

## **An inquiry into China's energy needs, strategies and implications**

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### **ABSTRACT**

Deng Xiao-Ping replaced Mao as China's paramount leader in 1978. Economic restructuring and modernization in China began the following year. Within a short span of three decades, China surpassed Japan in 2010 as the world's second largest economy.

Unparalleled growth in energy consumption and needs have been accompanying China's unprecedented economic growth. Though per capita energy consumption is still significantly less than that in the developed economies, China is now the second largest energy consuming nation in the world. The prospect of sustained economic growth, ongoing industrialization and growing urbanization for a population in excess of 1.3 billion requires a well-crafted energy policy. Viewed from wider perspective, expected continual economic growth being fueled by increased per capita energy consumption for China's still growing population will cast a long shadow over the future of the world's energy market.

Intensified domestic R&D activities on the energy frontier are being accompanied by China's widening energy-interest abroad. China's vast foreign reserves are poised to acquire foreign assets that include energy sources and hi-tech firms. The effect of China's recent energy policy will significantly and invariably influence the future fabrics of global economic arrangements and political landscape.

This paper presents a brief overview of the background information on China's energy sources, production, consumption and needs. This paper then examines China's new energy policy and practices and their implications for the economies and political entities of the world in the 21<sup>st</sup> century.

Keywords: China, Energy, Policy, Implications, Reform

## **A BACKGROUND NOTE**

Mao Ze-dong declared the establishment of the People's Republic of China on October 1, 1949, commencing the Communist Party's reign over the nation's vast population. After nearly three decades of Mao's demagogic rule, the nation's population remained impoverished. Mao's demise came in 1976. Many of his former Party colleagues whom Mao had purged through waves of political movements were rehabilitated. Among those was Deng Xiao-ping who by late 1978 had replaced Mao as China's paramount leader.

Directed by Deng, the 3<sup>rd</sup> Plenum of the 11<sup>th</sup> Central Committee Congress of the Communist Party approved the policy for economic reform in late 1978. The catchphrase then was "economic restructuring for achieving Socialism with Chinese characteristics."

Controlled administrative decentralization was accompanied by a calculated overall gradualism-approach to systemic transformation. From the inception of reform it was clear that economic reform and decentralization would not be accompanied by political liberalization. Reform, therefore, combined tight political control with liberalizing economic policies. Measured domestic reform policies were attended by relatively swift and bold advances in foreign economic relations. Expanded foreign investment and foreign trade became the two major engines for economic restructuring and rapid economic growth.

Despite rapid population increases, China has been reaping swift economic growth rates for the past three decades. Its successes are unparalleled in the annals of world development history.

The government's role in mapping major development policies in China and the processes of comprehensive implementation mechanisms has been pivotal in helping ensure objective-attainment. Reform successes over the past three and half decades in China evince high probability that the Plan-outlined objectives will achieve their envisioned targets.

Concern has been on the rise that China's rising political influence consequent upon economic successes is posing a serious challenge to traditional world powers. For instance, Stephen Leeb in his recently published book sounded that familiar alarm of China's challenge to the U.S. on the world stage (Leeb, 2011). Among the major concerns is that China's explosive economic growth has been accompanied by comparably rapid increases in energy demand. China has now displaced the U.S. as the world's largest energy consuming nation. The cogent question is what the future of world energy market will be like in light of China's growing needs for energy.

This paper comprises of five segments: first, causes for concern; second, thesis and objective of the paper; third, review of literature; fourth, government role in energy development; fifth, a preliminary conclusion.

## **CAUSES FOR CONCERNS**

### **Rapid Population Growth**

China's population at the inception of reform numbered 963 million and has ballooned to 1.354 billion by the end of 2013. That is, China gained a net of 391 million in population in 35 short years. Alternately stated, in three and a half decades, the size of China's population amounts to the combined populations of the U.S. Canada, Australia, Sweden and Austria in

2013. In terms of energy consumption and requirements, far more energy now would need to be produced or imported than three and half decades ago.

