

Wednesday, August 13, 2008

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Testimony before the U.S.-China Economic and Security Review Commission

Hearing: *China's Energy Policies and Environmental Impacts*

Panel: *China's Energy Policymaking Structure and Reforms*

I would like to begin by thanking the Commission for the opportunity to share my views. I have been engaged in the study of China's energy system for a dozen years and I look forward to our discussion regarding a topic of such importance to the US and to the global environment. As the title of this panel indicates, my goal this morning is to focus less on statistics and more on the structure and reform of China's energy regulatory apparatus over time. In addition, as today's hearing is focused on the relationship between China's energy policy and the environment, I will tend to privilege examples from China's coal and electric power industries and defer in-depth discussion of China's oil industry to my colleagues.

My comments will focus on three major points – the first relating to failure of reform, the second to success of reform, and the third to resulting challenges for reform. First, China's recent drive to establish a National Energy Commission is but one of many attempts at centralization over the past several decades. Central government entities have vague mandates and disparate interests that result in still-born energy institutions. These institutions historically have failed to produce focused, systemic energy policy. A full energy ministry, if and when it again emerges, will not resolve such tensions in the near to medium term. Second, successful measures by the central government in introducing energy price liberalization and state-owned enterprise (SOE) reform have created newly empowered corporate actors that are increasingly determining the speed and form of China's energy infrastructure, as well as the technology and fuel driving such growth. Moreover, the pressures facing these corporations are increasingly commercial in nature. Third, these price and corporate reforms enabled the streamlining of industrial ministries and encouraged rapid economic growth, resulting in the weakening of traditional levers of "top-down" vertical authority by the central government such as direct financing, permit and construction approval, penalty enforcement, and upstream controlled pricing.

In short, the majority of evidence reveals a national energy system characterized by a fractured central state attempting to: i) mitigate rising disparities between a liberalizing upstream energy market and a controlled downstream energy market; and ii) regulate powerful local governments and corporations that are rapidly transforming state owned energy assets and financing major energy infrastructure decisions. The dilution of command and control has not been lost on the leadership in Beijing. Certain central government agencies have now refocused their efforts on traditional command tools in an effort to maintain some degree of guidance: namely controlled downstream energy prices

and senior personnel appointments in industry. China's energy governance, therefore, is driven by a tension between the need to strengthen state dominance in a strategic sector and the need to support globally competitive corporate actors in an increasingly market-guided economy.

Competing Interests, Splintered Institutions

The work of identifying stakeholders has become increasingly difficult in recent years. Energy policy in China today is a battleground of negotiation among powerful actors with conflicting interests that are evident at all levels of analysis.

At the highest level, within the central government itself, the powerful pricing bureau of the National Development and Reform Commission (NDRC) and weaker, emerging regulatory bodies such as the State Electricity Regulatory Commission (SERC) seek to strengthen competition by maintaining higher numbers of energy firms in industries as diverse as power generation, coal extraction, coal gasification, nuclear component manufacturing, and certain downstream activities in the petroleum industry. China's major commercial banks often support such diversification, as it enables the banks to widen their portfolio of risk and wean themselves from a dependence on customers that are "too big to fail". In contrast, central agencies such as the State-owned Assets Supervision and Administration Commission (SASAC) – the nominal owner of core assets in China's economy, including energy assets – and the Ministry of Finance (MoF) together aim to maximize returns on assets owned by the central government by encouraging scale and the consolidation of existing firms.

At the middle level of analysis, conflicts of interest between central and local governments are perhaps more obvious. Sub-national government leaders, eager to maintain or increase economic output and thus advance their political careers, often aid in the financing and underreporting of electric power generation capacity, local coal extraction, integrated railway projects that promote local monopoly, and other forms of energy production expressly forbidden by the central government. While environmental protection is now included in the metric by which promotion is determined, economic growth and social stability far outweigh "green" contributions.

