NORGES HANDELSHØYSKOLE

Bergen, Spring of 2012

Master Thesis within the main profile of Energy, Natural Resources and the Environment

Thesis Supervisor: Linda Rud

Needles in a Haystack: Searching for Opportunities for Foreign Investment in China's Electricity Sector

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ABSTRACT

Given the high degree of complexity of this immense and opaque market, it is already a difficult task just to attempt to achieve a basic understanding of the market. In order to identify opportunities for FDI, the paper dedicates most of its efforts on providing a broad overview of the relevant aspects of the market. First it shows the overall size, growth, and condition of the market's incredible size along with brief overviews of each major fuel source. Indirectly, this big picture overview seems to describe an ideal market for investment. Next, it describes the key domestic players who, given their immense power and influence, determine the market conditions based on their key motivations, many of which are in direct conflict with each other. Armed with this market overview, it then first shows how FDI has performed within these market conditions to date and then shows the many obstacles it faces today. It is here that the big picture opportunities wash away in a flood of market and cultural obstacles. The paper concludes by attempting to identify the few remaining niche opportunities.

CONTENTS

FORWARD

The research challenges to write this paper were several in number and large in size. The first and most obvious challenge is the remarkable lack of quality information. The primary reason for this is, as we will see in section 2.2.2., China is internationally famous for its lack of quality data and market information for almost all its markets. Second, much of the little data that is available is highly unreliable, and moreover most of it is only available in Chinese. When quality information is available, it is most often available only for sale as reports from market research companies or as consulting services from the major international consulting agencies. Only a few such reports were available through the library's subscription service, and these tended to be very broad and lacking the necessary depth of analysis. Given these challenges, the paper was first designed to focus on key case studies from which the market conditions and characteristics could be deduced. However, the only available case studies are of four power generators from the late 1990s and early 2000s. These same four cases are repeated in a few different sources. Given the rapid pace of development of the market conditions, these case studies are no longer relevant. As a result, it was necessary to piece together a clear picture of the market by finding any and all research related to China's electricity sector, and then extracting the fragments relevant to this paper's topic.

Although this paper is strong from an academic perspective, it may be weak and ill-informed in the eyes of an experienced investor of FDI into China's electricity sector. For example, I worked as a senior executive in China for 9 years within a different sector which developed from a total market value of 20 million NOK in 2003 to one of the world's most lucrative markets in 2010. During this time I was constantly confronted with incredibly inaccurate market reports on my sector. Not only was it extremely rare to find even a partially accurate report, the vast majority came to conclusions that were in direct opposition to everything I knew about the sector. As with this thesis, the primary cause of their weakness is a severe lack of reliable information.

Such a complex market with such a lack of reliable information did not allow for the direct study and identification of market opportunities. Instead, it required the analysis to identify where the opportunities are not to be found and then infer where they may exist.

INTRODUCTION

The China market has fascinated foreign investors for centuries. In most cases, it is, and has always been, a "China Dream" instead of an investment reality. The iconic example of the China Dream comes from a nineteenth century British trade expedition to China from which concluded that "if the Chinese added one inch to their shirt sleeves, the textile mills of Lancashire would be busy for the next 100 years" (Financial Times, 2009). However, the reality of doing business in China has never been as easy as foreigners believe it to be. Distracted by the overall scale of the market, foreign investors often dive headfirst into the swimming pool without first looking if it has any water in it.

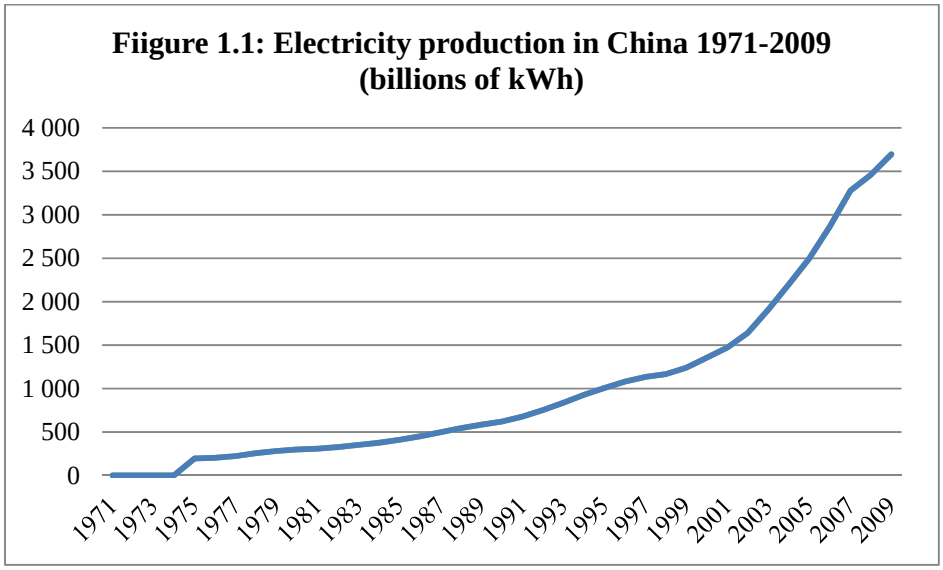
This paper attempts to provide a brief overview of a market that is immense in both its size and its complexity. As a necessity, it focuses only on those aspects of the market that have impacts of FDI. It is therefore not a sufficient total market overview, nor is it intended to be.

The opportunities for FDI in China's electricity sector are few in number and small in size. As we will see, it is not just like trying to find needles in a haystack. It is more like trying to find needles in a haystack while blindfolded.

PART 1: THE HAYSTACK - A MARKET OVERVIEW

When it comes to electricity China's challenges are quite different from most industrialized nations. While the latter focuses on increasing energy efficiency, China's rapid economic development has placed it in the situation where it needs to frantically increase supply in order to catch up with the rapid and continuous increase in demand. For the government, this is not as simple as just building more power plants. Central and local planners must first find the massive investment for such an undertaking, make efficient use of the fuel mix available both locally and nationally, and at the same time develop the infrastructure at a pace fast enough to build and utilize increased capacity. The sheer scale alone is a challenge unlike any other country has faced in human history. For example, in just 2009 alone, the increase in China's generation resources increased by more than the entire generation capacity of the United Kingdom (90GW). In terms

of total current capacity, China has already almost matched the total capacity of the European Union (900GW) making it the second largest consumers of electricity in the world after the United States. However, despites its meteoric speed of development, the increased capacity is immediately absorbed into the system and as a result has been insufficient to keep up with demand (Nan & Moseley, 2011). At such a large scale, and with no slowdown in growth in sight, China's energy demands will impact almost every other nation on earth.



Source: World Bank Database

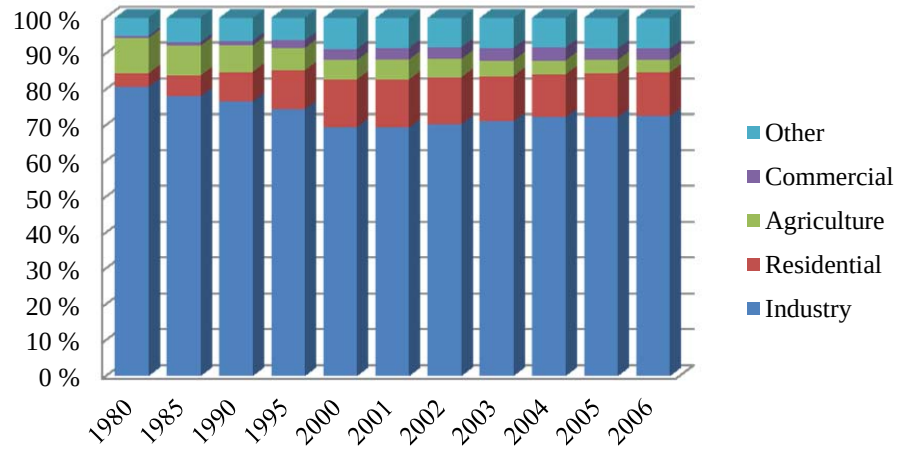
Looking forward the challenges China faces in providing its booming economy with sufficient electricity are tremendous. From 2005 to 2030 China's GDP is projected to increase in size over 6.6 times. During this same period the population in urban households is expected to nearly double (McKinsey & Company, 2009). As a result of these economic and demographic forces, China's 2030 energy consumption is predicted to exceed that of the United States before 2015 and the US by 20% in 2030 (Energy and Security Group, 2008), (Bergsten, Freeman, Lardy, & Mitchell, 2008).

1.1. Electricity Consumption by Sector

Given the mind-bending aggregate numbers associated with China's current and projected growth in both demand and consumption, it is important to take a deeper look as to which sectors are more or less responsible for the sky rocketing demand. Unlike many other developing nations, China has an unusually small share of consumption in the agricultural sector (4-5%)

(Pittman & Zhang, 2008). However, we be expected with any rapidly developing economy, the residential and commercial sectors have experienced dramatic relative growth in share of consumption (in the years 1980 to 2006 from 3.8% to 12.2% and from 0.6% to 3.2% respectively). The increase in residential consumption is due both to increased population in urban areas and the increased use and affordability of electrical appliances. In the commercial sector, the vast and rapid increase in hotels and commercial office space help explain its rapid gains (Ni, 2009).

Figure 1.2: Electricty Use by Sector 1985-2006



Source: China Energy Databook

The relative decline of the industrial sector's share of electricity use is only that; relative. In absolute terms, it is also increasing at a dramatic rate rarely seen in any other nation. Since 2000 China has become the dominant global producer of several energy intensive products (Ni, 2009). In 2006 China's share of the global production certain key products far exceeded its 6% share of the world's GDP. These included flat glass with 49% of global production, followed by cement (48%), steel (35%), aluminum (28%), passenger cars (11%), ethylene (8%), and semiconductors (7%) (Energy and Security Group, 2008). This should be, and normally would be, very good news for the Chinese economy. The government and businesses involved no doubt seek to become world leaders in these critical input sectors. However, it is here that we can see exactly what a poor state the electricity sector is in. Instead of further encouraging or leaving these

sectors alone, the central government has eliminated or drastically reduced the tax rebates given to steel exports, and has also increased the export tariff from 10 to 15%.