### **Economic Growth and Structural Transformation**

In constant prices, China's GDP was 354 billion Yuan for 1978. It soared to 31.5 trillion Yuan by the end of 2010, a 862 percent increase in 32 years (Statistical Yearbook, 2012). During the same time period, significant structural transformation concurrently occurred. Primary sector's contribution to GDP in 1978 was 28.2 percent. Despite substantial gains in agricultural production during the period under consideration, contribution from the primary sector in 2010 was only 10%. Tertiary sector's contribution grew from 23.9 percent in 1978 to 43.4 percent (Statistical Yearbook, 2012). Consumption of energy by the primary sector in China is significantly less intensive than that of either the secondary or the tertiary sector. China's rapid economic growth and structural transformation are expected to continue for the foreseeable future, notably altering the landscape of energy demand in China for decades to come.

### **Soaring Energy Need**

Unparalleled growth in energy consumption and needs have been accompanying China's unprecedented economic growth. According to the Statistical Yearbook, China's total energy consumption in 1990 was 987 million tons of standard coal equivalent (*sce*). Five years later, it increased to 1.31 trillion *sec*. Energy consumption in a five-year period, therefore, rose by 32.8 percent. By the year 2005, energy consumption soared to 2.36 trillion *sce.*, That is, within a short period of ten years (1995-2005), China's energy consumption rose by 79.9 percent. That was followed by another 37.7 percent increase during the 2005-2010 period. Viewed from another perspective, China's energy consumption rose from 987.6 million tons of *sec* in 1990 to 3.25 trillion tons of *sec*, a net increase of 329.6 percent.

Though per capita energy consumption is still significantly less than that in the developed economies, China is now already the largest energy consuming nation in the world. The prospect of sustained economic growth, ongoing industrialization and growing urbanization for a population in excess of 1.3 billion requires a well-crafted energy policy. Viewed from a broader perspective, expected continual economic growth being fueled by increased per capita energy consumption for China's still growing population will cast a long shadow over the future of the world's energy market. There is cause for concern.

### **RESEARCH OBJECTIVE**

The expectation is that China's rapid economic growth may be sustained for three more decades (Lin, 2009). The objective of this paper is to provide a framework for future analysis suggesting that, despite expected phenomenal increases in China's energy needs for decades to come, the evolving scenario in China, due to the government's carefully crafted long-term energy policy, is not likely to adversely impact the world's energy market situation.

## REVIEW OF LITERATURE

There have been many studies concerning the potential impact of China's massive energy consumption. Though China's population is nearly four times that of the U.S., its electricity consumption in 2009 was 3,253,185 GW hours when compared with that of the U.S.'s 3,723,803 GW. According to IEA calculation per capita electricity consumption in the U.S. in 2006 was 12 times greater than that in China. However, "This will change in the future, as China's further develops and its per capita GDP increases." (Blazey, 2013). One option for ensuring energy adequacy has been an increased reliance on energy imports. According to an U.S.-China Economic and Security Review Commission to the Congress in 2012, China's dependence on foreign energy sources has been on the rise. State-owned energy companies, under the watchful supervision of the state, have been broadening and deepening their ties with energy-producing countries. (Report to the Congress, 2012). The magnitude of China's current dependence on energy imports may be garnered from the International Energy Agency's (IEA's) 2012 report. For instance, China is already the second largest oil importer in the world, next only to that of the U.S. In 2011, China produced 215 mt of crude oil while its import of the same for the year was 235 mt. (International Energy Agency, 2012). China's demand for energy in the foreseeable future will continue is a foregone conclusion. That China has been diligently searching for energy investment opportunities abroad has also been common knowledge among scholars. The thesis of this study, however, is that the probability is low that China's hunger for energy supply for the decades to come will cause undue disturbances on the world's energy market. Lin's research results indicate that China's energy situation had evolved from years of a narrow-equilibrium position to recent energy surpluses. Furthermore, prompted by the unavoidable increases in energy demand in the foreseeable future, intensive investment efforts in energy exploration and extraction, both domestically and abroad, as well as on and off shores, have become better organized and standardized. According to Lin (2009), though supply from abroad will continue to rise, energy surpluses will be almost unavoidable.