Lastly, at the lowest level of analysis, interests between local government actors diverge as well. Energy investment at this level is perhaps best characterized as "tribal", as many localities remain unwilling to depend on other localities for sources of energy. Provincial and municipal governments, urged on by China's three major oil corporations, are moving ahead to build local natural gas networks in the southern and eastern coasts despite considerable price shock by the NDRC and an historical unwillingness to approve projects at the global price. Major regional large scale projects like the Ertan hydropower station begin life producing under capacity as local governments continue to build and protect locally owned plants to support higher tax revenue, thus dampening demand and lowering efficiency.

In sum, these conflicting interests at all three levels have fueled an institutional evolution of energy oversight that has become an alphabet soup of line ministries built and destroyed and supra-institutions effectively still-born.

Competing interests have resulted in an energy institutional landscape characterized by overlapping jurisdictions and inconsistent waves of centralization and decentralization. Significantly, Beijing's first attempt to centralize energy oversight proved short-lived. Between 1953 and 1955, the Ministry of Fossil Fuels combined the coal, electricity and petroleum industries into one organ for energy policymaking, allocation, and planning. Fifty years of reform has not resulted in a lasting structure. In 1980, a second attempt at comprehensive administrative centralization created the State Energy Commission, which never received any dedicated staff, an independent base of operations, or funding. Previously existing agencies continued to operate as before, and the Commission dissolved two years later amid a proven inability to obtain the capital necessary to support sufficient energy for the burgeoning national economy. A subsequent Energy Ministry lasted a mere five years, between 1988 and 1993. By 1998, China's energy policy structure had undergone four periods of decentralization and recentralization. In March, 2003, the State Economic Trade Commission was abolished and the majority of its functions transferred to the newly renamed NDRC. Most critical economic regulatory powers, it was then argued, were to be in the hands of this one supra-ministry, yet regulators were overseeing an energy economy more diverse and with a wider set of stakeholders than ever before.¹

Rise of the Corporation

While several waves of separation and merger affected the energy sector throughout the 1970s, the 1980s ushered in the process of removing government from enterprise work and from the business of controlling energy production. Decentralization and partial deregulation led to the creation of a new class of legally independent corporate actors able to pursue a range of choices regarding energy provision. The energy corporation initially served as a vehicle to resolve increasingly blurred rights and claims between central and local government control over energy assets, and also to attract foreign technology and financing to develop domestic resources under tight credit market conditions. Firms such as China Huaneng Group (CHG) and China National Offshore Oil Corporation (CNOOC) were formed to import foreign technology, increase energy investment, and promote international trade. In the nuclear industry, the Ministry of Nuclear Industry transferred its formal administrative capacity to the new China National Nuclear Industry Corporation. Energy corporations – particularly in the environmentally sensitive industries such as coal and electric power – are now rapidly proliferating in China, owned by a host of local public and private entities, and building capacity at a frenzied pace. For example, upstream in the electric power industry, *de facto* private mines contribute over one-third of total coal production. National production has doubled between 2000 and 2007 to stand at over 2.5 billion tonnes – well over twice the output of the US and over 41 percent of global

¹ For a summary of the argument in this testimony please refer to Cunningham, “China’s Energy Governance: Perception and Reality”, available at: <http://web.mit.edu/newsoffice/2007/china-energy-0625.html>. For a detailed analysis of the evolution of China’s energy governance, impact on corporate strategy and resulting public policy challenges, please refer to Cunningham, “New Institutions, New Actors, but Old Tools? Energy Governance in China”, Chapter 2, dissertation manuscript.

production. Downstream, China's electric power generation monopoly has been disbanded and carved into five large firms. Perhaps more importantly, over half of China's installed electric power is provided by hundreds of firms owned by provincial investment corporations, private groups, and several foreign players. Installed capacity has also more than doubled from 2000 to 2007 – the 102 GW China installed in 2006 was nearly equal to world installed capacity growth in 2004.