1.2. Market Value

Datamonitor estimates the total market value at €266.1 billion (2.02 trillion NOK[1]) in 2010, with a CAGR of 16.3% for the years 2006-2010. This rapid pace of development is not expected to slow down, with the market estimated to reach €571.4 billion (4.43 trillion NOK) by 2015 with a resulting CAGR of 16.5%. In order to illustrate the relative size of this market on the world stage, it is useful to compare them to a few benchmarks. Japan, China's close neighbor and the economic leader in Asia prior to the China's recent economic boom, is estimated to have a total market value of €123.9 billion (941 billion NOK) in 2015 with a CAGR of 1.7% from 2010 to 2015. India, who is similar in geographic size, population, and at a slightly earlier stage of economic development, will reach a total market value of €140.1 billion (1.06 trillion NOK) in 2015 with a CAGR of 13.6%. To put these numbers in a concise and clear perspective, it is estimated that the combined total value of Japan and India's electricity markets will be less than half of the value of China's in 2015 (Datamonitor, 2011). More specifically, in terms of the power generation market, China experienced a compound annual growth rate (CAGR) of 15.5% from 2007 to 2011, leaving it with a total value of €172.1 billion (1.30 trillion NOK) in 2011 (Marketline, 2012).

In terms of the market value by sector, the industrial sector accounted for 56.2% of the value in 2010, well below its share of total consumption. Conversely, the residential sector accounted for 17.4% of the total value, well above its share of consumption (Datamonitor, 2011). This wide gap is explained by China's complex and opaque pricing system, which we will address later in this paper.

1.3. Market Condition

Despite its massive generation capacity and the rapid pace of added capacity, China still faces severe electricity shortages. China' Electricity Council (CEC) recently warned that the shortages in 2011 were over 30 million kilowatts, and they project a further shortage of 40 million kilowatts in 2012. In order to deal with this crisis, the CEC recommends further increases in

[1] Exchange rates from ww.xe.com May 5, 2012

generation and further limiting the exports of energy intensive products. Moreover, the CEC points to the central role that coal plays in the problem. Power generators and coal producers are in a constant struggle to achieve reasonable profits, if any. Power producers complain that increasing coal prices are too high and, due to the price setting of electricity by the central government, they are unable to pass on these increased costs. This results in reduced profits and occasionally operating losses. Coal producers have a very similar argument (where prices are also fixed by the central government), and are not motivated to sell to power companies at a low fixed price when the open market price can be several times higher (Asia Pulse, 2012), (Research in China, 2012), (Yeh & Lewis, 2004).

1.4. Energy Resources

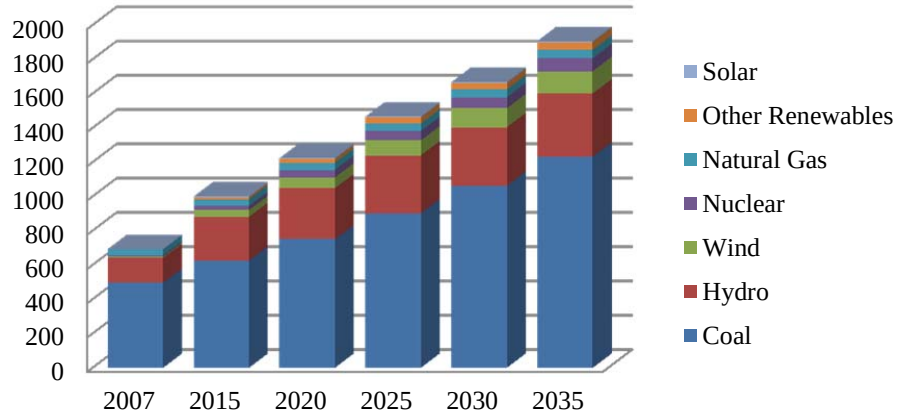
China has the world's largest exploitable reserves of coal and hydropower resources. As a result, coal and hydropower were used for 78% and 20% of China's power generation, respectively (Pittman & Zhang, 2008). However, the distribution of these resources presents a major challenge for the central government. While the major consumption and population centers are primarily on the East coast, the coal resources are primarily in the sparsely populated northern and western parts of the nation. In 2006 the reserves were estimated to be 1.035 billion tons. However, the coal is located within difficult geological conditions that require underground mining and the advanced systems required to locate and mine the reserves (Information Office of the State Council of the PRC, 2007).

The majority of China's hydropower resources are located in the Southwest of the nation. While China's total hydropower potential is 6.2 trillion kilowatts, the economically exploitable resources amount to 1.76 trillion kilowatts (Information Office of the State Council of the PRC, 2007). Although its potential wind resources are not as relatively rich as its coal and hydro resources, China still boasts 2380 GW of onshore wind power, and 200 GW of offshore wind power. However, these resources are located in the west and northwest regions of China, which present a challenge for the integration of these resources into the grid to reach the eastern centers of demand (Yang, Patiño-Echeverri, & Yang, 2012).

As a result of the natural resources available to them, currently 81% of China's power generation is produced from fossil fuels, with 17% from renewable resources and 1.8% from nuclear

generators (Marketline, 2012). Looking forward, the central government intends to focus its efforts on developing all of its generation fuels sources resources besides coal. However, given its current dominant position and abundant supply, coal will still dominate the production mix for the long term future (Business Insights, 2010).

Figure 1.3: China's Total Installed Generation Capacity 2007-2035 (GW)



Source: US EIA

1.4.1. Coal

As has been noted, coal is the dominant fuel source for China past, present and future. One reason for China's "addiction" to coal is the scale and scope of sunk investment in its coal mining and coal generation infrastructure. This began in the 1960s and 1970s with a massive central government construction program focused on developing its coal infrastructure. Despite is environmental impact, the inefficient combustion technologies, and the frequent accidents and loss of life during the mining process, coals large domestic resources and cheap price coal has remained and will remain the dominant fuel source (Yeh & Lewis, 2004).

The coal mining industry in China is relatively fragmented, with small mine operations outnumbering large and medium sized state operations by almost twelve to one. Despite ongoing mass consolidation the industry remains inefficiently fragmented (Karplus, 2007).

The central government has shown a high degree of interest in reducing the negative environmental impact of coal burning. It has done so by promoting other energy sources, and by

attempting to forcefully regulate the industry to adopt clean technologies. However, in practice the industry ignores such regulations, betting that potential penalty and the chance of getting caught will be far less than the lost profits spent on clean coal technologies and processes (Karplus, 2007).

The cost of coal comprises of 70% of the total costs of electricity production in coal-fired power plants. In addition, the selling price of electricity is fixed by the central government and does not allow generators to pass on increased costs to end users (Energy Foundation, 2007). As a result, the profits and losses of coal generators are almost totally dependent on the fluctuations of coal prices. As a result, when coal prices increase too much, many generators find excuses to reduce production or shut down entirely. For example, in the first half of 2008 generators in Shandong province lost $441 million USD and over 15 GW of generating capacity (over 35% of total capacity) was left idle (Wang, Qiu, & Kuang, 2009). In response, the central government established price caps for coal sold to power generators. However, this only resulted in coal companies finding excuses why they could not sell to power generators. The end result was and is the same, large amounts of generation capacity are left idle, this time due to lack of source fuel. For example, despite the fact that Shanxi province produces one fourth of China's coal yet the province suffered 4.6 GW of power shortages due to the lack of coal supply to generators (Wang, Qiu, & Kuang, 2009).

1.4.2. Hydropower

China's resources for hydropower and political will to develop them are well demonstrated by both its second position to coal for power generation and by the iconic Three Gorges Dam project. In 2009 the central government already exceeded its 2010 target of 190GW of installed hydropower generation capacity. By 2020, the central government plans to have 300GW of capacity, 225GW of which will be in large scale projects while the remaining 75GW will be in small scale projects (Business Insights, 2010). In terms of resources, China ranks as first in the world in terms of total hydropower production potential (Karplus, 2007).

While most of the technology for the large projects must still be imported, most often from the US and the UK, China has focused on developing domestic production, in particular with small

projects. They have been so successful that China has become an exporter of such turbines, although they have been extensively criticized for their lack of quality (Karplus, 2007).

Given its importance and high potential to reach isolated parts of western China, small scale hydropower (under 50MW) has been another focus for development. Much of the potential for small scale hydropower is located in areas where 70% of the current unelectrified population resides. By 2004 only 2.1% of this potential had been developed. However, only 2 years later there were over 40,000 small hyprodpower plants in western China with a combined generation capacity of 50GW. The reason behind this rapid development has been due to the strong and proactive support by the central government (Energy and Security Group, 2008).

1.4.3. Wind

The amount of China's wind power potential has been uncertain due to the widely different estimates of seperate studies. A 2004 official study found that the theoretically exploitable wind resource in China was 4350 GW, and the technically exploitable wind resource was 297 GW, while a 2006 study concluded that the technically exploitable wind resource alone was 2548 GW (excluding Qinghai-Tibet Plateau). In terms of the geographic location of the wind resources, all studies agree that the highest potential is in the northern and coastal regions (Zhao, Hu, & Zuo, 2009). Cumulative wind power capacity has increased rapidly starting in 2005. By 2009 it had already reached approximately 25 times that of 2005 levels. In terms of total installed capacity this rapid trend is expected to continue into the long term, with 2035 levels rising to more than three times that of 2015 levels (Business Insights, 2010).

Prior to 2004 China's market for wind power was almost nonexistent. However, just four years later China had become of one of the world's best markets. During this short period the annual increase of installed capacity exceeded 100% each year. Looking slightly further back to 2000, when increased capacity amounted to 58MW, there was over a 100 fold increase to 2008, when increased capacity amounted to 6240MW (Li J. , 2010). By 2009, China had become the second in the world in terms of installed wind power capacity (Business Insights, 2010). Part of the reason for this rapid development was the removal of certain obstacles that had prevented the development of wind power in the past. The primary obstacle was the relatively high cost of imported wind turbines. The central government then devised a series of policies and incentives

to encourage the domestic production of wind turbines and the construction of large scale wind power projects. The success of these policies and incentives is evidenced by the rapid increase of wind power after 2004 (Li J. , 2010). One of the most famous of these policies was the 2005 law requiring that 70% of the wind power equipment be manufactured in China. This rule was which was eliminated in 2010, partially due to foreign pressure, but primarily due to the fact that the law had already achieved its goal to jump start a domestic wind power manufacturing industry (McDonald, 2011). More importantly, costs have seen an annual decrease of 15% per year, a rate which is expected to increase (Karplus, 2007).

As a result, foreign companies were heavily involved in early stages of wind power in China, but the central government's policies and incentives, while powerfully promoting wind power, did so by focusing developing a domestic market. As can be seen in the figure below, the wind power boom starting in 2004 was actually the start of a bust for foreign players. In addition to all of the difficulties shared with domestic players in the market, foreign companies encountered two significant obstacles in the bidding process. First, overly aggressive and inexperienced local companies tend to enter low ball bids which allow them to win the project, but leave no room for profitability. Second, even if the other companies are rational bidders, the process is opaque and the local officials have a strong preference for domestic companies (Li J. , 2010). The end result has been a complete reversal of the market share split between foreign and domestic companies. While in 2004 foreign companies had a market share of 75% to the domestic share of 25%, by 2009 the foreign companies' share had been reduced to 13% compared to the 87% market share of domestic companies (McDonald, 2011).