According to the National Bureau of Statistics of China, energy consumption increased by 56.9% between 2001 and 2005. The increase declined to 25.6% for the five-year period thereafter. In terms of output—excluding imports—domestic energy production increase between 2001 and 2005 was 50.3%. Increase in consumption exceeded domestic production during that five-year period. On the other hand, domestic production of energy for the period of 2006-2100 was 27.9%. That is, increase in domestic energy production exceeded increase in consumption for that second 5-year duration (National Bureau of Statistics of China, 2013). The statistics appear to substantiate Lin's study conclusion.

In line with China's 11<sup>th</sup> and 12<sup>th</sup> Five-Year Development Plan, the pace for investment in and exploration for energy sources has been steady. In a forecast provided by Business Monitor International, year-to-year percentage change in proven oil reserve in China was 0% for 2011 and 2012 but 25.7% in 2013. Changes in natural gas proven reserves for 2011 and 2012 were also 0%, but then the change would be 16% for 2013 (Business Monitor International, 2013). The projected sudden surge in proven oil and natural gas reserves for 2013, though unexplained, perhaps could be due to China's accelerated investment during the past years in off-shore probes for oil and natural gas.

China's is a state-controlled and state-directed economic system comprised of mammoth state-owned enterprises (SOEs) and private enterprises. According to the U.S. Energy Information Administration, China's "National Development and Reform Commission (NDRC)

is the primary policymaking and regulatory authority in the energy sector.” And in July 2008, the state established the National Energy Administration (NEA). These two government organizations now implement the government’s energy policy (U.S. Energy Information Administration, 2013). Since reform began in 1979, government policies in all major economic domains have resulted in successes. Though the jury is still out, the government’s policy on energy is likely to reap the same result.

In an official statement published by the Chinese government, titled “China’s Energy Policy 2012,” the headlines announced: “Remarkable enhancement of energy supply capability and security,” “Conspicuous achievements in energy conservation,” “Rapid development in non-fossil energy,” and “Quick advance in science and technology” (Chinese Government’s Official Web Portal, 2012).

A study by a London-based management consulting firm concluded that China is “. . . currently the best country in the world for renewable energy investment” (Ross, 2013). The renewable energy technologies studied included solar, wind, geothermal, biomass and nuclear. Another study conducted by World Nuclear Association explained that China’s intensive effort at nuclear power generation began with its 10<sup>th</sup> Five-Year Development plan that began in 2001. China presently has 17 nuclear power reactors. In addition, 28 more are currently under construction and “more about to start construction” (World Nuclear Association, 2013). And a study conducted by American Council on Renewable Energy pointed out that in 2009, only 2% of total installed generating capacity in China originated from wind. However, 10.1% of new power generating capacity for that year was from wind energy, indicative of China’s growing interest in renewable energy (ACORE, 2011). Finally, an MSN-Money website on June 19, 2013 relayed a sensational heading “US cedes green energy future to China.” China’s intent on actualizing the virtually limitless potentials of renewable sources is evident.

The cursory review of literature above suggests China’s resolve to ensure energy self-adequacy for sustaining continual economic growth. In a state-directed but incentive-driven quasi market system in China, reform successes since 1979 have been mostly the end product of development strategies mapped out by the state. The ensuing segment of the paper highlights the government energy policies as outlined in its Five-Year Development Plans and cogent energy laws and pronouncements.

## **GOVERNMENT ROLE, ENERGY POLICY**

One of the government’s media methods has been coining catch-phrases or mottos to popularize official policies. Since the inception of reform in 1979, one of the catch-phrases has been: 抓大放小. Literally, it translates: “Seizing the major, loosening the minor.” It means retaining government-control over key issues while loosening less consequential spheres. For the past three and half decades of reform, policies implementation has closely been adhering to that motto.