By the late 1990s and early 2000s, successful central government policies supporting significant price increases in the energy upstream had heightened commercial pressures for Chinese energy firms. Prices for coal and, more recently, natural gas contracts, have been most directly influenced. While price *volatility* continues to be controlled, relative energy prices upstream and downstream have largely converged with – and at times exceeded – prices in the developed world. Delivered coal prices to Chinese power plants at times are more than double the national average in the US, Chinese contracted natural gas prices are largely setting the benchmark in the region, and local electric power rates for Chinese industry are often one to two cents higher per kilowatt-hour than in the US. In a survey of the Chinese electric power industry that our MIT China Energy Group just completed, over half the plants in the survey sample (44 of 85 plants) responded to questions about coal allocation and pricing. Of the plants that responded, 55 percent (24 plants) reported that none of their fuel supply was subsidized, while 45 percent (20 plants) reported that at least some fraction of their supply came through state channels at subsidized prices. Interestingly, only six plants reported receiving all of their fuel through subsidized channels. For many of the other plants accessing subsidized coal, these lower-priced fuels accounted for only a fraction – and sometimes a very small fraction – of the plant's total fuel supply. This important shift in pricing policy is often overlooked by observers and has begun to have far reaching effects. As one example, electric power generating firms have, in recent years, invested in larger generating units and advanced boiler and generator technologies that have increased efficiencies considerably.²

Only crude and retail oil product prices remain below world prices and continue to require considerable transfer payments from the central government to the oil majors as imported crude and product are increasingly allowed to enter the domestic market. Such receipts are particularly large for Sinopec, which suffers from a historical asset bias towards refining activities.

The Wizard, Revealed

Finally, the mobilization of corporate resources coincided with a massive reduction in the state's capacity to monitor the activities of these new actors. Central government personnel, dedicated funding, and institutional structure contracted considerably during the critical industrial reform period of the late 1990s. In 1998, the 40 ministries overseeing China's growth were reduced to 29, with many employees transferred to SOEs, research institutes, quasi-private firms, or simply laid off. The reforms affected over 30,000 central

² For a more quantitative analysis of technology, fuel and other aspects of China's electric power industry, please refer to Edward Steinfeld, Richard Lester, Edward Cunningham, "Greener Plants, Grayer Skies: A Report from the Front Lines of China's Energy Sector", available at the MIT Industrial Performance Center website: <http://web.mit.edu/ipc/publications/pdf/08-003.pdf>.

government personnel and in total laid off more than 4 million government employees. Moreover, the state did not redeploy its resources to guide energy investments at the firm level.

At most, a mere 750 individuals within the central government bear responsibilities that in some way relate to energy policy. Most Chinese experts estimate the real number to range between 240 and 320, even after the most recent raft of reforms. The vast majority of these people devote only a small fraction of their attention to energy issues. As many observers have noted, in contrast, the US Energy Information Agency (EIA) alone – an organization dedicated mainly to data gathering, analysis, and education – employs over 600 people. The US Department of Energy (DOE) employs nearly 15,000. While one may debate how many employees are involved in part-time energy work at these institutions, the disparity in personnel is striking, particularly in the context of the processes of decentralization, ownership diversification, corporatization, and rapid capacity expansion that characterize China's current energy market.

Nowhere are such challenges of decentralization more evident than in China's electric power industry. The great expansion of electric power that began in the mid 1980s, aided by the corporate reforms mentioned previously, also heralded the relative decline of central funding for such expansion. For example, as St. Francis Xavier University professor Xu Yichong has noted, between the years 1980 and 1994, the average annual growth rates of both power generation and installed capacity crept above eight percent; during roughly the same period the share of central government investment in total power sector investment declined from 91 percent to 30 percent. The central government provided nearly half of power industry investment during 1985-1990. In the following five years, only one-third of investment funds flowed from the central government. In the same period, local sources accounted for 42.9 percent of the total. Financial levers of central government influence have clearly declined.

