Shanxi Province, China
U.S.-China Clean Energy Initiative
Jackson Hole Center for Global Affairs
June 21-25, 2004

Summary of Findings and Results
Presented to Hon. John F. Turner
Assistant Secretary of State for Oceans
And International Environmental and Scientific Affairs
U.S. Department of State

Ten residents of Wyoming were part of a delegation of 18 U.S. and Chinese public and private sector leaders which visited China's Shanxi province June 21-25, 2004 to discuss issues of clean energy of common concern. The delegation was organized by the Jackson Hole Center for Global Affairs (JHCGA) and hosted by the Shanxi provincial government.

Sen. Grant C. Larson, Majority Floor Leader of the Wyoming State Senate, served as leader of the delegation. Other members included five representatives of the academic and research communities, three representatives of the business community, a representative of organized labor, a reporter, and one other representative of the Wyoming state government in addition to Sen. Larson. The delegation also included three officials of the central Chinese government, representing organizations with responsibility for coal mining and safety.

Shanxi, like Wyoming in the U.S., is the largest coal-producing province in China. Last fall, a delegation led by Shanxi's Vice Governor Niu Renliang visited Jackson Hole as part of the first meeting of the U.S.-China Clean Energy Initiative, convened by JHCGA. At that meeting Vice Gov. Niu described some of the problems resulting from coal mining and use in Shanxi, including methane emissions from mines and sulfur, carbon, and particulate emissions from the burning of coal to produce coke and electric power. All of these emissions rank among China's worst.

In addition, Shanxi suffers from severe pollution and depletion of surface and ground water supplies, further effects of the mining and combustion of coal. Shanxi is also home to many sites of cultural and historical interest, including temples and settlements over 3,000 years old. The purpose of the June 21-25 visit was to learn more about these problems and opportunities, and to explore common interests between government agencies and business and research enterprises in Shanxi and Wyoming in addressing them.

The level of interest of the Chinese participants was high, as indicated by the participation of over 100 representatives of 40 provincial government agencies, enterprises, and research organizations. The delegation also met with a

number of senior officers of major enterprises. These included the CEO and Deputy CEO of a diversified coking coal company with 150,000 employees, the General Manager and Deputy General Manager of a mine-mouth facility utilizing coalmine methane and waste coal to produce heat and electric power, and the Plant Manager and Senior Engineer of China's largest thermal power plant.

Members of the delegation observed first hand the challenges which Shanxi faces from its position on the front lines of the battle against global pollution. The provincial government has begun to take many steps to restructure its industrial and power sectors in response to these challenges, including:

- Expansion of a 600,000 ton/year coking plant to almost triple its capacity for the production of coke and town (heating) gas, while improving capacity to capture and recycle particulates to produce another 6 tons/day of coke. This huge infrastructure project, financed through a $65 million loan from the Asian Development Bank, will also make possible increased efficiencies in desulfurization and in the removal of other toxins (ammonia, naphtha, and cyanide).

- Renovation of an aging power plant through replacement of two older generators, producing a total of 186 MW of power, with six cleaner-burning units capable of supplying 1275 MW of power as well as heat to the 3.5 million residents of Taiyuan. This facility now constitutes the largest thermal power plant in China

- Expansion of a mine-mouth power plant from its present capacity of 106 MW of electric power, generated from waste coal produced in mining 24 million tons/year of coal, to a capacity of 405 MW generated from waste produced from a total of 50 million tons/year. In addition, this facility now utilizes 200 million cubic meters of methane recovered from coal mining operations to supply heat to residences, and will soon expand rates of recovery to utilize methane for electric power production and other purposes accounting for 1/6 of all coalmine methane utilization in China. The U.S. Environmental Protection Agency is involved in the process of enhancing coalmine methane recovery at this facility, as is the U.S. Department of Labor in improving mining safety.

- Improvement of dust recovery in smelting operations of Taiyuan's largest heavy machinery plant, employing 11,000 people, to meet national emissions standards.

The delegation visited all of the facilities mentioned above, as well as several other large-scale enterprises which have adopted cleaner-operating production methods and processes.

Members of the delegation also witnessed the many problems confronted by government officials and enterprise managers in Shanxi in instituting these changes. For example, as a result of low rates of utilization of gas produced from the making of coke, this gas is in such short supply that normal desulfurization procedures are routinely suspended in winter in order to make it available to residences to meet the demand for home heating. Moreover, gas distribution must be subsidized by coke production, in order to make it available to households at affordable rates. The same is true of heat produced from thermal power generation, also supplied to residences at a loss. It is difficult to see how these constraints on the supply of heat from the generation of thermal power and the utilization of coking gas can be lifted without higher prices.

All members of the delegation expressed their deep concern with these problems and their surprise at the magnitude and, in Sen. Larson's words, "enormity" of their scale and impact. A typical view expressed by a member of the delegation was the following:

> …people in the U.S. don't fully understand how global the contribution of pollution from China and all of Asia really is. It is in the best interest of the U.S. and other advanced countries to work with countries like China that are "behind the curve" when it comes to environmental regulation and pollution control technology.

Several members of the delegation commented on the wide disparity between marginal benefits of investment in incremental air quality improvements in the United States, versus those of investment in controls in China of emissions affecting air and atmospheric conditions in the United States.

At the same time, members of the delegation commented on numerous obstacles standing in the way of closer U.S.-China cooperation in addressing these problems. The business practices and investment expectations of people in China vary widely from their counterparts in the United States. The technologies needed to address issues of coal mining and use are also often very different from one place to another. Even the types of coal mined are not the same.

