China Petroleum - A Sense of History in the Making

*By Paul Tempest**

The elaborate arrangements of the 15th World Petroleum Congress and International Petroleum Exhibition held in October in Beijing under the patronage of President Jiang Zemin, reflect the arrival of China among the top half-dozen oil producers in the world. China is already top coal producer and a major natural gas producer. Yet China is facing a serious energy policy dilemma.

Some 58 chairmen of major corporations, 38 Ministers and 5186 delegates assembled for a week of high level discussions and carefully prepared technological exchange and review, with the Chinese hosts deploying a total staff of over 800. It was by far the most meticulously organized congress in the 65 year history of the WPC and was followed by an extensive program of site visits to all parts of China.

Tianamen Square, the largest in the world, was especially decorated with flowers, illuminated and closed to the general public. A red carpet carried the delegates, diplomatic corps and top cadres of the Chinese Administration from the square into the still forbidden part of the Forbidden City, where for the first time for this sort of purpose, The *Temple of The Imperial Ancestors*, built in 1520 AD and renamed by Mao *The Working People's Palace*, provided a dazzling backdrop to a reception and entertainment of 8500 guests. Then followed a comprehensive introduction to Chinese regional cuisine. Earlier the Great Hall of the People had provided an equally impressive venue for the Opening Ceremony and musical, gymnastic, opera and ballet entertainment where 4800 guests were served a 24 course banquet simultaneously without the slightest fuss or delay. A half-hour fireworks display had showed how computerized control will revolutionize fireworks displays in the 21st Century. The Chinese, who invented the art were again effectively demonstrating a new technological ascendancy and an ability to cope with large numbers, just as their medieval invention of the compass also changed the course of human history and gave man a new sense of direction.

The scale of China, one fifth of humanity, is ever-present. Walking around the *Temple of the Imperial Ancestors* with Wang Tao, for 11 years the President of the China National Petroleum Corporation, reminded me of my first meeting when I asked him how many people worked for CNPC. One point six, perhaps one point seven, he had replied. No need in China to even mention the word million. By comparison, the current worldwide staff of the two most powerful oil and gas multinationals in the world, Exxon and Shell, each are close to 100,000 which was the range of uncertainty conveyed by Wang Tao's reply. On this hallowed spot, I could not help but think that even the Imperial Ancestors themselves might not be too displeased with this brilliant, creative display of traditional skill and rediscovered culture, so long stifled by revolutionary zeal and conformity and narrow-mindedness.

The Yin and Yang, the compass and the gunpowder, the fireworks and the fountain, the power and the poverty. Contrasts spring readily to mind in China. As far as petroleum in China is concerned there is good news and there is bad news.

As far as domestic petroleum production is concerned, there is very good news. The heirs of the Chinese drillers who 2500 years ago perfected the techniques of drilling very many feet through solid rock and distributing natural gas by bamboo pipeline have reason to be pleased. The scale and style of the 15th World Petroleum Congress demonstrated beyond doubt the willingness of the Chinese authorities to attract foreign capital and the scramble by the foreign companies to secure a foothold.

The bad news is all on the demand side of the petroleum equation. Only within the past five years has China moved from being a net exporter of oil to being a major and growing importer. Domestic production is unlikely to keep pace with demand. The implications of this imbalance for the next two decades are profound. China must have its incremental oil to underpin its continued and remarkable level of economic growth. This gives added urgency to the search for new domestic resources, but it also signals increased economic dependence on external supply focused on the Gulf. There is a perceived geopolitical imperative to forge a political and commercial partnership with the three largest (and most unpredictable) leviathans of petroleum supply – Iran, Iraq and Saudi Arabia, whose mutual antagonisms remain the cornerstone of U.S. containment policy and protection for the industrialized world against a repetition of the deeply damaging Gulf supply discontinuities of 1973-74 and 1979-80 which threw global economic activity into a period of disorder, inflation and unnecessary extended recession. China's potential exposure to economic dependence and to the political turbulence of the Middle East is a very raw nerve in their thinking.

Amongst the Congress plenary speakers, the Secretary General of OPEC and the Executive Director of the International Energy Agency had, therefore, more to say than the predictable rhetoric of sterile consumer/producer dialogue. This has become more or less irrelevant as the global oil and gas markets have taken over fully the role of price-setter and supply-allocater. The markets today also indicate, perhaps too easily, a very low chance of further global supply discontinuity. The IEA is concerned that China, unlike other major importers, does not hold the recommended 90-day level of strategic stocks as a cushion against supply interruption. OPEC, on the other hand, foresees, with some enthusiasm, the emergence of one large new customer who within ten years could begin to rival the oil import dependence of Japan, Western Europe and the United States.