However, despite the incredible growth in the wind power sector, its total market share remains very small, with large amounts of potential capacity untapped and many existing wind power projects left idle or operating well below their designed potential. In order to illustrate this point, in 2008 wind power capacity accounted for only 7% of the national total, while on grid electricity generation accounted for only 0.35% (Li J. , 2010). As a result of this and other factors, the vast majority of wind power projects are not profitable (Yang, Patiño-Echeverri, & Yang, 2012).

The causes of this failure can be assigned to poorly designed policies regarding the grid and project incentives. Connectivity to the grid has been, and remains to be, a significant obstacle for wind power projects. In the early stages of wind power in China, the grid companies would refuse to pay the costs to connect remote wind power projects. However, the grid companies were not allowed to pass on the cost on to customers. The result was the formal and informal refusal of the grid to connect wind power projects. In order to reverse these negative incentives, the central government required the grid companies by law to connect all wind power projects and to purchase all of the electricity generated from them. In addition, they provided a mechanism in which the grid companies could pass on the increased costs to the customers. However, these polices have failed to capture all of the indirect costs, resulting in continued and effective resistance by the grid companies. Exasperating this problem was a law requiring the large generating companies to have a certain proportion of their capacity in wind power. However, since the law was focused on capacity and not on electricity production, many projects were built and then intentionally left idle due to the high costs of connecting them to the grid and operation (Yang, Patiño-Echeverri, & Yang, 2012).

1.4.4. Nuclear

As one of the only possible clean replacements for coal as a base load producer of electricity, the development of nuclear power has been high on China's priority list. Compared to gas, nuclear power is cleaner and unlike hydroelectric power, the government is free to determine the location of its nuclear power plants. This allows the power plants to be based close to the large demand centers in eastern China (Fung, China's Energy Sector: A clearer view, 2009).

China began developing its nuclear power in the 1980s by building one reactor in Hong Kong from imported technology and one near Shanghai based on indigenous designs developed from foreign models (Karplus, 2007). In 2005 the government began a more proactive approach to the promotion of nuclear power. In 2006 installed capacity was at 6.9 GW and by the end of 2007 it had 11 plants with a combined capacity of 8.9 GW (Ni, 2009). By 2012 China had 14 plants in operation, 25 in construction and many more about to start construction (World Nuclear Association, 2012). Since then, the central government further increased its 2020 target from 4 to 5% of total installed capacity. In order to implement such a plan, China will build five to six 1 GW plants every year until 2020 (Ni, 2009). All of these new plants will use a mix of domestic

and foreign technology in order to build some of the world's most advanced reactors. Although there has been a heavy reliance on foreign technology and participation up to now, China is rapidly becoming self-sufficient in both design and construction. In order to supply these reactors, China has aggressively pursued the securing of uranium resources overseas in addition to developing its limited domestic reserves (EIA, 2010).

Tempering this aggressive development strategy is a careful and tight central control over the ownership and operation of the plants. Only a handful of State-Owned Enterprises (SOEs) are allowed to have the license to own and operate nuclear plants. Other SOEs are, at most, allowed to have a minority share (Karplus, 2007). It also the official policy to require that the nuclear fuel assemblies are manufactured domestically, and that the domestic design and manufacture of all other elements be maximized (World Nuclear Association, 2012).

The Fukushima disaster temporarily slowed the development of nuclear plants in China. In March of 2011 it was announced that all approvals for new plants are suspended and intensive inspections would be imposed upon all existing plants and those in the process of construction. This process lasted three months, after which all operations and construction continued (World Nuclear Association, 2012).

1.4.5. Natural Gas

By 2007 China was one of the top ten nations in the world in terms of natural gas consumption and until 2006 was totally self-sufficient in terms of supply (Higashi, 2009). In addition to these conventional resources, China has recently began to explore its shale gas resources, with the government now estimating that its shale gas reserves to be around 31 trillion m3 (Forbes, 2012). Since 2006, annual consumption has grown by at least 20% per year (Higashi, 2009). Despite these seemingly large numbers, as a share of primary energy natural gas is at just 2.5% in China compared to the world average of 25% (Li J. , 2010). Per capita consumption is also very low compared to the rest of the world, with China's 53 m3 at almost one-tenth the world average (Higashi, 2009).

The central government has been very interested in promoting the use of natural gas for economic, efficiency, and environmental reasons. As a substitute for coal, natural gas is cleaner and the plants can be built on the coast where both the demand centers and points of importation

of LNG are located. In order to promote its use, the government has focused on two issues: infrastructure and pricing. In terms of the former, plans are being implemented to develop a West-East pipeline and several coastal LNG terminals (Li J. , 2010). In terms of price, natural gas is at a significant disadvantage to coal in the power sector. In contrast, the residential and industrial sectors have been quite receptive to is adoption and use as substitute for coal and oil.

As a result of the government's desire to make natural gas a viable substitute for coal, China's domestic prices for coal are often well below international prices. However, the lower price for natural gas is still not enough to overcome coal's price advantage in the power sector (Higashi, 2009).

Even though the use of natural gas has increased greatly in the power sector, it still only accounted for 11.6% of China's 2007's total consumption of natural gas. Many of the plants were constructed in the large coastal demand centers of Shanghai and Guangdong, helping China to reach 2.5% of its power generation capacity. However, these plants experienced significant idle time due to both high prices and shortages. As a result, gas fired power plants ran an average 36% fewer hours per year than coal fired plants.

1.4.6. Solar

Similar to wind power, the central government had implemented a strategy based on an initial reliance on imported technology from which knowledge was officially and unofficially obtained. As a result of this successful technology transfer, China is already the largest producer of solar panels in the world with almost 40% of the world market share. The domestic industry is heavily dependent on exports with 90% of production set for export, mostly to the US and European markets (Business Insights, 2010).

In order to promote solar power, the central government has set a target of 20GW of installed capacity by 2020. Much of this focus will be to develop large scale on grid PV power plants and to electrify one million households using off grid solar generation. These programs generally focus on the underdeveloped, isolated and dry Western and Southwestern regions. In the heavily populated Eastern cities, the government is promoting rooftop PV power generation (Energy and Security Group, 2008) and the generation of electricity using solar power through China's Golden Sun Subsidy Program. As a result of government planning and support, cumulative

installed capacity of solar PV has increased almost six fold from 2005 to 2009. This trend is set to continue into the long term with the annual installed capacity of solar PV in 2014 projected to be almost 4 times that of 2010 (Business Insights, 2010).

One exciting area of development within solar power in China is in concentrated solar power (CSP). The central government has shown increasing interest in developing CSP. One example of this was when in 2010 US based eSolar signed an agreement to install over 2GW of CSP in China over the next ten years (Business Insights, 2010).

1.4.7. The Renewable Energy Category

China's central government is very eager to develop all categories of renewable energy for several reasons. First is China's energy current and rapidly expanding energy needs in which China seeks simply to fill the increasing demand for electricity that coincides with rapid social and economic development. Second is China's concerns related to energy security, from which China is highly motivated to develop all domestic energy resources compared to those that must be secured from international sources, even when the latter is far less costly. Lastly, China is also motivated to develop renewable energies as a way to reduce its pollution and CO2 emissions. Key initiatives that target specific forms of renewable energy have been discussed in the relevant sections above.

In addition to these are several directives and laws intended to develop China's renewable energy resources. The most important of these was the 2006 Renewable Energy Law which provided subsidies and tax breaks along with requiring the grid companies to provide grid connection for all renewable energy power generators (Fung, China's Energy Sector: A clearer view, 2009).

The Renewable Energy Law also created a pricing system meant to further encourage the development of renewable energy in the market. The central government sets separate prices on a cost plus basis for each type of renewable energy. The cumulative difference between the on grid price of renewable energy and the on grid price of desulfurized coal plants is accounted for by the creation of a surchage which spreads the extra cost nationally to end users (Ni, 2009).

However, the law was not as effective as the central government intended. In 2010 the law was further strengthened in three areas. First, the law sought to increase planning cooperation

between the grid and renewable energy projects. This was needed due to the boom of renewable energy generation projects along with the much longer planning time required for grid development. Second, the law strengthened the guarantee that the grid would purchase all the electricity produced by renewable sources. Despite the law's coverage of that issue already, the grid companies had successfully exploited loopholes in the law or just outright refused to comply. Lastly, the law increased the funds available to a renewable energy fund that is used to promote further development of renewable (Martinot & Junfeng, 2010).

1.5. Key Players

1.5.1. The Central Government

The most common misperception foreigners have about China is in regards to the power and authority of the central government and their ability to exercise that power. Despite their official and formal power, which is very strong, the central government is often unable to dictate policy. This is due to the influence of many other actors including: provincial and local officials, policy research groups who often control the information from which policy is developed, powerful business interests, and the highly influential "Princelings" who are the children of powerful government officials who use their family relationships to gain wealth and power, often through corrupt practices (Martin, 2010), (Bergsten, Freeman, Lardy, & Mitchell, 2008). In recognition of their lack of power to implement their own policies, the central government frequently only makes abstract guiding principles to which the local officials are left to interpret.

The effects of the conflict between these interest groups can often be seen in the internal contradictions in policy. For example, there is continued pressure and efforts to create competitive markets, yet electricity prices are controlled and set by a powerful central ministry. According to a Capgemini report "Capgemini's Peng is less optimistic on the level of progress China is set to make in terms of electricity market development in the coming years.

> "There has been five or six years of discussion of the opening of the market. Zero has been achieved. It will be another five to 10 years before we see progress. The problem is that the government's idea of a power market is not really a power market. The Chinese system of transferring of electricity at a controlled price does not fit in with the westernised idea of a free market, with common rules and competitive participants. Government control is a real barrier and it's hard to push the market forward from a pricing perspective because only one company plays a major role" (Holliday, 2010).

Another and more relevant example for this paper of China's internal conflicts is the desire to attract foreign investment and expertise while polices continue to limit it (Yeh & Lewis, 2004). More specifically, the process for the approval of a foreign power project is a case study in the myth of the powerful central government. Foreign entities are forced to negotiate with government agencies at all levels along with a plethora of institutions. A 2003 survey of experts in the Chinese power markets concluded that "Even where there is delegation, decisions are still subject to review by a number of agencies. The result is a decision making process that is slow, diffuse, inefficient, and non-transparent. It also leads to bargaining between government institutions, with each institution pursuing its own particular interest. And where problems or conflict appear, there can be so much buck-passing that even government officials themselves have difficulty ascertaining who should be responsible for specific issue" (Wee & Wee, 2003). Relevant powers are fragmented amongst many separate government agencies and major oil, power and coal companies such as the State Electricity Regulatory Commission, the State Administration of Coalmine Safety, the Ministry of Water Resources, the Ministry of Land and Resources, China National Petroleum Corp., Sinopec Group and State Grid Corp. of China (Downs, 2008).