For example, enterprise managers with whom members of the delegation met expressed needs for equipment such as that used in mining coal underground, generating electric power from coalmine methane, and producing aluminum from bauxite. Some of these technologies differ greatly from those commonly utilized or employed by organizations represented by members of the delegation. One member of the delegation expressed particular disappointment in Shanxi's apparent lack of incentives for the development of advanced technologies for coalmine methane treatment, and the apparent lack of channels for forming partnerships or joint ventures for developing such technologies. Difficulties in

negotiating intellectual property rights were mentioned as a further obstacle in effecting such technology transfers.

A critical factor in resolving these difficulties and surmounting these obstacles will be the capacity of decision-makers to demonstrate the benefits of investment in cleaner forms of energy. Policymakers and enterprise managers in Shanxi must address urgent pressures for increased industrial production and satisfy intense demands of consumers for increased access to home heating and electricity, at the same time as they seek to deliver the benefits of cleaner air and water. Ultimately, in resolving these dilemmas, they will need to make hard choices regarding energy pricing and other issues of resource allocation.

In the meantime, however, these decision-makers need to be able to demonstrate concrete benefits from win-win investments in energy/environmental infrastructure. Members of the delegation witnessed many of these investments in process, including expansion and improved emissions controls of coke making and coal gasification operations, and investments in increased capacity for the general of combined heat and power. Other priorities, including opportunities and needs for increased coalmine methane recovery and utilization, will also require attention. The capacity of decision-makers to deliver concrete benefits from such investments will determine their future success in generating public support for further investments in energy/environmental improvement.

Such public investments appear to be the "low-hanging fruit" where technical support and financial involvement of U.S. public and private sector organizations, as well as that of multilateral financial institutions such as the World Bank and the Asia Development Bank, can help make a difference. Those involved in decisions regarding the allocation of the province's resources are by all indications extremely motivated to make these critical investments in expansion of the province's clean energy infrastructure. The application of such U.S. technologies as GIS mapping resources for the identification and location of coalmine methane reserves, or methods for the liquefaction of coalmine methane to facilitate its delivery to user facilities, can play a key role in this process. All of these and many other capabilities were represented within the delegation.

One of the surprise outcomes of the visit was the emphasis on mining safety. China averages over 6,000 mining fatalities per year. Accordingly, JHCGA invited the top safety official of the United Mine Workers of America to accompany the delegation, without knowing exactly how this official would be received. We needn't have worried. The Chinese themselves, including Vice Gov. Niu and the coking coal company CEO mentioned previously, welcomed this representative and proposed that mining safety be included front and center in the work program emerging from our discussions. As a result of these and other discussions, a dialogue has now been initiated in this area.

Two memoranda of understanding (MOUs) relating to clean energy issues were signed in the course of the discussions. These included:

- *Wyoming-Shanxi Clean Energy Cooperation Partnership (WSCECP).* This partnership establishes a mechanism for cooperation involving public and private sector organizations in Wyoming and Shanxi. Areas to be addressed include utilization of wastes from coal and coal byproducts, coalmine methane recovery and utilization, distribution of combined heat and power, and mining safety.

- MOU establishing partnership between *Shanxi Energy Industry Group (SEIG)* and the *U.S.-China Energy/Environmental Technology Center (EETC)* to prepare a pre-feasibility study on coalmine methane and coalbed methane purification and liquefaction. This work will be performed under Annex II of the Clean Fossil Energy Protocol, to which China's Ministry of Science and Technology (MOST) and the Office of Fossil Energy of the U.S. Department of Energy (DOE) are signatories.

In addition, a memorandum of understanding was signed establishing a tourism exchange between Wyoming and Shanxi, to be conducted over the course of the coming year.

JHCGA plans to convene a third meeting of the U.S.-China Clean Energy Initiative this fall in Jackson Hole to follow up these and other opportunities developed as a result of the June 21-25 visit.

Members of delegation:

Grant Larson, Majority Leader, Wyoming State Senate **(chair)**
Karen Cooper, Vice President, Marketing, Jackson Hole Mountain Resort
Mark Davies, Manager, Environmental Technologies, Kennecott Energy
Steve Duerr, Vice President, Jackson Hole Center for Global Affairs; Executive Director, Jackson Hole Chamber of Commerce
S. T. Hsieh, Director, U.S.-China Energy/Environmental Technology Center, Tulane University
Hu Yuhong, Deputy Director, International Division, China National Coal Association
Huang Shengchu, President, China Coal Information Institute
Diana Hulme, Assistant Director, William D. Ruckelshaus Institute for Environment and Natural Resources, University of Wyoming
Rebecca Huntington, Reporter, *Jackson Hole News and Guide*
Liu Wenge, Acting Director, China Coalbed Methane Clearinghouse
Joe Main, Director, Health and Safety, United Mine Workers of America
Olivia Meigs, Secretary, Jackson Hole Center for Global Affairs

Patrick Pitet, Director, Minerals, Energy, and Transportation, Wyoming Business Council
Bruce Reynolds, Manager, Fossil Energy Technologies, Idaho National Engineering and Environmental Laboratory (INEEL)
Milton Russell, Senior Fellow, Joint Institute for Energy and Environment (University of Tennessee, Oak Ridge National Laboratory, Tennessee Valley Authority); Senior Advisor, Jackson Hole Center for Global Affairs
Patricia Ann Russell
David Wendt, President, Jackson Hole Center for Global Affairs
Jeremy Wendt, Jackson Hole Center for Global Affairs

July 25, 2004