Construction oversight and environmental compliance have also suffered dramatic setbacks. Illegal power generation capacity has become a major concern for regulators, particularly those responsible for grid safety, environmental protection, and market supervision. While a myriad of pollutants simply lack reduction targets and are ignored, SO₂ challenges have proven particularly troublesome for regulators. A recent World Bank report outlined how, during the 10th Five Year Plan (2001-5) the central government failed to meet 10 of 13 core targets for air and water pollution. By 2005 total sulfur emissions were over 40 percent higher than the standard set and emissions from industry were up by 50 percent. Despite the passage in 2005 of the National Renewable Energy Law and the high profile shuttering of certain plants by the State Environmental Protection Agency (SEPA), results have been disappointing. In 2006, only four out of China's 31 provincial-level jurisdictions met their annual two percent reduction targets in SO₂. Despite these policies, national SO₂ emissions increased by 463,000 metric tons. While the percentage of flue-gas desulfurization (FGD) equipment being installed in new plants, or retrofitted in older plants, is rapidly increasing, such actions are clearly failing to affect substantially core emissions. The inefficacy of such a policy has less to do with installation and more to

do with the fact that while plants may install FGD solutions, they rarely operate the equipment – largely for economic reasons.

Although the cost of running such equipment has been reduced through gains in efficiency and innovation, the reality is that plants are acting rationally given the fractured and incomplete regulatory and financial system created by the reforms previously discussed. On the one hand, decentralized, subsidized capital, in the form of bank loans or provincial investment companies, greatly aids the fixed cost capital purchase of environmental equipment. This explains why plants are so willing to install them and pacify the local environmental protection bureau. On the other hand, direct financing by the central government has essentially ended. Thus, the operation of such equipment has a direct negative impact on the plant's operating costs and, critically, retained earnings. Parasitic power loss is in the range of one to two percent, and operating cost is often in excess of the US\$ 0.0019/kWh (RMB 0.015/kWh) subsidy that FGD-compliant plants receive in the price paid to them by the grid.

Beijing has not failed to notice the disparity between state resources and corporate activity. In recognition of the fractured nature of such governance, the National Energy Leading Group (NELG) was established in 2005 to bring together the heads of 13 ministries to lay out a long term vision for creating what has now been announced as the National Energy Commission. This Commission will enjoy ministerial rank, remain separate from the National Energy Bureau under the NDRC, and be charged with implementation of energy policy as formulated by the Bureau. However, the cast of characters is ever evolving and a true division of responsibilities remains unclear. The draft Energy Law does not detail authority delegation and continued uncertainty is highlighted by the fact that no vice premier has been named to head the National Energy Commission. It has been stated that the National Energy Bureau itself will oversee 9 departments with a staff size of 112 people. However various energy-related officials, such as NDRC vice minister Zhang Guobao, have stated that the Bureau “will not seek the right to set energy prices”.³

Finally, the newly established Commission, often cited as an indication of regulatory consolidation, is confronted by the disparate interests and overlapping authorities that have plagued China historically, as well as the interests of new entities. At the central level, SASAC claims nominal ownership rights over, and bears responsibility for, the financial performance, management and disposal of core state-owned assets (including approval rights regarding merger and acquisition approval and other energy asset restructuring). SASAC also, in most cases, drafts personnel appointments of energy corporation executives with a vice ministerial rank and below. Energy executives with ministerial rank are appointed directly by another entity – the Central Organization Department of the Chinese Communist Party (CCP). The environmental agency, now with enhanced ministerial rank as the Ministry of Environmental Protection, enforces environmental standards and compliance by energy firms, while resource extraction rights, operation management, and conflict resolution responsibilities are largely shared by the Ministry of

³ These departments include: General Integration, Strategic Planning, Policy, International Cooperation, Science and Technology Energy Savings, New Energy, Coal, Electric Power, Petroleum and Natural Gas.

Land and Resources, the Ministry of Water Resources, and the State Administration of Coal Mine Safety. Energy policy research and formulation falls under the auspices of the Energy Bureau – now renamed the National Energy Bureau – while energy pricing authority is exercised by the Pricing Bureau. Both bureaus are under the auspices of the strategic and long term economic planning agency, the NDRC. Most evidence points to the fact that the NDRC will not be ceding its pricing powers anytime soon, that SASAC's newly established authority to demand dividends from energy corporations will increase its personnel appointment powers, and that environmental enforcement will of course remain in the strengthened environmental ministry.