What China thinks it needs most at present is advanced technology to maximize domestic production of oil and gas and, if possible (but unlikely) to achieve self-sufficiency. What it really needs is new technology to make the existing supply go much further. Further relaxations on the bans of the private use and ownership of automobiles indicate an imminent surge in the national stock of vehicles with incalculable consequences for demand for imported petroleum.

Already in Florida and California the prototypes of family saloons with hybrid engines not much larger than a bicycle pump, composite lightweight bodies and elaborate but cheap electronics have been tested and run for the last five years. They use about 20 percent of the petroleum consumed

---

*Paul Tempest is Director General, World Petroleum Congress, London, England. He was president of IAEE in 1986.

today by the average family saloon. The world record for distance traveled in a powered vehicle using one gallon of petrol is now approaching 10,000 miles. There is, therefore, immense opportunity now for increasing the efficiency of automobile fuel consumption.

For the Chinese, not surprisingly, a quantum jump in vehicle efficiency would provide solutions to many of their energy problems. Yet, from their point of view, the automobile, steel and petroleum industries in North America, Europe and Japan appear reluctant to forge ahead in this direction. Indeed, several key Chinese experts I have talked to find it difficult not to conclude that the Chinese economy is faced with a competitive conspiracy of free market forces, institutional self-interest and imposed technological delay which works to the disadvantage of the entire less-developed world. While the world's bankers and oilmen have no difficulty in financing new exploration and production for oil and gas without too much consideration of the consequent environmental impacts, the new technologies of efficient energy use are starved of capital, bought up at distressed prices, stifled and shelved.

Governments, for their part, rant on about environmental protection but have neither the will nor the wit nor the wherewithal to provide effective stimulus to new technologies of energy use. They excuse their lamentable lack of interest by a naive belief in and reliance on market forces to solve this and other problems.

The usual answer given in the West to these allegations is that too much is being expected too soon. That is probably right. Nonetheless, I think that the Chinese have a point which needs addressing seriously.

Imminent Breakthroughs in Automobile Design

Report from Beijing WPC Panel

- Lean-Burn – The lean-burn engine creates an air-fuel mix of 24:1 (current conventional engines 15:1). Stable combustion is achieved with enhanced fuel economy of about 20 percent. Several engines are already in production.

- In-Cylinder, Direct-Injection – The in-cylinder direct-injection engine injects fuel direct into the cylinder head. A complex (and still costly) system of pumps and nozzles are needed but it achieves an air-fuel ratio of 40-50:1 with enhanced fuel economy of 30-35 percent and a marked redirection in noxious emissions.

- Cleaned-up Diesel – Injectors can now store pressurized fuel to achieve greater pressure-change control. Engine noise is reduced. Nitrogen oxygen emissions are cut by 20 percent. Together with catalytic converters for diesel engines, fuel savings are likely to be substantial once the various systems have been fully developed and tested.

- Electric-Hybrid Vehicles – This combination of a single small gasoline engine with multiple electric motors may provide fuel savings of 50-80 percent. The electricity generated by braking is returned to the battery. This technology is a marked advance on electronic vehicles

(continued on page 10)

It's Time to Lift Trade Barriers with China: Participating in China's Nuclear Program is in the Best Interest of the United States

*By Bob Ebel**

As the economic and strategic reasons for the United States to assert its presence in Asia have grown, U.S. policy towards China has taken on increasing importance. At the U.S.-China summit in Washington later this month. President Clinton may certify China has met the conditions necessary to lift trade barriers that have prevented commercial nuclear trade since 1985. The administration is correct in doing so.

The Center for Strategic and International Studies has recently released a review of these issues entitled *U.S.-China Commercial Nuclear Commerce: Non-proliferation and Trade Issues*. The Steering Committee that developed the report was chaired by former National Security Advisor Brent Scowcroft; Senators Frank Murkowski, Max Baucus and Representative Doug Bereuter cochaired.

The report concluded, "If the president can certify the congressional conditions have been met, it is strongly in the U.S. national interest to participate in the Chinese nuclear program."

Over the last several years, China has taken significant steps to enter the nuclear non-proliferation community by joining the Nuclear Non-Proliferation Treaty, signing the Comprehensive Test Ban Treaty, and cooperating with U.S. efforts to halt North Korea's nuclear program. These are very sensitive issues, and if the United States fails to acknowledge this process, continued Chinese cooperation on such importance issues will be jeopardized.

We must recognize no other country that supplies nuclear technology has followed the United States' lead in eschewing trade with China. For that reason, the question is not whether China should develop a nuclear program but rather whether the United States, long recognized as the global leader in nuclear technology, will forfeit this role and stand alone as the only nation in the world that excludes itself as a participant in the Chinese nuclear energy program.

