed by some, perhaps unfairly, to the unanticipated demands that China has been making on the world oil market in recent years.

China is a country that in some respects is today not unlike the USA of the 1850s – it has a sophisticated and prosperous east coast and an interior and western region that lags a long way behind, with a much lower standard of living and heavy dependence on agriculture and mining. The interior is also still somewhat remote from the writ of Beijing, as the saying goes 'The mountains are high and the emperor is far away'.

Tens of thousands of towns and villages in western China are still without mains electricity and the benefits of communication and quality of life that they bring. These internal disparities have led to varying degrees of civil unease. For these reasons it is hardly surprising that the priority of the present government is to redress the balance. In part this is being done by a programme of power-plant construction on a scale that has probably never been matched. Currently the equivalent of a large (1Gigawatt) capacity power station is being commissioned every five days. These plants are, however, not being fuelled by oil or gas, but by coal, the one fossil fuel that China has in abundance. Although this choice of fuel would probably have been made in any case, the high world prices of oil and gas have effectively ruled them out as alternatives for power generation. This choice, however, carries a major penalty, namely that of air pollution. Particulates and acid rain continue to pose a major respiratory problem in industrialized cities and as recently as November 2005, Chinese government officials were estimating a cost to the country of around 3.5 per cent of GDP. Both oil and gas can be significantly lower in both local pollutants and greenhouse gas emissions.

The greater part of China's energy resources lie in the west of the country, while the bulk of current demand arises in the urban and industrial east. For that reason the new west–east gas pipeline is of great importance. This is one of the largest and most rapidly completed projects of its

kind in the world. For the future it is worth remembering that the nearest unexploited or underexploited oil and gas reserves in China's immediate neighbourhood lie to the north-west, in eastern Russia. These are currently being explored by consortia comprising Russian and foreign oil companies. When they are fully assessed it may prove that access to these resources by pipeline could be an important way for China to strengthen and diversify its energy supply.

The rate of growth of Chinese oil consumption is matched by the growth of the demand for transport fuels. Perhaps the most visible indication of this growth is the increase in private and other forms of car ownership. China's new middle class and the growth of its corporate activities now create rush-hour congestion equal to any found in major cities in the East. However, it would be wrong to think that vehicles are the only problem. Increase in both internal and international aviation and increases in the energy demands for shipping have both played a major role.

For transport there is no generally available alternative to oil. As the authors show, although China has some reserves of oil and a reasonably effective oil industry, there is no prospect of demand for transport fuels being fully met from internal resources, and hence imports can only rise. This has several consequences. The most obvious are the attempts to secure resources overseas either by direct acquisition or by partnership deals. In recent years China has completed deals in Sudan, Venezuela, Angola, Kazakhstan, Algeria and Indonesia (and has been rebuffed in the USA). It will be surprising if securing additional resources overseas does not remain a major objective of Chinese foreign policy for many years to come.

Another consequence is the search for direct oil substitutes. With world oil prices at their present levels, technologies that a decade ago were of research interest only are now attracting urgent attention. In particular, the possibility of new techniques to exploit coal reserves must be of great interest to China. If coal is heated under appropriately controlled conditions, new gases are evolved that may either be used directly, or used to make vehicle fuels. Some work of this kind is going on in collaboration with foreign companies, but so far there does not appear to be any production. If current world prices remain above $50, this may prove to be a cost-effective way of improving supply security for vehicle fuels. As well as being in the world market for conventional oil, China may also have an interest in the ultra-clean vehicle fuel that is being produced by the multinationals in the Middle East from natural gas (GTL – gas to liquid). This would make a welcome contribution to improving air quality in major cities.

This is a timely volume. Understanding the oil and gas industry that China has at home is essential to understanding Chinese foreign policy and the future role of China in world oil and gas markets. It is certain to be a major one.