Historical Development

After the communist revolution of the 1940s and the establishment of the People's Republic of China in 1949, the first central government entity created to oversee China's electricity industry was the Ministry of Electric Power in 1955. In true communist style, this agency was responsible for command and control of China's entire electricity sector. All production was to provide their electricity consumption budgets up a long bureaucratic chain that eventually led to the Ministry of Electric Power. The Ministry would use these forecasts as the basis for the centralized planning for the development and operation of China's entire electricity sector (Nan & Moseley, 2011). Such a system is ill-equipped to handle any market, much less so a market characterized by rapid development.

In 1997 the Ministry of Electric Power was dismantled, and all of its assets were assigned to a newly created state-owned enterprise named the State Power Corporation (SPC). This move formally changed the role of the central government from direct market control to market regulator. However, the central government remained in total control of the SPC until the next

major stage of reform, when in 2002 the SPC was broken up into two grid companies (each with separate and exclusive territories) and five large generation companies. At the same time the powers of government regulation where reassigned to three entities: the pre-existing and powerful NDRC (National Development and Reform Commission) as a central economic planner and policy-maker with broad powers over the entire economy; the newly created SERC (State Electricity Regulatory Commission) as the regulating body exclusively focused on the electricity sector; and the CEC (China Electricity Council) as a non-governmental association whose purpose was to serve as a bridge between the state-owned enterprises and governmental agencies (Nan & Moseley, 2011). The end result is a fractured structure of power and responsibility where government agencies with separate priorities and interests are unable to create coherent and effective policies (Downs, 2008).

NDRC (National Development and Reform Commission)

The NDRC is the primary entity in the Chinese central government responsible for long term economic planning and policy making. In many ways it is encompasses the remaining communist style command-and-control powers of the central government prior to the start of economic reforms in the 1980s and 90s. In terms of China's electricity sector, the NDRC is responsible for the long-term plans for the sector's development, the distribution of major investments in the sector, the planning for funds related to state investment in energy infrastructure, and control over the pricing of electricity. The latter is the most important power to note, and is unique to China.

This power of pricing was supposed to be only assigned to the NDRC in a transitional period until the SERC was deemed ready to assume this key responsibility (Pittman & Zhang, 2008). In practice, the NDRC has been successfully reluctant to give up its power over the pricing of electricity. One reason is that the setting of electricity prices has been one of the NDRC's most powerful macroeconomic tools. The NDRC is understandably unwilling to give up such a powerful tool, and even more so when the agency it must give up that control to has interest and objectives that run counter to the NDRC's (Lehman & Aldo, 2009). Chief among the NDRC's goals is to combat inflation, and the chief means it has to do so is by setting and maintaining a low price for electricity. However, the primary unintended side effect of this goal is that is

prevents the development of an efficient market based electricity sector, which is the primary goal of the SERC (Wang, Qiu, & Kuang, 2009).

The NDRC's desire to keep inflation low by maintaining a low price for electricity has severe negative consequences on the electricity sector. The first problem was the cost crunch between coal producers and power generators already mentioned in section 1.4.1, resulting in power shortages. Instead of dealing with the core problem, the NDRC just moved the burden from generators, then to the coal producers, then back to the generators and end consumers (EIA, 2010). This is a perfect example of how the NDRC behaves in accordance to objectives that are both in conflict with, and have precedence over, the improvement of the electricity sector.

SERC (State Electric Regulatory Commission)

Founded in 2002 the SERC is intended to be the central government's primary body to supervise and regulate competition in China's electricity sector. The agency's primary mission is to provide consumers with reliable and affordable supply of electricity (Downs, 2008). Its formal powers include: issuing licenses to operators, monitoring operations, and holding operators accountable for violations of pricing and competition rules, as well as setting up an electricity supply trading market (Karplus, 2007). One of its most influential powers has been its responsibility to supervise the transmission grids to ensure its reliability, development and equal and fair access to all segments of the population and economy (Lehman & Aldo, 2009). However, the most important power, while inside the SERC's scope, has remained outside of their grasp. To date the NDRC has refused to give up its power to determine electricity prices and to approve new installations. Without these most basic tools to achieve its goals, the SERC has always been, and continues to be, an ineffective organization (Wang, Qiu, & Kuang, 2009).

Other factors contribute to the SERC's lack of power and influence over its designated areas of control. One is the involvement of several other government agencies that greatly complicate and impede the progress of all policies and reforms (Holliday, 2010). Another has to do with the staffing of the SERC. First, the number of staff is far too low to implement its objectives and responsibilities. Moreover, the few staff it does have mostly come from the power and grid companies that they are meant to regulate (Yeh & Lewis, 2004). As a result, many policies seem to indicate that the industry is regulating the government instead of the other way around.

A Series of Failed Regulatory Agencies

There has been no lack of awareness or effort from the central government to resolve this structural conflict between the NDRC and the SERC. The first attempt was done by the NDRC in the creation of the Energy Bureau in 2003, just one year after the creation of the SERC, as an internal unit given a powerful and wide mandate to exercise the NDRC's powers over electricity sector. However, the agency was given very little actual authority and insufficient manpower to exercise what little authority it has.

In 2005 the National Peoples Congress created the State Energy Office (SEO) and the Energy Leading Group (ELG). Both were meant to bridge the divide between the SERC and NDRC, along with the interests they represent and defend. The ELG was comprised of some of China's most powerful and high ranking officials, including Premier Wen Jiabao, whose influence was intended to overcome the various conflicts of interest. However, in practice these same interests limited the officials' ability and motivation to use their power and influence to resolve them. As for the SEO, it failed to be effective primarily does to its official rank below the NDRC. As a result, its only effect or output has been the generation of reports (Li X. , 2011).

In 2008 the National People's Congress created the National Energy Administration (NEA) and the National Energy Commission (NEC) to replace the ELG (Downs, 2008). However, its specific functions, organization, and staffing where not established until 2010. According to a 2010 press release, the NEC will "determine national energy development strategy, address significant issues concerning energy security and energy development and coordinate major programs of domestic energy development and global cooperation" (People's Daily Online, 2012). However, these agencies have remained ineffective for the same reasons as their predecessors (Downs, 2008).

Taking advantage of the government's paralysis, the large state owned energy companies are likely to continue to informally dictate and dominate policy creation and enforcement in the energy sector (Downs, 2008).

An often quoted definition of insanity is "doing the same thing over and over again and expecting different results". Using this definition we could characterize the central government's approach to resolving the structural conflicts in their political organization as insane. The government continues to create new agencies who only succumb to the old and ever present

conflicts of interest. Little to no progress has been made, and there is no indication that it ever will.

Key Motivations and Policy Drivers

It is important to note that the central government's failure to create and implement an effective strategy for the electricity sector does not imply that sector reform has not been a critical priority. When focusing on their actions instead of the results, it is obvious that electricity sector reform is of the highest priorities for the central government. Very few other issues have had so many top level entities created for it, and even fewer have had so many of China's top officials assigned to its cause. In fact, it may be the case that the failure to achieve effective reform is a symptom of how important the issue is rather than the opposite. This issue is of such critical importance to so many actors across the economic and political landscape that each of them attempts to exert considerable power in order to influence the kind of change, or lack thereof, which benefits their specific interests. The end result is a political gridlock that prevents any real action from being taken.

In order to then see where the opportunities are in the electricity sector, it is important to look one step deeper into the various motivations behind electricity sector policy and reform. Whereas the big picture paints a seemingly hopeless view of the market, opportunities can and do exist within the separate motivations behind policy and reform. Although they may be niche opportunities, given the immense scale of China's electricity sector, a Chinese niche opportunity can still be relatively larger in size when compared to opportunities in other nations. In addition to identifying niche opportunities, an examination of the basic motivations and policy drivers also shows the various pitfalls that must be avoided in order to achieve success in China's electricity sector.

Need for Investment

Some estimates show that between 50 and 70 billion USD needs to be invested annually into generation alone. This is approximately double the current rate of investment, which comes almost exclusively from the government. Much more investment is required, and it must be directed into several specific areas of need including: cleaner generation, transmission and distribution, and energy efficiency (IEA & OECD, 2006).

Social Stability

One of the most common reasons for the lack of effective reform is related to social stability. Any action, or lack thereof, that has a direct or indirect negative impact on employment, helping the poor, containing inflation, or maintaining the competitiveness of the industrial sector will most likely fail (IEA & OECD, 2006). It is for exactly these reasons, for example, that the NDRC refuses to provide the SERC with the powers it needs to reform the electricity sector. There is no doubt that the sector requires reform, but the most basic part of that reform is market pricing, which will have a significant and direct impact on social stability issues. As one of the most basic inputs into a society and economy, electricity touches every life and every input. As a result, any increase in electricity prices would have a disproportionate and large negative effect on the poor and elderly.

Energy Security

The Chinese government is very sensitive to foreign influence in critical areas such as banking, the internet, and energy. In all of these areas the central government attempts to limit foreign involvement and influence as much as possible. For example, China has been a net importer of oil since 1993 and it is estimated that they will need to import 60% of its oil and 30% of its natural gas by 2020. The central government sees this as a major strategic vulnerability that will be used by foreign powers to exert influence over China. Although there is little they can do about oil and gas imports, this foreign foothold into China's energy needs not only prevents the central government from encouraging foreign involvement in the electricity sector but it also causes them to proactively limit it (IEA & OECD, 2006).

Power Shortages

The development of China's electricity sector has been characterized by a series of stages of over and under capacity. In each instance, the solution to solve the current problem causes the next. The first problem arose in the 1980s when China's central command and control economy was not able to keep the pace of investment in the electricity sector with its rapid economic development. The resulting lack of sufficient generation capacity lasted for several years and was the most severe bottleneck for economic development that the nation faced. Over one fifth of industrial capacity was shut down during this period due to permanent shortages of electricity (Yeh & Lewis, 2004), (Woo, 2005). In response, reforms were created in order to open up

investment into the electricity sector and to encourage local governments to raise their own money to invest in generation capacity (Yeh & Lewis, 2004).

