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IEA OECD ETSAP news

ANNEX VIII EXPLORING ENERGY TECHNOLOGY PERSPECTIVES

ETSAP Goes to China

ETSAP held its fall meeting in Beijing, China, in parallel with the International Energy Agency (IEA) along with the Energy Research Institute (ERI) of the National Development and Reform Commission of P.R. China. IEA has a memorandum of policy understanding in the field of energy with the State Planning of the Government of China. IEA has been working with Chinese experts. In the 2002 World Energy Outlook IEA featured an in-depth study of China that drew substantially on input for Chinese experts. IEA is working with Chinese experts in the Energy Technology Perspectives (ETP) project. ETSAP experts also are participating in ETP. Several of the national participants in ETSAP have been engaged in collaboration with Chinese organizations. ETSAP is open to non-OECD member countries and a closer formal collaboration between China and ETSAP is being discussed.

Mr. Hiroyuki Kato of the IEA indicated that China will account for 20% of world incremental energy demand and for half of the increase in coal use over the next three decades. The strong economic growth in China drives up energy demand. Coal will continue to dominate the fuel mix, although oil imports will reach almost 10 mb/d in 2030, equivalent to U.S. imports today. The demand for gas is projected to grow rapidly, which will be increasingly be met by imports. Enormous investment in energy supply and infrastructure is needed. CO_2 emissions with increase in line with growth.

ETSAP AROUND THE WORLD

USA: The United States Energy Information Administration in this year's International Energy Outlook is based on SAGE, the system for the analysis of global energy markets. This model is a time stepped-version of MARKAL. This is an important step that could greatly increase interest

In this issue

Visit ETSAP on the www: http://www.etsap.org

Information on ETSAP, its activities and members is also provided on the Internet. The home page contains the latest news, general information on ETSAP, and links to: ETSAP member; ETSAP 'outreach' activities; description of the MARKAL model and its users; archives of new item; selected publications and the ETSAP Newsletter.

ETSAP AROUND THE WORLD
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in MARKAL.

Australia: Ken Stocks obtained a 3 year program from AUSAID for 4 million dollars to assist countries to build a framework for energy policy. Aim is to get senior government people in the countries to recognize the importance of energy planning and a regional database. Cambodia, Laos, Myanmar are being added.

Belgium: Plan to integrate the Belgium in a more enlarged model including neighboring countries.

Germany: The German model is on-going. Focus is on renewables. Work on national heat utilities and on electricity trade and carbon trade in Europe.

Italy: Focus on efficiency standards. MARKAL MACRO analysis demonstrated use of efficient end use devices increases GDP.

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Mr. Kejun JIANG of the Energy Research Institute focused on climate change issues, energy planning, policy and policy. Energy forecasts, technology trends, costs, and air quality targets are important goals.

Fridtjof Under of the IEA indicated that a key issue in China's future is the struggle between driving forces and technology decoupling factors. Assessing future development will require an understanding of the past. There is a need for disaggregated of good quality, consistent over time and consistent with international standards.

Yufeng Yang of the Energy Research Institute spoke about China's energy supply. An irrational energy mix and heavy dependence on coal has caused problems of mine accidents and production. Oil supply will depend on imports. There are great regional differences in resources. The country lacks an integrated energy policy. Urgent needs include:

- More timely local energy data?
- What is the possible energy mix?
- How to solve China's oil and gas supply? Where are the sources?
- How to solve transport problems in the large cities?
- How to address environmental issues?

The energy supply infrastructure cannot keep up with national and local planning. Regional energy transfers are very important. The focus should be on national integrated energy policy.

Ms. Hong Zhu of the China Statistic Bureau (NBS) presented a substantial discussion on energy statistics in China. The process is complex. Fulltime posts of energy statistics are at the local level. Data are collected product output survey of industrial enterprises. The Division of Industrial Economics of the Department of Industry and Transport is responsible for carrying out a monthly survey. This includes all state owned industrial enterprises and non-state industrial firms with annual output of over five million Yuan. These surveys are collected by the local government and must be complete within 10 days. Energy information of other energy production enterprises are surveyed annually.

These are two types of domestic trade information: Energy sales and stock from the survey of product enterprise and information of energy sales and stock of enterprises involved in energy sale and retail trade.