Energy adequacy became one of the key concerns and policy issues since the early 1990’s. China’s total energy production in 1990 was 1.04 billion tons of standard coal equivalent (SCE) while consumption for the year was 0.99 billion SCE. That is, China was still producing more energy than it consumed for the first decade of reform. By 1995, however, total production was 1.29 billion SCEs with consumption for the year exceeding 1.31 billion SCEs, costing foreign reserve for importing 0.02 billion tons of SCE-equivalent of energy (National Bureau of Statistics of China, 2009). Energy adequacy for sustained economic growth emerged

as a major issue. It evolved into a ‘major’ policy issue. The government began ‘seizing’ or confronting this issue.

### **The 10<sup>th</sup> Five-Year Development Plan (2000-2001)**

Prior to the 10<sup>th</sup> Five-Year Development Plan (2000-2005) (FYP) , growth in energy production relied primarily on increases in coal, oil and natural gas extraction. No significant consideration was given to energy conservation or efficiency. As energy imports increased in the 1990’s, energy adequacy evolved into a focal issue for policy designers. In a document titled “National Economy and Social Development in the 10<sup>th</sup> FYP: Strategic Schemes for Energy Development,” special directions were given to the ensuing domains for future advances:

- Actualize the full potentials of (harvesting energy from) natural gas, hydro power, nuclear and other forms of clean energy forms.
- Accelerate the development of new and renewable energy sources.
- Advance the technologies in wider utilization of cleaner coal.
- Gradual reductions in the proportion of coal consumption in total energy forms.
- Achieve economic growth, energy adequacy and (cleaner) environment on a sustainable

basis (National Development and Reform Commission, 2013). Given the directive from the FYP, the State Council implements the state’s official policies during that five-year span (2000-2005). The directives provide focus for the administration to design strategies for achieving Plan-directed objectives. As an example, in a speech delivered by an official from the Ministry of Science and New Technology and Industrialization, the following passage helps demonstrate how administrative wheels in China turn:

. . . China will develop and popularize clean energy resources, such as solar energy, wind energy, geothermal energy, tidal energy and biomass energy to suit measures to local conditions. . . The technical level has been improved greatly. . . In the period of the five years, from 2001 to 2005, China will pay more attention on (sic) developing the renewable energy, especially on improving its conversion efficiency, cutting down its production cost, and increasing share in the national energy construction (sic) (Shi Dinghuan, 2006).

Renewable energy development was only one of the numerous principal aspects specified in the FYP. In the Plan itself, for instance, references were made--among others--to new pipeline construction, enhanced efforts at oil exploration, ‘rational development of off-shore oil,’ diversification of oil imports, promoting energy conservation, and technology for improved energy efficiency. The Plan even detailed geographic locations in China where major energy development projects such as hydro power and thermal power plants were to begin construction (The Ninth National People’s Congress, 2001).

### **The 11<sup>th</sup> Five-Year Development Plan (2006-2010)**

The 11<sup>th</sup> FYP continues the emphases as enunciated in the Plan preceding it. Prefacing the 11<sup>th</sup> Plan, the official document for the 11<sup>th</sup> Plan asserts that: “. . . great achievements have been made in China on energy development. Basically they met the demand of national economy. . . and paved the way for the development of the 11<sup>th</sup> Five-Year Plan” (US-China Institute, USC, 2013).

The principal objectives for energy policy during the Plan period accentuate the ensuing spheres:

- conservation
- diversification of energy sources
- intensified efforts in developing renewable energy forms
- on and off shore exploration for new energy reserves
- broaden the areas of off-shore search, explore for new oil and natural gas fields on land
- improve production and distribution and consumption structures for the energy sector, and
- establish a dependable supply system that is economically efficient, environmentally friendly and functionally safe.