Ron Oxburgh,
Lord Oxburgh of Liverpool,
Climate Change Capital

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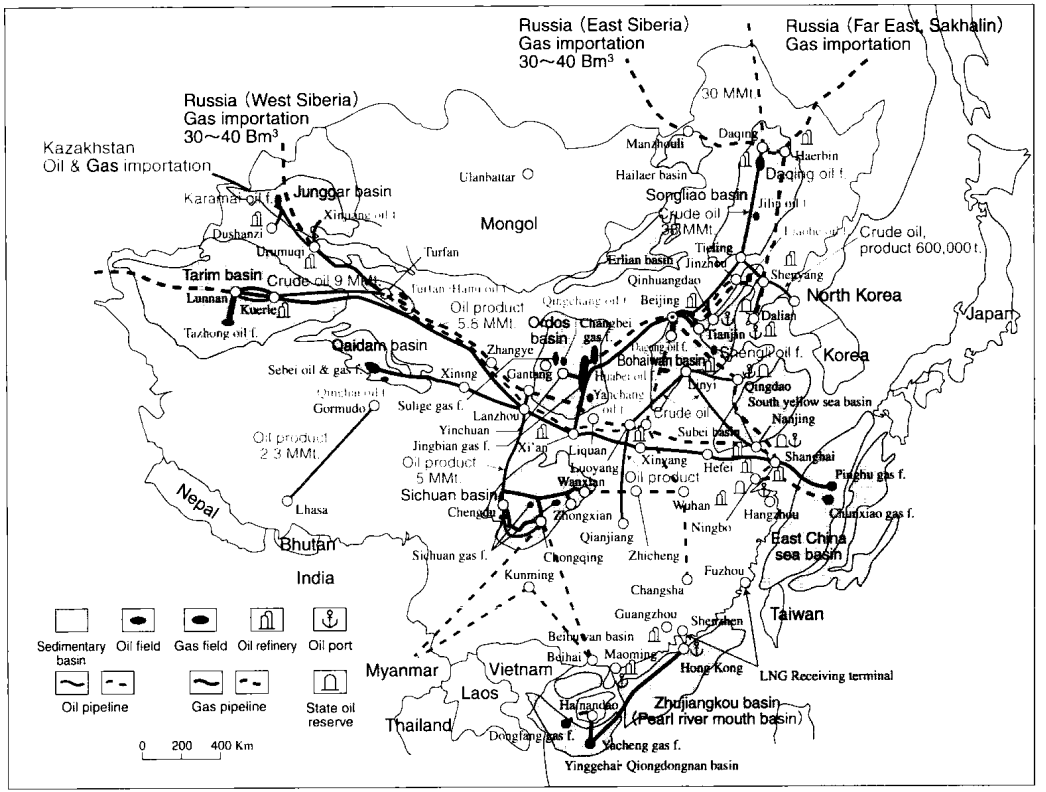

Oil and gas map of China

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Introduction

The rapid economic development of China during the past two decades is proving to have profound implications for China's energy situation. China's GDP increased fourfold between 1980 and 2000, while primary energy consumption approximately doubled in the same period. By 2004, China's primary energy consumption had risen to 1386.2 million tons of oil equivalent (mtoe). Of this, coal supplied 68 per cent and oil 23 per cent. In the same year, while China's domestic output of crude oil had reached 174 million metric tons (mmt), consumption of petroleum products was reported to be 300 mmt – a huge gap that has had to be filled by imports.

According to official statistics, net imports of crude oil in 2004 reached 117 mmt and oil products imports were an additional 26.4 mmt. In global terms, therefore, China produced only 4.5 per cent of the world's oil but consumed 8.2 per cent.[1] Bearing in mind that at present Chinese per capita energy consumption levels are less than one-tenth of those in the USA and one-seventh of those in Japan, the scale of the future potential of Chinese consumption and its world impact are both obviously important.

On present estimates, energy consumption in China is likely to increase by two- to threefold between 2000 and 2020. Within this total, if oil is to maintain its recent share of energy supply, it is likely that more than 60 per cent of all oil will have to be imported.

This far-reaching transformation is all the more remarkable when we remember that when China's economic reforms began in the late 1970s, China was a significant energy, and especially oil, exporter. Further, whereas before reform China's economic system enabled the planners to control many of the parameters of demand and supply, this is increasingly no longer the case. Firms and householders, now driven by prices, incomes and profit criteria, make choices that the economy has to respond to. What this means is that while energy issues are bound to remain an important concern of government, both the technical and economic feasibility of solutions to China's energy problems will, increasingly, have to be consistent with changing market realities.

In the days of the planned economy, calculations were largely in real terms, and cost considerations were not decisive in either the planning of the energy supply or in decisions by the major consumers. Today, this has all changed, not least as a result of the internationalization of China's

economy. International participation in the Chinese energy sector means, first, that foreign participants weigh China-related decisions in the balance of a worldwide range of alternatives and, second, that consumers are increasingly able to make choices between both types of fuels and between domestic and foreign suppliers all based on price, reliability of supply, and other conventional market factors. The implications of this are already becoming apparent as a result of the arrival of 'West to East' gas supplies in the eastern provinces. These supplies are clean but expensive and have to compete with both coal and imported liquid natural gas.

Understanding China's current and prospective supplies of oil and gas and their international significance is, therefore, a complex problem. To understand it we need to consider four distinct sets of issues. These are:

1. China's natural resource endowment for these industries.
2. The technological and business capabilities available domestically to develop this.
3. The organizational structure of the sector and the extent to which market-type incentives are operating within it.
4. The role of foreigners in China's energy sector.

Foreign involvement can now take several forms. These include: supplying energy imports; supplying the technology for exploiting domestic resources; and, increasingly, entering into partnerships for on- and offshore exploration and development both in China and overseas.

From this last point we can see that, even in an age when economic growth and reform are so high on the national agenda, China's thinking about energy policy is bound to be coloured by international politics, strategic and security considerations.