Three types of energy consumption information are directly surveyed in China. All fall under the purview of the Energy Statistics Division. First is the energy purchasing, consumption and stock. These data are collected annually through the industrial enterprises. The scope for this is 160,000 enterprises. Second, information of energy purchasing, consumption, and key industrial enterprises are collected. There are more indicators in the second category. Targets in the second category are smaller, about 10,000 enterprises with data collected by local governments. The third category is information of consumption and stock of major energies. These data are collected quarterly by local government.

The Urban Survey Organization of NBS does monthly surveys on energy prices. An energy balance table is complied annually. Publications include the China Energy Yearbook, China Statistics Abstract, China Monthly Economic Indicators.

Ms. Hong Zhu concluded her presentation with a look toward the future. The current energy data are not rich enough. The energy systems balance sheet should be made to match the approach that is used generally throughout the world. The current balance sheet does not satisfy the need of researchers or international comparisons.

A system should be developed to promote energy savings. Saving energy is a national policy of China. Currently research is on-going for achieving energy savings.

Her talk was supported by Hongyi Hao of Economics and Technology Research Institute CNPC. The first issue is that existing statistics are not complete. The current energy statistical report does not include all the enterprises. There are too few indicators. No clear statistics that cover all aspects of energy. Current statistics are insufficient to support analysis. Many of the statistical data are wasted. There is a lack of communication among departments leading to duplication of work.

There is great potential for

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Korea: Energy management in Korea has re-organized. Five people were sent to BNL to learn TIMES, which will be used in the next IGCC report.

Sweden: Management of coexistence of difference MARKAL-based policy measures. Work progressing on Green Electric Certificates to see what will happen with tradable emissions permits.

UK: White Paper published.

China: CDM in china, China MARKAL model for transportation sector, funded by Japan.

Visitors Corner

New Zealand was initially involved in ETSAP, but dropped out some time ago. They are now considering joining again. Peter Read has participated in the last two ETSAP meetings. A MARKAL model is being developed with a 50 year horizon. Their main requirement is to collect data for both the supply and demand side.

Possible applications of the

VISITORS CORNER
- continued -

model include:

- Mitigation of CO2 emissions with a carbon tax at different levels.
- Investment requirement in the energy sector to 2050.
- Estimate of the contribution of renewable technologies.
- The cost to the economy of the Kyoto Protocol.
- Timing of major energy developments, such as a new gas field.
- In the case of an abrupt climate change requiring immediate action, what is the best course to take?

New Zealand is currently in a similar situation to 1975, facing an uncertain energy future with a need to implement new technologies. New Zealand has not suffered from its lack of energy modeling capability since 1980 due to a surplus of supply capacity. Currently, policy decisions are based mainly based on data derived from economic analysis of the past. In addition, there are engineering models of subsectors. There is a need for MARKAL development of oil, but it will be difficult to maintain a large production rate in the future. He predicts that by 2020 China will need 400 to 430 million tons180 to 200.

China has several energy modelers. Kejun JIANG of ERI described a number specialized bottom-up models, including CDM assessment models, some linked with the Message model, a CGE dynamic 20 sector model that included economic activity and environmental factors. Another model, I-PAC, is a bottom up, least cots model with 26 sections and over 500 technologies. This model runs in the medium term (2030), and many others.

Guo Yuan was introduced to MARKAL at Brookhaven Laboratory in the early 1990s. She described model results of sustainable energy development in China. In her presentation at the EIA-ERI-ETSAP symposium, she evaluated the likely development trend within expected social and economic condition and under better conditions. She described three scenarios. In the first, the market becomes determinative, with governments role for promoting conservation weakening, some barriers remaining, difficulties exist in enlarging natural gas and urban mass transportation infrastructure. The second scenario is based on the 10th Five-year plan and a 10 year outlook. Administration management continues to play an important role. Her third scenario reflects sectional experts' direction for concerned sector development. Conservation enforced by new standards, government aids in enlarging the natural gas sector, and there is a favorable environment for sound technology transfer. The results are annual growth rates (Table 1).

Table 1 *- Projection of Electricity Consumption per Capita (kWh).*

	1998	2000	2005	2010	2015	2020
Scenario 1	960.8	1,054	1,362	1,705	2,143	2,546
Scenario 2	960.8	1,057	1,364	1,702	2,124	2,503
Scenario 3	960.8	1,056	1,352	1,547	2,031	2,338

Support for her work came from the Energy Foundation and Shell Foundation, with cooperation with Lawrence Berkeley Laboratory and cooperating Chinese sector experts.