One initiative in the 11<sup>th</sup> FYP that is distinct from previous Five-Year Plans is the call for the construction of mega power generating facilities. The Plan simultaneously details specific geographic regions where construction of such large-sized hydro power plants is to take place. Also underscored is that the envisioned new nuclear-power-generation-stations are to be designed in accord with the most advanced technology available (The 10<sup>th</sup> National People's Congress, 2006).

In addition, the 11<sup>th</sup> Plan calls for rational approaches to the mining of energy sources and continual reductions in pollutants originating from coal usages. The overall policy regarding coal energy in the 11<sup>th</sup> Plan is: establishing new large-scale coal bases, merging of medium-sized coal producers and elimination of small-sized and less efficient coal mines. In order to encourage the production and consumption of renewable forms of energy, the Plan directs that tax, investment and production incentives be a part and parcel of implementation policies (The 10<sup>th</sup> National People's Congress, 2006).

The pivotal role played by the government in directing the overall course of China's development path cannot be overly emphasized. In a succinct synopsis, the US-China Institute in USC depicts the compelling force of the Five-Year Plans thus: "Relevant authorities should actively conduct various tasks in the light of the requirements of the Plan and strive to complete every task as defined in the Plan (US-China Institute, 2007). A prime instance suggesting the veritable relationship between directives from the state and the desired outcomes is the landing of a Chinese spacecraft on the moon in December of 2013 (China National Space Administration, 2009).

### **Renewable Energy Law**

Concurrent with the adoption of the 11<sup>th</sup> FYP was the passage of The Renewable Energy Law (REL) in 2005. The energy authorities of the State Council are charged with drafting renewable energy development and utilization plan for implementation throughout the country (The 10<sup>th</sup> National People's Congress, 2005). In chapter 3, article 12 of the law, the document emphasized that: "The government lists scientific and technical research in the development and utilization of, and the industrialized development of, renewable energy, as the preferential area for hi-tech development." That is, within the scheme of national planning, privileged consideration is given to the hi-tech development of renewable energy.

Furthermore, enhancing renewable energy production and consumption is not focused merely on industries or urban centers. Article 18, chapter 3 of the law directs that:

Energy authorities of local people's governments above the country level shall . . . prepare renewable energy development plan for the rural area and promote biomass energy . . . household solar energy, small-scale wind energy and small-scale hydraulic energy etc.

Concentrated efforts at developing and enhancing renewable energy production and consumption have emerged as a pivotal concern for the central government. In order that the FYP's objectives for developing renewable energy be realized, the law directs that funding for research, construction, and production of renewable energy forms be established. In addition, subsidized loans from financial institutions are tax privileges and to be extended to renewable energy development and utilization projects in the 'guidance catalogue' (The 10<sup>th</sup> National People's Congress, 2005). China's resolve to ensure energy adequacy for the decades to come appears nearly self-evident.

In sum, the recent FYPs and the new renewable energy law appear to substantiate the idea that sustained increases in energy demand by China is not likely to pose an undue threat to the stability of the world's energy market in the foreseeable future.

### **The 12<sup>th</sup> Five-Year Development Plan (2010-2015)**

The 12th 5-Year Plan views China as a developing country replete with opportunities as well as challenges in a rapidly changing world. A recurrent theme is "science." Therefore words and phrases such as "scientific outlook," "scientific development," "innovation," "scientific progress" and "education and talent" are commonplace catchwords in the document. Paralleling W.W. Rostow's theory of the five development stages, China sees itself as at the threshold of the "takeoff" phase. Two of the development priorities, therefore, are: sustained and sustainable growth, industrial upgrading. As sustained economic growth presupposes adequate energy supply, the Plan directs that ". . . the importance of building a resource-saving and environment-friendly society should be stressed. . ." (National People's Congress, 2011).