However, starting in 1994 electricity demand unexpectedly entered a declining trend for reasons that are today still not well understood. As a result of the over capacity, the central government heavily restricted the approval of new power plants. In addition, the economic plan covering the period from 2000 to 2005 was created during the peak of the Asian Financial crisis of the last 1990s and thus was totally unprepared for the economic boom of the early 2000s (Yeh & Lewis, 2004). This boom, in combination with the central government's policies to limit the increase of generation capacity and its policies to encourage the development of energy-intensive industries, resulted in a cycle of power shortages. Shortages first began to appear in 2002 when power shortages were reported in 12 of China's 31 provinces. Demand continued to climb at an increasing rate, resulting in shortages in 24 provinces in 2004, and 25 provinces in 2005 despite a 13% drop in demand growth (IEA & OECD, 2006). China's immediate short-term actions focused on demand side management in which industries were forced to shut down or reschedule operations away from peak electricity usage hours (Woo, 2005) including major international joint ventures such as Volkswagen and General Motors. In provinces where economic growth was the fastest, the effect of the power shortages was the most severe. In booming industrial Guangdong province bordering Hong Kong, the problem was so severe that no company or official would admit to or discuss the issue on record for fear of punishment by the higher authorities. It is estimated that 10% of all industry in Guangdong installed their own back-up generation capacity, most often at very high cost and with severe environmental impact (Yeh & Lewis, 2004).

In order to deal with this shortage the government greatly increased investment and the incentives for investment into generation capacity. Despite achieving this goal, shortages reappeared in 2008 with brownouts occurring in 19 provinces. These most recent shortages seem to be the result of the cost crunch between coal producers and power generators (Wang, Qiu, & Kuang, 2009).

Transfer of Technology

China's openness to foreign investment in the energy sector is strongly driven by a wish to attract foreign technology. This is especially true in wind power and nuclear power, where China currently lacks the technology to produce reliable equipment. The opposite is true in solar and coal power, where domestic technology and production is equal or superior to international production (IEA & OECD, 2006).

Environmental Protection

China is already the world's largest consumer of energy and it continues to grow at a rapid pace. By 2030, if carbon intensity continues to growth with the GDP, China would be emitting as much CO2 as the entire world emits today (Yang, Patiño-Echeverri, & Yang, 2012). According to the World Bank, the total cost of air and water pollution in China in 2003 was almost 3% of China's GDP (over 50 billion USD, 298 billion NOK). Another study focusing on losses associated to health related issues resulting from air pollution estimate the cost to be 3.8% of GDP (Energy and Security Group, 2008). In response to this crisis, the central government has pledged to cut its carbon dioxide emissions per unit of economic growth by 40-45% of 2005 levels by 2020 (Business Insights, 2010).

However, the move from centralized command and control to a market based incentives make it harder to implement strategies that promote environmental issues. This is due to the fact that purely competitive markets reward efficiency. In contrast, environmental issues require the direct regulation which the government now seeks to give up. As a result, as the central government moves to increase market efficiency, it at the same time reduces its ability to directly implement environmentally friendly policies (Cudahy, 2008). For example, one of the most powerful side effects of increased market competition has been that the oldest, most polluting power plants are being kept online given their relatively low operating costs. Additional regulation from the SERC and the State Environmental Protection Agency (SEPA) to control this trend has been routinely ignored by players who remain focused on maximizing profits (Karplus, 2007).

China's dependence on coal is the primary target for environmental policies within the electricity sector. As noted earlier, coal dominates China's electricity generation with almost an 80% share of total production. On average, two 500 MW coal plants are built every week, each of which

produces three million tons of carbon dioxide per year (Li J. , 2010). Switching away from coal is difficult given China's plentiful and easily accessible coal reserves. As a result, coal's dominance will continue for the next several decades. One estimate predicts that coal will account for between 59 and 70% of total generation capacity in 2020 (Cudahy, 2008).

It is therefore impossible to discuss the reduction of carbon dioxide emissions in China without addressing the use of coal in China's power generation sector. The central government has approached this issue in two ways: encourage cleaner forms of generation and to promote increased efficiency in coal power plants. In terms of the latter, every 1% gain in efficiency results in a savings of four million tons per year of carbon dioxide emissions. And there is plenty of room for efficiency gains in China's coal power plant sector. Over the last ten years the net efficiency has increased from 30% to almost 33%, but is still well below the world average of 37% (Cudahy, 2008).

1.5.2. Local Governments

"The mountains are high, and the Emperor is far away" - Chinese proverb

China officially has 34 provincial-level governments, over 300 prefecture-level governments, almost 3,000 county-level governments, and over 40,000 township-level governments (Martin, 2010). One of the most common incorrect perceptions Westerners have regarding China is that it is controlled by an all-powerful, all-knowing central government. The past few decades of reform and decentralization has created local government power structure that formally and informally can have significantly more power than the central government (Wee & Wee, 2003). The ability of the central government to enforce its decisions is extremely limited. In theory, each lower tier of government should be subservient to the tier above it. However, in practice the central ministries do not have local offices or locally based personnel and therefore completely rely on local bodies to implement their policies. Local officials are therefore in a situation where they are given directives by the various bodies in the central government and asked to implement them with the limited resources at their disposal. As a result, local officials are forced to prioritize competing and sometime conflicting directives (Martin, 2010). In such an environment, the priority is most often given to short-term local economic development. One reason for this is that their promotion within the party has always been tied to economic growth

and reducing social unrest. In both of these cases, the end result is that local officials prioritize short-term economic development over long-term sustainable economic development (Bergsten, Freeman, Lardy, & Mitchell, 2008) and engage in local protectionism.

In terms of the electricity sector, this basic characteristic of China's political system results in the unregulated construction of new power plants and the protection of local generators from outside competition (IEA & OECD, 2006). For instance, the NDRC controls approval of all installations over 50MW, resulting in local officials breaking up wind farms into installations under 50MW each and the construction of coal plants of under 50 MW each (Yang, Patiño-Echeverri, & Yang, 2012). The end result is an ever increasingly fragmented, inefficient electricity sector and increased problems related to grid development and connection (Bergsten, Freeman, Lardy, & Mitchell, 2008).

1.5.3. The Large Energy Corporations

As noted in the earlier section on reform, the former government monopoly of the entire electricity sector was broken up into two grid companies and five companies (called the Big 5) controlling the generation assets. Each of the Big 5 is subject to a limit of 20% share of any one of the regional power markets.

Although this was intended to encourage competition, the opposite has been the case. As is the case with almost any corporation in any market, the Big 5 have sought to exploit their market power in order to minimize competition and costs in order to maximize profits. One natural advantage for each of the Big 5 is their legacy of dominance in the regions in which they were founded. Even today each of the Big 5 has their largest markets share in its original home market. They have further expanded on their dominant positions by developing consortiums with other companies, allowing them to far exceed their official 20% market share cap (IEA & OECD, 2006). In total, state owned enterprises control over 97% of the total market with the remaining 3% in private and foreign control. As a result, the challenge faced by independent power generators is immense, and thus the prospects for a truly free market are questionable at best (Nan & Moseley, 2011).

The most serious experiment with wholesale market competition was in 1999 by the State Power Corporation, the state monopoly on all generation, transmission, and distribution prior to its

break up in 2002. Each province selected a limited number of generators to compete in a limited segment of the market. Of their total capacity, 90% was secured by contract and the remaining 10% was allowed to compete. However, the small scale of the experiment made it almost totally unrealistic and therefore its results were largely irrelevant. In 2001 experiment was terminated, the official reason given was that it was due to rapidly increasing demand (Pittman & Zhang, 2008). Unofficially, many experts believe it was due to the SPC's official and unofficial interests to retain monopolies (Yang H. , 2006), (Yeh & Lewis, 2004). It is likely that this failed experiment contributed greatly to the decision to dismantle the SPC in 2002 (Yeh & Lewis, 2004). No significant market experiments or have been implemented since (Ma & He, 2008).

For both formal and informal reasons, the large energy corporations are able to have almost complete control of government policy related to their industry. One reason for this is that the heads of several of these large state owned companies hold ministerial rank. This often puts them at a higher official rank than the bodies created to regulate them. Informally it allows them to hold face-to-face discussions with China's top leadership in order to override and undercut the authority of the regulatory agencies (China.org.cn, 2008). Compounding their formal power, the leadership of the large energy corporations has immense informal power due to the fact that the regulatory bodies are dominated by ex-government officials and the "princeling" relatives of current officials (Yeh & Lewis, 2004). For example, former premier Li Peng has much of his power base positioned in the energy sector. His son was the head of the former company that had a total monopoly of the energy sector until its breakup in 2002, after which he became the head of the largest of the five generation companies. At the same time Li Peng's daughter was named vice president of the China Power Investment Corporation and his close ally was named as head of the newly created SERC (Yeh & Lewis, 2004). This type of nepotism is not unique to the electricity sector but rather is a norm of politics and business in China.

The combined formal and informal power of these companies often exceeds that of the central government. While the government's power remains fragmented amongst several agencies with competing interests, the large energy corporations are unified in their mutual objective to maximize profits (Downs, 2008). In addition, in contrast to the understaffed and underfunded government regulatory bodies, these companies have immense financial, human, and political resources to pursue their goals (Li X. , 2011). It is therefore predictable that they would exert

their power and influence to minimize market competition. This may be difficult to believe given Westerners' image of China's central government as being an all-powerful entity. However, not only is it true, it is a common phenomena. For example, the China National Petroleum Corporation acquired assets in Sudan with direct disregard to the NDRC's exclusion of Sudan from the list of nations oil companies are encouraged to invest in (Downs, 2008).

Given their position and power, it could be speculated that the real reason for Chinas inability to reform the energy sector has been, and will continue to be, due to the direct influence of these large energy corporations protecting their current and future profits.

1.5.4. The Grid

With almost 400,000 km of high voltage transmission lines, China already operates the world's largest electricity transmission grid. In terms of rural electrification, China has connected 99.85% of all rural households (Nan & Moseley, 2011). Although some independent distribution companies exist, they operate almost exclusively in isolated rural areas where it is not economical for the national grid to provide connection (Pittman & Zhang, 2008), (Pittman & Zhang, 2008). The national grid is physically divided into four relatively equally sized regions with the State Grid Corporation operating all regions except the south, which is operated by the China Southern Power Grid Corporation (Yang, Patiño-Echeverri, & Yang, 2012). There is no specific tariff given to the grid companies for transmission and distribution. Instead, the grid collects the margin between the fixed prices that generators sell electricity and the fixed prices to which consumers purchase the electricity. This margin is thus indirect, and it is not based in any way to the actual costs of transmission and distribution (IEA & OECD, 2006).

It is important to note that, given that the grid companies are completely responsible for the entire value chain from generator to end consumer. This eliminates any and all potential opportunities related to trading, distribution, and retailing. Moreover, for the purpose of this paper, it is also important to note that all foreign investment into the grid is strictly and specifically forbidden by the central goverment (IEA & OECD, 2006).