All three scenarios should be referred as low carbon scenario, as all of them include the continuing efforts and new efforts on energy conservation and fuel substitution in coming years. The Government plays an important role in pushing those efforts, for the sake of promoting sustainable energy development in China (Figure 1, Table 2 and Figure 2).

Figure 1 - *Final Energy Demand by Sector:*

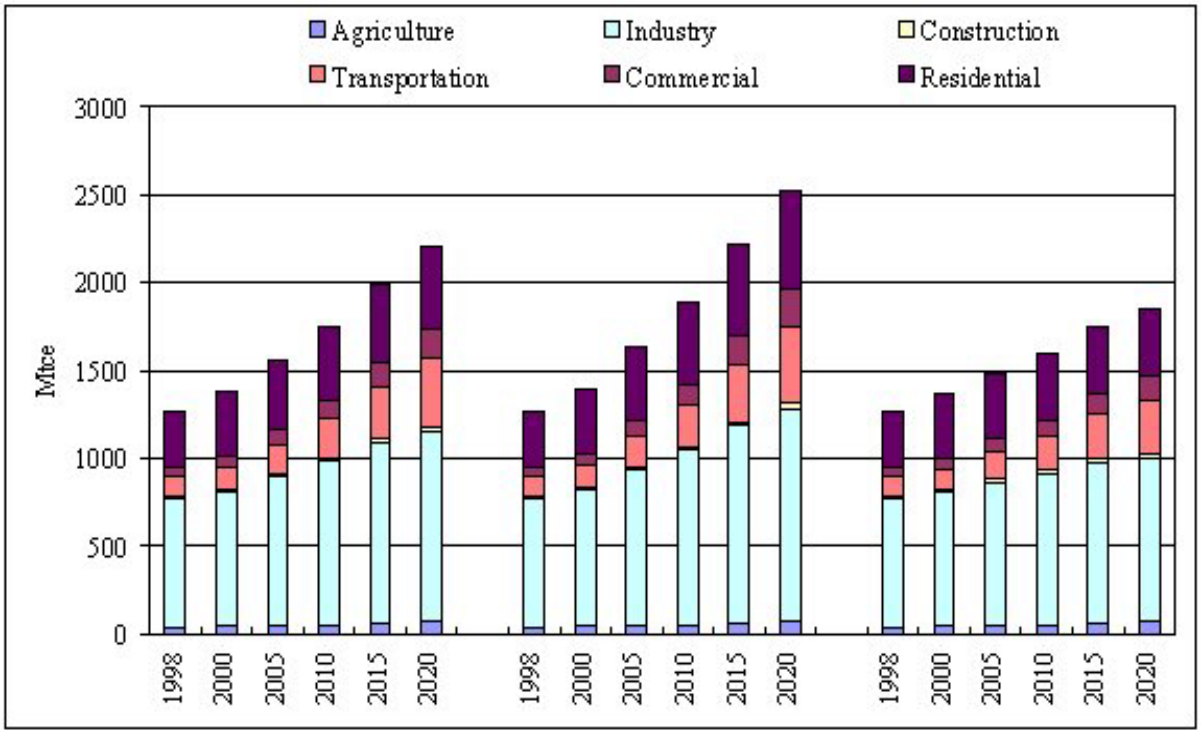
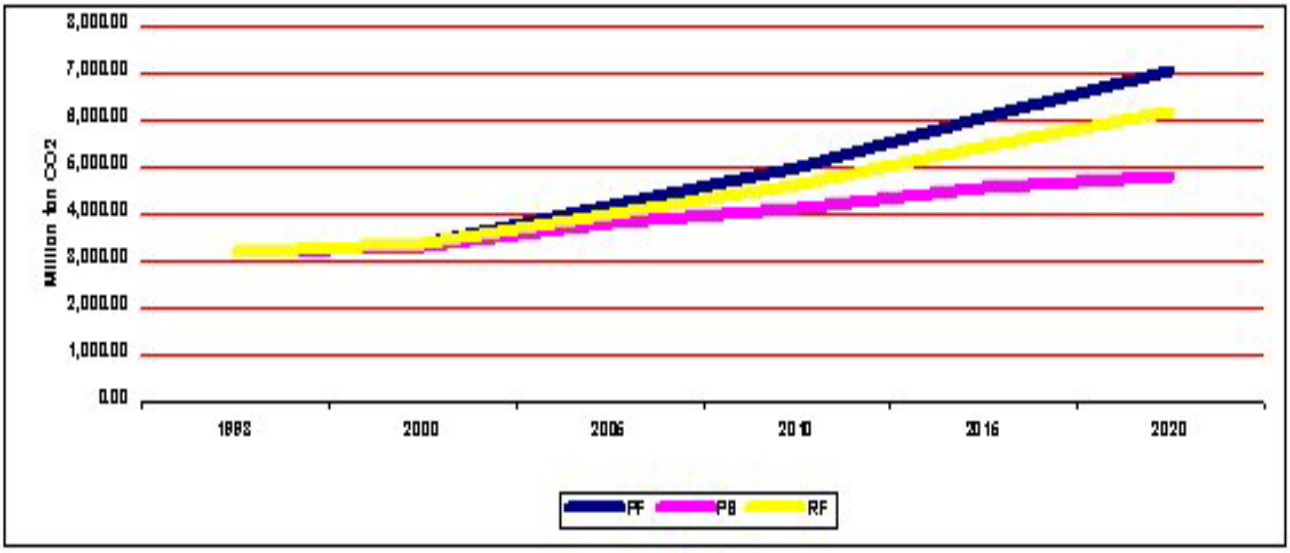