In setting forth development targets, the Plan specifies whether a target is forecasted or 'binding.' The target to increase the percent of non-fossil fuel energy consumption from 8.3% to 11.4% of total primary energy consumption for the Plan period is specified as 'binding.' The target to decrease energy consumption per unit of GDP by 16% for the same 2010-2015 period is also 'binding.' And, to engage the daunting challenge of environmental pollution, the Plan directs that the carbon dioxide level per GDP output be reduced by 17%. That target is likewise 'binding' (National People's Congress, 2011).

The intent of the policy designers is manifest: improve energy efficiency, develop renewable energy forms, reducing the share of coal consumption.

Notable focus is given to innovation and the development of strategic industries in the 12<sup>th</sup> Plan. Other than innovation in energy conservation and resource recycling industries, the Plan's directive for new energy industries are as follows:

Construct industrial bases for new-generation nuclear power equipment, large wind power generating sets and parts, new assemblies of efficient solar power generation and heat utilization, biomass energy conversion and utilization technologies, and intelligent power grid equipment, and implement exemplary large-scale application projects of marine wind power, solar power and biomass energy (National People's Congress, 2011).

In addition, the Plan calls for the construction of large-scale hydropower stations in key watersheds in different parts of China as well as the installation of oil and gas pipeline networks. For energy generation from hydropower sources alone, “In 2011, the installed generating capacity of hydropower reached 230 million kw, ranking first in the world. And in order to increase the country’s oil and natural gas production, the government news agency Xinhua declares that, “China will continue to implement the policy of ‘simultaneous development of oil and gas,’ with the target of stabilization in the east, acceleration in the west, development in the south and exploitation in the offshore areas” “China’s Energy Policy 2012).

Energy production and distribution systems in China are mostly under the control of an oligopolistic industry comprised of state owned enterprises. Rationalizing energy production costs and distribution prices is one domain that requires corrective measures. The document titled “China’s Energy Policy 2012” affirms that:

China is actively promoting market-oriented reform in the energy sector by giving full play to the fundamental role of the market in the allocation of resources. . . The Chinese government encourages private capital to participate in the exploration and development of nergy resources, oil and natural gas pipeline network construction and the electric power industry, encourages the involvement of private capital in coal processing and oil refining, and supports the entry of private capital into the new energy and renewable energy fields“ (China’s Energy Policy 2012).

China’s decision to permit the entry of private capital into the energy sector substantiates its avowed resolve to actualize all the potentials that are available for expected increases in energy needs.

For three consecutive 5-Year Plans now, China has given special considerations to the pressing issue of energy needs and energy adequacy. The government’s role has been prominent in mapping major policy goals, paralleling evolving conditions and milieus both at home and abroad in the recent past. It is a foregone conclusion that the government’s leading role in directing the nation’s adjustable and flexible energy policy will continue for the foreseeable future. Given the close relationship between government policy and economic successes during the past 35 years, the probability is high that China’s ability to increase energy production in the next few decades will reach the desired targets.

## **A PRELIMINARY CONCLUSION**

The decision for systemic transformation came from the state. The agenda for economic growth and strategies for policy implementations are also under the controlled supervision of the state. The economic system that China has metamorphosed into is neither strictly centralized-command of bygone years nor purely market-based. As Deng repeatedly stated at the inception of reform, China was to develop a development path according to China’s ‘unique characteristics.’ Translated into reality, China’s is a controlled-market system. It is free within the well-defined parameters set by the state at any given stage of reform and development. This state-market combination has reaped successes unparalleled in the history of economic development. The reality to date is that what the state has promoted, the desired consequences have been forthcoming.

The implication of this exploratory study, therefore, is as follows: the effect of China’s recent energy policy will significantly and invariably influence the future fabrics of the world’s

energy market. However, the government's role in crafting major reform and development policies and the accomplishments consequent upon them thus far would suggest that China's surge in energy demands in the future is unlikely to cause undue disturbances on the world's energy market. A remote possibility is that, in time, China could be a net exporter of lean energy forms in the foreseeable future.

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