Overall, the performance of China's grid has been quite poor. For example, Lehman Brothers Research ranked China's grid as 7th in all of Asia below Thailand, Taiwan, Malaysia, South Korea, Hong Kong and Singapore (Woo, 2005). Some research indicates that grid bottlenecks

are the main cause of the frequent supply shortages. This is due to the fact that, during many shortages excess production of electricity is available in the system but lacks sufficient grid connectivity to reach the demand centers (Yong, 2012). Despite the connecting of the grids in 2005, power flow between regions and even between provinces within the same region is extremely limited (Yang, Patiño-Echeverri, & Yang, 2012).

The weakness in grid infrastructure has long been one of the greatest constraints on the development of wind power in China. As mentioned in section 1.4.3., given their fixed margins, the grid companies have historically refused, resisted or delayed the connection of relatively expensive wind power (Renewable Energy World, 2005). The legislation requiring the grid companies to connect and purchasing all the electricity produced from renewable energy sources failed due to the absence of penalties for lack of compliance nor is there any compensation for generators when the grid fails to meet its obligations (Global Wind Energy Council & Greenpeace, 2010). Another factor severely limiting the production of wind power is that the wind resources are mostly located in the far north and west of China, far from the coastal demand centers.

Serious improvement in the grid first began in 2005 when grid investment increased 70% from 2004 (Borgford-Parnell, 2011). In 2008 investments in the grid exceeded that of investments into generation for the first time in China's history (Ni, 2009). This pace of intense investment into the grid will continue for several decades. From 2001 to 2030 it is estimated that the grid companies will spend two trillion USD (11.9 trillion NOK), an average of 60 billion USD (358 billion NOK) per year (Karplus, 2007). Besides general improvements, the investments have focused on two areas: west to east connection and smart grid technology. In order to address the former, the central government has required the construction of three major transmission corridors that will take electricity from the isolated western generation centers to the demand centers on the eastern coast of China. The transmission capacity of each corridor is planned to reach 20GW by 2020 (Pittman & Zhang, 2008). As for the development of a smart grid, emphasis has been placed on increasing the grids capability to take more power from renewable energy sources. The State Power Grid has already created a budget of almost 600 million USD (3.58 billion NOK) specifically for this purpose (Business Insights, 2010).

Although the two grid companies are both state-owned companies that are heavily regulated by the central government, in practice they behave as the Big 5 behaves; an unregulated businesses protecting their profits and monopolies. Not only do they behave as they wish, they often act in direct opposition to explicit laws and regulations on their sector. A common complaint by generators, especially of renewable energy, is that the grid companies refuse to connect project to the grid. Even when the central government successfully pushes the grid to abide by rules requiring them to connect all power projects to the grid, they then charge the power producers fees so high and unreasonable that they resemble extortion (Chandler, Gwin, & Shiping , 2011).

1.6. Pricing

One of the most basic features of China's electricity tariff regime is the inability to accurately describe it. Endless official reforms in combination with endless unofficial responses and manipulation of those reforms have created a tariff regime that even the top officials in the SERC struggle to describe or deal with (IEA & OECD, 2006). The private sector is equally ignorant of the pricing situation. As illustrated by Paul Peng, vice president at business and technology consultancy Capgemini's Shanghai office, "None of us are clear on what the costs are for electricity prices" (Holliday, 2010).

The most important feature of China's tariff regime is that it was never intended to provide an autonomous guiding function to the market. When it was created in the 1960s, its intent was to provide preferential treatment to heavy industry and agriculture (IEA & OECD, 2006). Prices were set centrally without any regard to the demand-supply relationship in the market. Instead, prices were a means to redistribute social resources and depress consumption. Profits on finished industrial products were set very high, thus provided the state with the funds it required for its ambitious investment programs (Yang H. , 2006). In most cases the lack of information is unintentional, but in the case of land-related information (plot value, environmental impact assessments, utility connections, etc.) China has intentionally made the information difficult to access (The World Bank Group, 2010).

Although tariff's function as tool to meet social and economic objectives has not changed, the objectives have. The primary motivation for tariff changes since the mid-1990s has always been to reduce inflation instead of the creation of a more efficient electricity market. As a result,

despite all of the tariff reforms the Big 5 lost over 3.8 billion Euro (29.3 billion NOK) in 2008 while the entire coal generation sector lost 8.4 billion Euros (63.7 billion NOK). These losses are largely due to the fact that almost all reforms have been short-term reactions to market fluctuations and have avoided the core issue that inputs for generators are market based while their selling price remains fixed (Ni, 2009). More generally, the lack of focus on market-based tariffs and artificially low tariffs for certain sectors has led to the inefficient use of energy in China's economy. In comparison to developed nations China requires much more energy to create one USD of GDP growth. In this regard China is 3.3 times less efficient than the United States, 4.8 times less than Japan, and 6 times less than Germany (Wang, Qiu, & Kuang, 2009).

The fixed prices have always been, and continue to be, based on end consumer categories. The number and scope of these categories has been in constant flux with a few general categories that have generally remained constant. These categories are: residential, general industry, public sector, heavy industry, commercial, and agricultural. Given the importance of social stability and keeping inflation low, prices to the residential category remain the most protected of all the categories. While in most developed countries the price of electricity to residential households is 1.5 times higher than that charged to large industrial consumers, in China they are 15% lower (Ni, 2009).

Despite the clear rules and guidelines given by the central government, local governments give a much higher priority to economic development and job creation. The end result is often low tariffs to inefficient, energy intensive and polluting heavy industry. In aggregate, all the official and unofficial changes made by local governments create a confusing mess of prices that no one at any level of government is able to accurately describe (IEA & OECD, 2006), (Ni, 2009).

The best official description of China's current tariff regime, drafted by the NDRC in 2008, is a two part system. The first part of the tariff is a capacity payments which are intended to cover all of the generators' fixed costs. The second part of the tariff is meant to cover variable costs and profits (Wang, Qiu, & Kuang, 2009), (Ni, 2009). Given the vague directives of the central government along with the unofficial actions of local government, it may be more accurate to describe China's tariff regime as being a non-regime created ad hoc by players at the local level down to individual generators. Adherence to central laws and guidelines often seems to occur

only when following them happens to achieve the goals of the local officials and market participants.

PART 2: THE NEEDLES - OPPORTUNITIES FOR FDI

2.1. The Previous Experience of Foreign Investment

China's very first power plant, established in Shanghai in 1882 with a generation capacity of 654 kW, was American built. By 1937 95% of China's 461 power plants were foreign owned, mostly by Japan with almost 60%, followed by the US with 35%. One of the most prominent examples was a British built, US owned coal-fired plant in Shanghai with a generation capacity of 16.1 MW. At that time it was the largest power plant in all of Asia. Control and operation of the power plant was seen as a symbol of the communists' victory over what they saw as oppressive imperialists. At that time there was no doubt that the Communist Party would never allow the foreign ownership of power plants ever again (Yeh & Lewis, 2004).

All private investment in the electricity sector was prohibited up to 1985. However, the situation changed drastically when the rapid economic development started by the 1978 Open Door Policy economic reforms led to a rapid increase in the demand for electricity. The central government found themselves unable to cope with this increasing demand. Some reports showed that factories were forced to shut down their production line four days out of every week due to electricity shortages (GETRC, 1999). As a result, policies were passed in 1985 removing the state monopoly of the electricity sector, opening it up for investment from local governments, private enterprises, and foreign companies. Investors were, in most cases, guaranteed a 15% return on investment. Most importantly, decision making authority for power plants under 50MW was given to local governments. Given the strong incentives to improve the local economy, local governments were very eager to approve new power plants. All of this this paved the way for the final negotiations of China's first foreign-invested power plant plants jointly developed between Hong Kong power companies and the neighboring local governments of Shenzhen and Guangdong (Woo, 2005).

This new and sudden openness to private investment was far from the socialist ideals that the central government claimed to represent. One way they kept some degree of their socialist ideals was to initially structure the foreign investment as a build-operate-transfer (BOT) model. In this

model the foreign enterprise would build and operate the power plant for a certain number of years during which they would sell the produced electricity at a contracted price. When the time was up, the ownership of the power plant would transfer to the central government (Cudahy, 2008).

2.1.1.The Boom Period for Foreign Investment (1994-1997)

Foreign investment in China's electricity sector peaked in 1997 reaching almost 6 billion USD (35.8 billion NOK). Until then, foreign investment had been strong, but not strong enough to counter the massive and chronic electricity shortages. The start of that boom was in 1992 after Deng Xiaoping's tour to China's Special Economic Zones. This was seen by foreign investors exactly what it was meant to show; that China is increasingly open for foreign investment. The end result of the tour was the signing of over 100 Memorandum of Understandings for private investment in the electricity sector (Wee & Wee, 2003). A powerful motivating factor for the central government was the establishment of a target to have 50% of all investment in power generation to come from FDI (IEA & OECD, 2006).

These powerful moves to encourage foreign investment came from the urgent need to reduce the chronic power shortages along with the insufficient capital China had at that time to deal with the situation themselves. In 1994 the Ministry of Electric Power reported that 25 billion USD (149 billion NOK) of FDI was required for power generation investments. The central government was unable to cover this investment gap due to its measures to control inflation in the late 80s and early 90s. In the 1980s inflation reached an annualized rate of 80% to which the government responded by tightening credit starting in 1988. With inflation still at 27% in 1993 and 1994 the central government continued to control and limit credit, especially on large construction projects. In this financial environment foreign funded BOT projects seemed to be the perfect solution. They provided the initial capital to build these power plants essential to support the rest of the economy while spreading the repayment over a long time to end consumers (Woo, 2005).

Another motivation to bring in FDI into the power sector was the desire for technology transfer. Although not nearly as powerful as the motivation to reduce power shortages and bring in capital, the need for increased efficiency was, and continues to be, greatly needed. The energy efficiency of fossil fuel fired power plants in China is still 9% below the world average (Graus et al., 2007). Moreover, the utilization hours for a domestic power plant was 5500 hours compared

to 7500 hours for a foreign invested power in China. This low efficiency was caused indirectly by China's early reforms allowing local governments to approve power plants under 50MW. In response the Ministry of Electricity in 1994 created targets to increase the thermal efficiency of power plants to 33% by 2000 and 35% by 2010 (Woo, 2005).