We believe that this is an opportune moment at which to reappraise the present and prospective oil and gas situation. One reason for this is that China's transition to an oil-importing status is relatively recent and its implications are only beginning to be fully appreciated both within and outside China. Second, in the post-Iraq-War situation oil and gas prices have begun a trajectory that is certainly upward but very possibly unstable. It remains unclear what the prospect for long-term price trends really is. Pessimists are convinced that the high prices of summer 2005 represent the future, but some dimensions of the supply situation remain potentially highly favourable. Strong development in Russia and a renewal of stability in Iraq could, for example, transform the supply situation. Also, the events of the past two years have renewed pressures for technical innovation and also for investment and policy measures to constrain demand and improve supply. Thus the post-crisis history of rapid market adaptation that took place in

the 1970s and 1980s may be repeated. However, for the immediate future, world energy price trends remain crucial to China because the viability of several of China's current plans and options is critically dependent on them.

The new factor in the global situation, not present in the 1970s, is the emergence of China, India and other developing nations as major consumers of energy. The problem of the two oil price crises of the 1970s was essentially the conflict between producers and consumers – largely a conflict between the interests of Middle Eastern producers and the big net importers in America, Japan and Europe. The contemporary problem looks increasingly like a competition between consumers, whose numbers have been enlarged by the rapidly growing demand of Asian potential superpowers.

Some of these issues have been vividly illustrated since 2002, the year in which China entered an open electricity supply crisis. This reflected a planning failure of the late 1990s: in the first quarter of 2004, 24 of China's provinces had power shortages and one-third of all the Chinese provinces had serious power deficits in the summers of 2003 and 2004.[2] So severe was this crisis that the national planners had to make emergency changes to the current five-year plan and at the local level, in the summer of 2004 the Beijing authorities had to decide whether to keep the air conditioning in the city's offices and hotels functioning, or to interrupt for weeks on end the power supply to local industrial consumers. (They chose the former.) The knock-on effect of these shortages was a jump in China's demand for imported oil as consumers fell back on small-scale diesel-driven generators to make up for the deficiencies of the grid supply. Then, in the summer of 2005, there were yet more manifestations of China's energy problems, first in the form of a shortage of gasoline in southern China caused by a refiners' 'strike'. This arose because crude prices (linked to international prices) reached levels that forced losses on Chinese refiners who were required to sell at the regulated prices of refined products. As a result, long queues of unhappy consumers appeared on the petrol forecourts in Guangzhou. Meanwhile, up the coast in Shanghai, taxi drivers caught between rising fuel prices and regulated fare levels were also in uproar. Events of this kind would have been unimaginable just a few years ago and the energy flexibility of China and other developing economies is, therefore, something that we must urgently seek to understand if we are to think sensibly about the global energy future. In China, such flexibility is very much a matter of both physical resources and of the systems and efficiency with which these are used.

One other new factor in the Chinese situation is political. Since March 2003 a new 'fourth-generation' leadership has come into power. By spring of 2006 and the announcement of China's Eleventh Five Year Plan (2006–2010) at the National People's Congress, this change had already brought a great deal of new thinking to economic policy generally and, if

words are turned into action, may be important for strategic aspects of energy development as well. There is, for example, new emphasis on achieving a better balance between industry and agriculture, between industrial and trade growth and the claims of environmental factors, and between coastal and inland development. All of these changes have energy implications. Further, the future of the economic reform itself remains at an important juncture as the Chinese wrestle with the problems of reconciling development of a market economy with the maintenance of a society with distinct Chinese and socialist characteristics.

China's organizational capability to handle energy problems is one of the large unknowns of the sector at the present time, but such capability is clearly critical. It is essential that both household and commercial consumers have strong incentives to economize energy consumption and that suppliers of energy work in an effective and coordinated way to satisfy the market. The success or otherwise of the continuing drive to economic reform is bound to be a key factor determining China's energy future.

The purpose of this book is to provide a concise introduction to China's energy problems by focusing on the growth and development of the oil and gas sector. These realities provide a starting point for all other dimensions of China's energy situation. Important as the subject is, we find it remarkable how limited is knowledge of these issues outside China and outside a very small group of foreign specialists. This is a serious issue, particularly bearing in mind the growing tendency among some politicians and commentators to blame the world's economic ills on the Chinese. The graph that appeared in the press in 2005 showing a close fit between the trend of Chinese oil imports and world oil prices was a good example of this type of misleading and alarmist analysis. We hope that this book will do something to remedy this situation.[3]

We start our study by analysing the historic trajectory of the oil and gas sector. Present energy resources and the infrastructure to exploit them are very much a product of history and, in Chapter 1, we briefly review the Chinese development of oil and gas from the earliest times to the present. In particular we examine the changing emphases between the eastern and western phases of exploration and the story of the offshore oil mini-boom of the 1980s. In Chapters 2 and 3 we discuss the geological basis for this progress and the record of exploration and development. Chapter 4 focuses on the role of natural gas and in Chapter 5 we look at the development and prospects for the Tarim Basin – often seen as China's new energy Klondike. In Chapter 6 we examine the infrastructures of refining and transportation. These are both topics critical to oil and gas development but about which relatively little is known outside China. In the last chapter we sum up and analyse the prospects for longer-term supply and discuss some of the policy