Table 2 - *Electricity Consumption Per Capita (kilowatt hour)*

	1998	2000	2005	2010	2015	2020
S1	961	1054	1362	1701	2143	2546
S2	961	1057	1364	1702	2124	2503
S3	961	1056	1353	1647	2031	2338

Figure 2



Ugo Farinelli described the role of the China Council for International Co-operation on Environment and Development. Its Task Force on Energy Strategies and Technologies prepared a report on coal gasification-based energy strategies for China. Much of the study was based on work by MARKAL analyst Pat DeLaquil in co-operation with Tsinghua University. The work of the ERI of the National Development and Reform Commission, also based their work in part on MARKAL modeling. Professor Ugo

The main challenges as seen by the task force were:

- Meet the rapidly increasing demand for energy services.
- Meet the projected liquid fuel needs, especially for transportation, without endangering the security of energy supply.
- Reduce the dangers and costs of pollution.

Contribute to mitigate Greenhouse Gas emissions "on the basis of equity and in accordance with its common but differentiated responsibilities and capabilities.

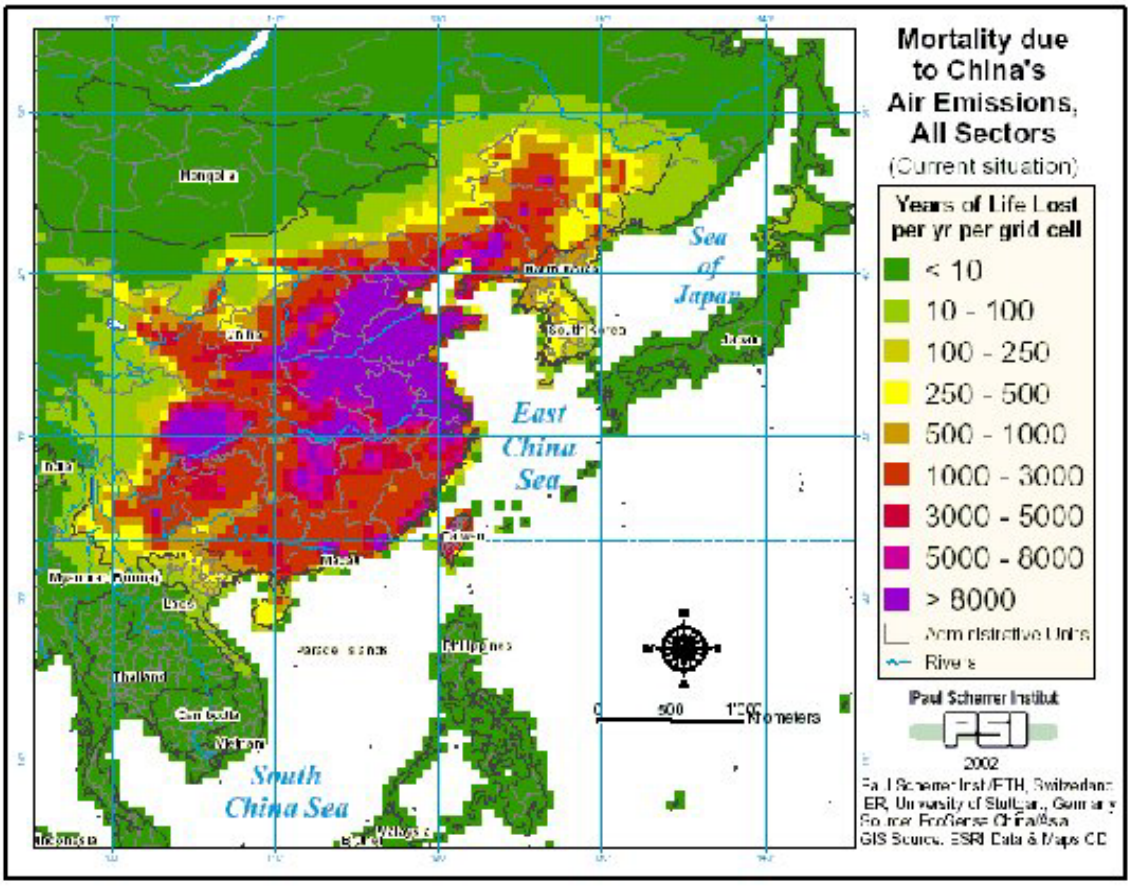
Why coal gasification? Several reasons were presented. China is one of the countries with the most experience with coal gasification. Currently they have plants for 9 GW. Most of the expertise is in the chemical industry, not in the gas industry. Most importantly, China has very large reserves of coal, inherently dirty, while gasification can turn it into a clean fuel. Gasification allows using gas turbines and combined cycle plants for greater efficiency. Syngas from gasification can also be the starting point for high quality liquid fuels and chemicals.