From the perspective of the foreign investors, the motivations were quite simple: the desire of high returns and the need to diversify from their primary markets. China's booming economy and the guaranteed rate of returns given by the local authorities in the form of PPAs made it an ideal investment. However, there were other less obvious motivations that even further encouraged foreign investment even when the foreign party suspected or knew it would fail. In some instances foreign companies agreed to build power plants merely to secure the construction phase, where most of the return on investment was achieved. After the plant is complete, this type of investor was not very interested in operating the plant. In other situations over enthusiastic senior management enthralled in the China Dream put undo pressure on their subordinates to close projects. Sometimes these middle managers knew that the project would fail but moved forward rather than go against senior management. Other managers, after spending years in project development, simply did not want to walk away from the sunk costs and time (and the potential damage to their reputation) even though they could see that the project was going to be a money losing venture. Lastly, some managers were simply focused on earning closing bonuses. In all of these cases, managers were confident that, by the time it was clear that the project was failing, it would be several years later and they would have advanced their career beyond their current position or company (Studwell, 2002).

The result of all of these strong motivations from all sides of the issue resulted in a boom of foreign investment into the electricity sector. Between 1995 and 1997 8.5 billion USD (50.7 billion NOK) in FDI helped to build 21 major power projects (IEA & OECD, 2006). By the end of 1998 a total of 24 plants with a total operating capacity of 4.9 GW were constructed with the assistance of FDI, and another 9 GW was under construction. By 2002, FDI accounted for 13% of total investment in the sector, double the amount in capital construction in all other sectors. Most importantly, by 1997 the chronic power shortages had been relieved (Xu and Chen, 2006).

Despite its overall success, foreign investment did not succeed in giving China the efficiency gains it originally wanted, nor did it introduce competition into the market. Although the FDI did bring in more efficient technology and construction techniques, these benefits were offset by two important factors. First were the overwhelming incentives to construct small power plants instead of larger more efficient plants. The second factor was a powerful unintended side effect of the price agreements. Almost each project had its own unique price agreement based on covering all costs and providing a reasonable rate of return for the investors. However, fixed-price such agreements provided no incentives for the operators to increase their efficiencies (IEA & OECD, 2006), (Pittman & Zhang, 2008). In terms of FDI's impact on competition, the total amount of capacity owned by foreign investors at the peak of investment was still dwarfed by the amount of generation capacity controlled by the government. Moreover, prior to the breakup of the State Power Corporation in 2002, transmission, distribution and almost all generation was controlled by one organization. Although formally there was supposed to be fair treatment to all generators, informally strong preferences where always given to the generators under the State Power Corporation (Woo, 2005).

2.1.2. The Bust Period for Foreign Investment (1998-2000)

The only thing faster than the boom of investment into China's electricity sector was its bust. From its peak in 1997 the market completely bottomed out in 2000 with not one single new projected reported (Wee & Wee, 2003), (Woodhouse, 2006). This steep drop-off occurred at the halfway point to the central government's 1994 goal to reach 25 billion USD (149 billion NOK) in foreign investment by 2000. Given the sudden and extreme bust, it is not surprising to learn that, in a 2001 World Bank survey comparing six emerging markets in Asia; China was first in terms of dissatisfaction for investors (Wee & Wee, 2003).

The reasons for the sudden bust are a remarkable set of independent internal and external factors that coincidentally all occurred at almost exactly the same time, creating a perfect storm of influence against foreign investment into China's electricity sector. In terms of internal factors it is first important to note that the central government never wanted to invite foreign investment (and therefore control) into any sector essential to the overall economy. Instead, in the face of severe power shortages and an inability to fund enough generation capacity, the central government chose what it saw at the time as the lesser of two evils. The first major internal

factor was a change in the supply-demand situation. In contrast to all predictions and forecasts, demand growth in the late 90s was much lower than expected. The supply-demand swing was so large that it not only reduced the shortages but actually created a power surplus situation (Wee & Wee, 2003). In such a total reversal of market dynamics, the large gap between the tariffs given to foreign investors in the PPAs and the tariff given to domestic generators for the first time became a serious problem. This resulted in the forced renegotiations of the PPAs and thus ruined the returns for the foreign investors, and scared away future investment (Wee & Wee, 2003).

The second major internal factor was a complete reversal of China's ability to fund the projects without the need for FDI. This was caused by a combination of different factors that greatly increased the liquidity in China's financial system. First was the creation of a rapidly growing trade surplus (75 billion USD/447 billion NOK for 1999-2001). Second was the fact that China has one of the highest savings rates in the world (in 1999 worth 645 billion USD/3.85 trillion NOK). In addition to China's increased financial liquidity, banks aggressively pursued investment opportunities with private companies. This was due to the pressure to reduce the proportion of non-performing loans, the vast majority of which were with the large state owned enterprises. In addition, financial reforms allowed domestic private and state-owned companies were able to access equity financing and international capital markets (Woo, 2005). Local governments also found themselves rich in capital due to land-use-right auctions to the booming real estate market (Nan & Moseley, 2011).

In terms of technology transfer, domestic equipment and technology improved substantially, vastly narrowing the gap between its foreign counterparts. Moreover, industry experts point out that higher efficiency was not necessarily required, especially at the increased cost imported equipment came with. In the few cases were such technology was required, local companies had the capital to purchase the equipment themselves, or to involve a foreign partner by providing them very limited ownership (Wee & Wee, 2003).

The circumstances described above had quickly and entirely erased the original key motivations for bringing foreign capital: supply shortages and lack of capital. However, a few more powerful external factors further enforced the downward spiral of foreign investment in China's electricity sector. The 1998 Asian Financial Crisis severely reduced the enthusiasm and aggressive

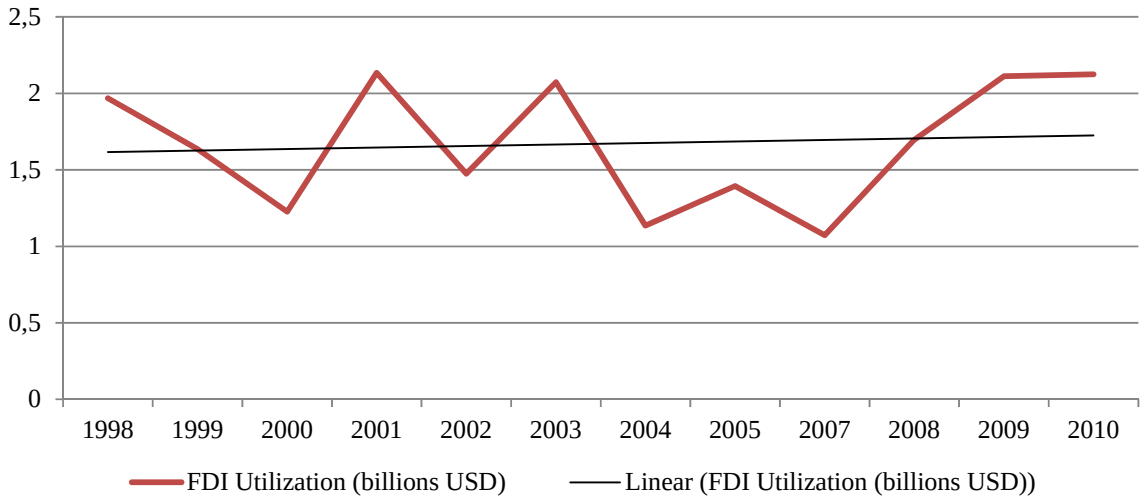
strategies of foreign companies (Wee & Wee, 2003). Second, just as Asia was recovering in 2000 to 2001 came the California Electricity Crisis and the collapse of Enron. The impact of these events are not to be underestimated, and may be one of the primary reasons why reform of the sector has been largely slow, delayed and unsuccessful since the 2002 breakup of the State Power Corporation. What happened in the US clearly reversed the top leadership's attitudes from successfully implementing massive restructuring and reform to one of deep caution and skepticism. Many officials believed that the only way to stop an extreme crisis like that in California was to maintain government control while continuing to endure chronic shortages of a manageable scale (Woo, 2005), (Ma & He, 2008).

Although circumstances outside of anyone's control or ability to predict caused the bust of foreign investment, the end result was that the central government got exactly what it wanted (Woodhouse, 2006). It never wanted foreign involvement in this critical sector but was forced to allow it due to lack of capital, severe and chronic supply shortages, and a relatively low level of technology. By 1998 all of these factors had completely reversed, eliminating the need for any foreign involvement in the electricity sector. In such conditions it is not surprising that China reverted back to its long standing views on foreign investment in sensitive sectors: keep it limited as much as possible and only use it in times of monumental and insurmountable crisis.

2.1.3. After the Bust (2000-Present)

The figures below using data from China's Statistical Yearbook provide rough estimates of this uneventful period for FDI. It appears that the bust represents the new normal; FDI is generally stable from 1998 to 2010. However, as will be noted in section 3.2.2. market data on China is famously unavailable, and what is available is highly inaccurate. For this data, it is important to note two key issues. One is that fact that the data also includes FDI into the gas and water sectors. Second is the intentional removal of the 2006 data which showed FDI of over 4 billion USD. This was most likely due to the Three Gorges Dam, which was completed in 2008 and had a cost over 29 billion USD (173 billion NOK) (BBC, 2012).

Figure 2.1: FDI in the Production and Supply of Electricity, Gas and Water



Source: China Statistical Yearbook

2.1.4. The Sector's General Future Outlook

China's central government's primary method to manage its economy has been by the development and implementation of a series of five year economic plans. China's 12th Fiscal Year Plan (FYP) covers the period from 2011 to 2015. In this plan the central government identifies seven strategic emerging industries as being absolutely essential to China's future economic development. Of these seven, four were in China's 11th FYP and three were new additions. Two of these three new focus industries have to do with energy: clean energy technology and alternative energy. The third new focus is on clean energy vehicles (US-China Economic and Security Review Commission, 2011).

More specifically, the 12th FYP focuses on the investment, R&D, and development of a smart grid and the addition of over 200,000 kilometers of power transmission lines of 330 kV or higher. It also calls for a 12 GW increase in hydropower capacity, 7 GW in large offshore wind power capacity, 4 GW of nuclear power capacity, 5 GW of solar capacity. In addition to these individual targets, the central government has also established a target of achieving 11.4% of all electricity consumption in 2015 to be from non-fossil fuels. This is meant to be a stepping-stone target to its 2020 target of 15%. If China achieved this goal, it would mean that they would have to generate between 320 and 480 GW of non-fossil fuel energy within the next 8 years, which is

about one-third of the world's equivalent projected total. Such an achievement would result in the creation of economies of scale for non-fossil fuel that could radically change the global energy markets (US-China Economic and Security Review Commission, 2011).