Electricity is the fastest growing source of energy in China, and China represents the largest single market for power generation equipment to meet growing electricity demands. China, which already has a few nuclear reactors, has announced an ambitious plan to add a total of 50,000 megawatts of new nuclear energy by 2020. To put this in perspective, China's program requires the construction equivalent to two new nuclear power reactor orders each year. Access to this market could produce more than $1.6 billion per year in U.S. exports to China, with more than 25,000 U.S. technical jobs supported by those exports.

There are also important environmental issues that must be taken into consideration. China is the world's largest user of coal and, in fact, by the year 2015, China is projected to be the largest emitter of greenhouse gases in the world. Because nuclear plants do not burn fossil fuels, the development of nuclear energy can play an important role in avoiding the emissions of greenhouse gases.

(continued on page 10)

* Bob Ebel is Director, Energy and National Security Program, The Center for Strategic and International Studies, Washington, DC.

China Petroleum... *(continued from page 9)*

which need frequent recharging. The high-torque engine gives immediate and good acceleration. $C0_2$ emissions are halved and carbon monoxide, hydrocarbon and nitrogen oxide emissions can be cut to 10 percent of the level stipulated currently in Japan (which already has strict standards).

- Natural-Gas Powered Vehicle - Natural gas vehicles use compressed natural gas or liquid petroleum gas. LPG requires very strict safety standards. CNG is likely to become the No. 2 fuel after gasoline, particularly in town use and urban delivery fleets. (CO_2 emission are cut by 20 percent). More development is needed to reduce the weight of fuel pumps and to extend the range.

- Electric Vehicles - Electric vehicles have zero emissions, almost no vehicle noise and high energy efficiency. They are used extensively for urban delivery fleets but the current state of battery technology severely limits their range.

- Conventional Development - Fuel efficiency is being gradually enhanced by electronically controlled fuel injection, better design of combustion chambers, a greater use of lightweight materials, improved dynamics, more efficient drive systems, flex lock-up for automatic transmission, new tire technology.

- Unconventional Development - Solar and hydrogen-powered gas and gas turbine engines still need much further development.

It's Time to Lift Trade Barriers *(continued from page 9)*

It is also in the United States' and the world's interest to ensure China operates nuclear power plants as safely as possible by allowing China to benefit from the strides made in America to standardize designs and to improve the safety of this technology. The United States has been a world leader in commercial technology since President Eisenhower's Atoms for Peace program and clearly is a model for safety.

Where every plant is unique, reactor engineers, regulators, and operators must learn different systems. For this reason, China is expected to select *families* of standardized reactor designs from the large number of designs now available. Given the United States' investment in reactor safety and standardized plant designs, it would be regrettable from both global safety and national economic perspectives if the window into the Chinese nuclear power market were to close and deny access to American designs for decades to come.

Engaging with China on nuclear issues and establishing a presence in the country to assure the highest levels of safety, security, and environmental protection will help promote American interests in the years ahead. It is clear if China meets the condition for presidential certification required to commence bilateral nuclear cooperation, failure to proceed will strip United States of valuable leverage to secure further progress or to prevent reversals in the pursuit of American non-proliferation objectives with China.

Announcement and Call for Papers

GEE/IAEE European Conference on:

Energy Markets: What's New?

Berlin, September 9-10, 1998

Topics Include

- How to define a new corporate strategy in a deregulated framework?
- How to cope with new environmental policies?
- How to take advantage of spot, options and futures?
- How to reduce CO_2 emissions through joint implementation?

Those who wish to present a paper are kindly asked to submit an abstract prior to April 15, 1998 to:

Georg Erdmann
Conference Chairman
Technical University TAB
D-10587 Berlin, Germany
Fax: +49-30-314-269-08
e-mail:erdman@ensysl.fb10.tu-berlin.de

Or, submissions can be sent to one of the members of the scientific committee:

	Fax Number
Denis Babuisaux	+33-147-527-066
Edgardo Curcio	+39-632-249-21
Ole Jess Olsen	+45-467-544-03
Peter Pearson	+44-171-594-93-04
Wolfgang Pfaffenberger	+49-441-798-37-15
Charles Spierer	+41-227-742-400
Paul Tempest	+44-171-255-14-72
Fritz van Oostvoorn	+31-224-563-338

Participants in this GEE/IAEE European Conference will have the opportunity to attend the 64th International Conference of the Applied Econometric Association on *Modeling Energy Markets* at a reduced fee. This conference will be held in Berlin on September 10-11, 1998, immediately following the GEE/IAEE European Conference. For more information contact Georg Erdmann at the above address/ fax.

IAEE Headquarters Moves

IAEE Headquarters has moved to new space in the same office building. The new suite number is 350; however, the old suite number will still reach us. All other numbers remain the same: Phone 216-464-6365; fax 216-464-2737 and e-mail: iaee@iaee.org. The street address remains 28790 Chagrin Blvd. Cleveland, OH 44122, USA.