Two technological scenarios were compared:

The Base Scenario included:

Coal used primarily by existing or advanced direct combustion technologies, energy end-use technologies including best energy efficient options, renewable energy technology

Figure 3 - Mortality due to China's Air Emissions



limited to existing commercialized technology, carbon sequestration options not available, all other currently existing technologies.

The Advanced Technology Scenario included:

Advanced poly-generation technologies based on gasification of coal and biomass, advanced high-efficiency industrial processes, advanced renewable energy technologies, urban residential demand technologies, hybrid electric and fuel-cell vehicles, carbon capture and sequestration options.

Thomas Heck of the Paul Scherrer Institute, Switzerland, described a comprehensive benefit-cost analysis including externalities. Heck and his co-authors did an extensive analysis, focusing mainly on Europe but included a case study for Shandong Province, China.

Conclusions: Health impacts of air pollution in China are extraordinarily high. Associated mortality effects result I about 9 million years of life lost per year in China (Figure 3). Secondary particulates dominate the impacts. The overall losses of due to these damages are of the order of 6-7% of GDP. Mortality effects per ton of SO2 emitted in Shandong Province are about one order of magnitude higher than the average in the EU. The "true" costs of electricity are dominated by damages to health. Reducing damage by changing electrify generation strategies is feasible, economic and socially justified.

Vincent Rits, Socrates Kypreos, and Alexander Wokaun provide one possible way to reduce the air pollution: eventual introduction of fuel-cell cars. Poor traffic management and the current environmental performance of Chinese vehicles are an important part of the air pollution. Fuel systems represent a technology that can contribute to the reduction of greenhouse gas emissions and eliminate local pollution the megacities. Fuel-cells have high efficiency, low maintenance, and low noise level.

Runs with MARKAL show that if the diffusion of fuel-cell cars in China is to set off, high technological development is a necessary condition along with continuing growth.

The MAKAL database used for China was set up by Wu DeLaquil, Larson, Chen & Goa (2001). Data on passenger cars was updated. Three fuel-cell cars were added into the model: hydrogen fuel-cell, a gasoline fuel-cell car and a methanol fuel cell car. The costs of hydrogen and methanol delivery also had to be added. These costs are 9 US$ (1997) per GJ for hydrogen (based on Ogden et al, 2003), and 5 US$ (1995) for methanol (based on Ogden et al., 1999).

Before diffusion of hydrogen fuel cell cars can take place, three problems must be solved. First, the problem of storage of hydrogen , second, problem of fuel contamination, and third, the cost of the fuel cell must be reduced to within a factor of at least ten to twenty before it can be cost competitive. In all four scenarios that were considered, fuel-cell cars began to diffuse into the market after 2025.

Operating Agent

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