Implications for the US

US actions designed to support productive energy, and, by definition, environmental change in China require an analytic shift along two dimensions. Effective *short term* action must target the incentives of current decision makers on the ground – the local government and corporate entities building China's energy future. Effective *long term* actions must begin by recognizing the systemic weaknesses in central state governance and by working towards resolving them in concert with specific central actors.

In the short term, effective actions towards leveraging resources in the US and China will require changes at the sub-national and national levels. At the sub-national level, initiatives should facilitate a considerable ramp up of investment in the identification of and interaction with powerful local governments as well as the interests of the often quasi-public, quasi-private enterprises that make many of the ground level energy decisions in China. Precedents exist. AIRNow, a cross-agency US government program, has made progress in the measurement and dissemination of air pollution indices (API) through close collaboration with municipal governments such as Shanghai and the major electric power firms operating there. The benefits of such a shift in focus are clear from the experience of the US itself, as many of the most innovative and effective energy solutions have been pioneered at the state level.

As recent congressional hearings in the US have pointed out, large energy consumer states such as California have dedicated much effort to promote energy efficiency, conservation, and the development of renewable energy technologies such as solar power and advanced energy storage technologies. These states have also linked such advances to the training of provincial regulators in China. In 2005 the state government of California joined forces with the Jiangsu provincial government to pursue such avenues of cooperation. Large energy producing states such as Montana and West Virginia have focused efforts on advanced clean coal technology partnerships with specific corporations such as Shenhua Ltd, China's largest coal producer. States should be encouraged to follow the lead of their business delegation counterparts and link directly with provincial and other local governments in China. Similarly, federal resources could be focused on enabling the many innovative small and medium sized energy enterprises in the US to link with counterparts in China and encourage reverse trade missions back to the US.

In the long term and at the national level, experience suggests that in the absence of a coherent national energy ministry in China, strategic partnerships with specific ministries

yield critical results. As an example, building related energy consumption accounts for over one-quarter of China's national energy consumption. The Lawrence Berkeley National Laboratory (LBNL) has achieved important and laudable milestones through a long history of interaction with China, creating environmental building code standards along with China's Ministry of Construction. Such partnerships require increased support and should become the rule, not the exception.

Equally important in the long term, it is clear that the US has not devoted enough human and financial resources to understanding China's energy market and its impact on the global energy market. While the disparity in regulatory capacity between China and the US in the energy sector is increasingly appreciated by observers, what is noted far less frequently is the fact that few of these US resources are dedicated to the study of China's energy system itself. By the estimates of some in the DOE most familiar with China, the DOE has, at the most, only 10 full time employees on the ground that focus on China in some manner. Similar individuals within the State Department estimate the corresponding number of full time employees to be about eight. International Energy Agency (IEA) membership for China would greatly enhance regional and global energy emergency preparedness and afford greater transparency and understanding relating to China's energy decisions and statistics. Yet the IEA employs one – albeit quite capable – China specialist. I gather that at least a deputy position has now been created. US political resources could be utilized to strengthen the capacity and impact of this important group in an effort to make a clear argument for why membership is in China's national interest and why continued exchange training between statistical arms of the IEA and NDRC are so critical to both sides.

In conclusion, as China's growth begins to transform international markets as vital as energy, understanding the structure governing energy policy and markets in China has never been more important. First, effective US policy towards China requires identifying and interacting with powerful sub-national governments, not focusing exclusively on policy makers in Beijing. Second, strategic policy thinking will require serious consideration of the interests of the quasi-public, quasi-private enterprises SOEs that make many of the ground level decisions in energy and other key sectors. Third, encouraging state regulatory capacity in China, rather than fearing and demonizing it, will prove paramount. While accusations of neo-mercantilism and an over-bearing state tend to have dominated US policy discussions of Chinese energy policy in recent years, it is Beijing's lack of authority in this critical sector that should be most concerning to careful observers of China's long term governance.