More generally, China plans to invest 11.1 trillion RMB (10.2 trillion NOK) in the power industry over the next 10 years, 2.75 trillion RMB (2.5 trillion NOK) of which will be invested in power plant construction. A further 2.55 trillion RMB (2.34 trillion NOK) of which will be invested in power grid construction (Fung & Chu, China's 12th Five-Year Plan: Energy, 2011). To put these numbers in perspective, Statistics Norway reports that Norway's total GDP in 2011 was just under 3 trillion RMB (2.71 trillion NOK).

In terms of FDI, one issue seems to indirectly show a gloomy picture for the future of FDI in China's electricity sector. China has been quite aggressive in the past few years to secure energy resources in other nations. The 12th FYP further encourages and expands upon this trend (Fung & Chu, China's 12th Five-Year Plan: Energy, 2011). In addition, China plans to invest 100 million USD (597 billion NOK) into building solar power plants in Africa (US-China Economic and Security Review Commission, 2011). These plans and actions seem to show that not only does China no longer require nor welcome FDI into China, it has itself become a serious contributor of FDI. Perhaps the international investment environment needs to change its view of China from an investment opportunity to that of its strongest global competitor. At the very least, it seems that China's ability to expand abroad demonstrates that China no longer requires FDI for the growth of its electricity sector. More specifically, a report in Business Week explicitly states that there is little hope for FDI in the electricity sector for the long term. Foreign companies have almost no advantages against local companies, while at the same time the informal and formal legal system and regulatory environment heavily favor local firms. The only place where foreign firms still hold an advantage is in nuclear and wind power where they hold a significant technological advantage (Bloomberg Businessweek, 2008).

2.2. Obstacles for FDI

As has been noted in earlier sections, FDI is limited to generation in China. This is due to the total lack of a market for retail, and the explicit exclusion of FDI from transmission and distribution. That leaves only the generation sector as the possible target for FDI with 45% of it privatized. However, given the many obstacles for foreign companies, many experts and reports

come to the same conclusion: the likelihood of new entrants into the Chinese electricity sector is unlikely (Holliday, 2010), (Woo, 2005), (Datamonitor, 2011).

The reasons for this are many, and any chance of identifying and capturing any of the potential opportunities in the market necessitates a clear and detailed knowledge of the many obstacles. This paper's focus on the obstacles reflects the focus of the available research; most information on FDI in this sector offers little in the way of opportunities while providing endless insights into the challenges. Given size and importance of the market obstacles, success in the Chinese electricity sector seems to be more about avoiding the many obstacles more than it is seizing the opportunities. These obstacles can be grouped in two distinct types: explicit/intentional barriers created by the central government and implicit/unintentional barriers of many different types.

2.2.1. Explicit Obstacles to FDI

While explicit obstacles are far fewer in number, they have the most powerful limiting effect. The strongest and most direct obstacle to FDI is the central government's regulations explicitly limiting the scope of FDI in the sector. A 2010 World Bank report confirmed this feature of market when it found that China has some of the highest restrictions on FDI in the world (Qinglian, 2010).

The rules for FDI are given in the Catalogue of Industries for Guiding Foreign Investment, first created in 2002 and amended in 2007 and 2011. In this official regulatory framework, all FDI into transmission and distribution are explicitly forbidden. It also limits FDI in thermal power plants to those of 600MW or above only (Information Office of the State Council of the PRC, 2007). The most recent update of the catalogue in 2011 did not have any significant changes from the 2007 update in terms of FDI in the energy sector (Dezan, Shira & Associates, 2011).

The second most powerful obstacle to FDI is the regulations associated with the repatriation of profits from China. It is extremely important to note that FDI in the electricity sector is fundamentally different than the vast majority of FDI focused on manufacturing. This is due to the fact that FDI in the electricity sector is focused on domestic customers and thus payments are made in domestic currency. Profits must then be repatriated in a way that is fundamentally different from the way it is done for FDI focused on manufacturing and selling their products in international markets. The latter results in the inflow of currency, profits, and jobs into China

while the former can have the opposite effect. The central government generally discourages anything that causes the outflow of currency, profits and jobs from its economy. As a result, it creates strict regulations that make it very difficult to repatriate profits. Although the primary target for this policy is on FDI into China's real estate bubble, FDI into the electricity sector has been collateral damage (Chandler, Gwin, & Shiping , 2011).

Lastly, the laws in China are structured heavily in the favor of local companies. Foreign companies are almost always forced to enter join ventures in order to enter the China market. Chinese law governing joint ventures states that the Chairman and Vice Chairman of the Board of Directors must be split between the foreign and local partner, regardless of how small the share the local partner owns of the joint venture. Another regulation then dictates that all major decisions must be made by consensus, effectively giving the local partner veto power over the foreign partner even in cases where the local partner owns 1% or less of the company (Wee & Wee, 2003).

2.2.2. Implicit Obstacles to FDI

The implicit obstacles include all of those challenges which are not directly and openly intended by the central government to be obstacles for FDI in the electricity sector. Some of these obstacles, such as a legal bias against foreign companies, seem to be intentional even though the central government would never openly admit to it. On the other hand, other implicit obstacles are those the central government is not consciously aware of, such as cultural factors, or are unintentional consequences of other policies, such as the lack of legal transparency.

The Legal System

Many of the implicit obstacles for FDI are related to various factors with the Chinese legal system. One of the largest root causes of many of these issues has to do with the way in which the central government issues laws and governs society. The only thing more remarkable than China's lack of rule of law is the amount of FDI that has and continues to be poured into its economy (Wang, Xu, & Zhu, 2011). In 1978 China lacked the most basic foundations of a legal system, including anything in the form of contract, company, intellectual property, securities, or banking laws. Given this late start, many foreign firms believed that, even though the legal system was totally insufficient for their investments when they first entered the market, that the situation would improve over time. In many respects they were sorely mistaken (Woo, 2005).

Unlike most other nations, the central government in China governs by issuing intentionally vague laws and guidelines. It is then up to those in charge of implementation to interpret the laws and guidelines. For a typical example, Article 11 of the 1997 Law on Energy Conserving states the following:

> The State Council and the people's governments of provinces, autonomous regions, and municipalities directly under the Central Government shall allocate funds for energy conservation in funds for capital construction and technical upgrading to support rational utilization of energy and exploitation of new and renewable energy resources.
> People's governments at the municipal and county levels shall allocate funds for energy conservation according to their actual conditions in order to support rational utilization of energy and exploitation of new and renewable energy resources.

Such language does not require governments to follow this law, nor does it specify the amount of funds they should spend. This is typical of how the central government operates in most areas and topics (Yu, 2010).

Even in the few cases where the central government is explicitly supposed to provide detailed regulations, they often fail to do so. The 1996 Law on Electric Power is a perfect example of this. The law specifically states that the State Council must create eight relevant regulations to allow for its implementation. However, more than ten years later only half of the regulations had been issued, resulting in the original law's inability to be effective. This is common for many of China's energy related laws (Yu, 2010), (Energy and Security Group, 2008).

The exceptions to this trend of vague laws can sometimes make the situation even worse for FDI for three different reasons. First is due to the fact that when specific laws are formed, it is under the heavily influence of the large domestic market players. The end result is most often laws that serve their short-term commercial interests and not the long-term national interests. Another issue with the few clear laws that exist is that they are often long out of date and fail to address critical issues (IEA & OECD, 2006). Lastly, even if the law is formed without the undue influence of domestic market players and is up to date, it cannot be assumed that the laws will remain stable over time. It is not unusual for the central government to reverse laws when the political or economic situation changes. This can result in situations where the very laws that foreign companies relied on as the basis for investing are removed or reversed (Zhao, Zuo, Zillante, & Wang, 2010).

The most powerful example of this was an integral part of the 2000 bust of the market for FDI. For example, there is an inherent conflict between the PPAs and the reforms that increase market competition. PPAs were given to foreign companies by the government bodies with which they were signed in order to guarantee the foreign company a purchase price and amount of power. When the market suddenly saw itself in a supply surplus situation the high price of the electricity from the PPAs became a big problem for the local governments who have signed them. Many times the local governments just ignored the PPAs. The SERC's only action to resolve this issue has been to ask all parties to use their "best endeavors" to find a solution without providing any guidelines or details as to how this should be done (Wang, Qiu, & Kuang, 2009). This situation, which showed foreign investors that contracts hold almost no business or legal value, led to the bust of the market for FDI in the electricity sector. Given that this situation has not changed, it also explains why the market never recovered after the bust. This is due to a unique feature of the Chinese legal system where the concept of "fairness" of the current situation takes precedence over any contract or commercial agreement (Woo, 2005).

Yet another legal obstacle for FDI is due to the overlapping responsibilities and authority of the many government institutions and bodies with regulatory power and responsibility that impact the electricity sector. As a result, foreign companies often find it difficult to get clear and consistent answers to their inquiries (Energy and Security Group, 2008). In this environment, even when there is a clear law and the incentive to enforce it, the legal system is inadequate to effectively deal with the issue (IEA & OECD, 2006). Almost every industry insider interviewed in one report confirmed that the legal system is almost totally ineffective and legal agreements are almost totally useless when problems arise (Wee & Wee, 2003).

Many foreign companies and investors report that there is a strong unofficial bias towards the domestic party in any dispute. As a result, it is rare for a foreign party to win any case against their local counterpart. This is due to the close working relationship between those responsible for legal enforcement and the local government and local companies. This specific opinion of the Chinese legal system is widely held by foreign companies operating in China (Woo, 2005), (Pittman & Zhang, 2008), (Wee & Wee, 2003). Taking the case out of the Chinese courts to international or foreign courts is also not an option due to the fact that China does not enforce foreign judgments (Energy and Security Group, 2008).

Some special attention within the legal realm needs to be given to intellectual property rights (IPR) in China. The lack of respect and enforcement of IPR in China is well known. There is no lack of stories in the mainstream media on the subject. However, the most frequent IPR issue for foreign companies in China is called "trademark squatting". This occurs when local entities trademark foreign companies' trademarks and then use the trademark to block the foreign company from selling their products in the China market (Energy and Security Group, 2008). In the electricity sector, trademarks are far less important than technology. In the past, much of the IPR related to technology was obtained by local entities through joint ventures with foreign companies. Many lawsuits show that this transfer of information was done illegally. Since then the central government has changed commercial regulations so that foreign companies are now forced to "voluntarily" provide their technological IPR in exchange for market access. Foreign companies now often only have two choices, give up their IPR or give up on entering the China market (Qinglian, 2010). In conversations with the CEO of Statkraft and the staff of Innovation Norway in Beijing, this is the primary unofficial reason why Statkraft and SN Power have no intention to enter the China hydropower market despite its huge potential and the frequent invitations from the central government.

Lack of Information

A recent article in the Wall Street Journal makes a concise and accurate description of the reliability of data coming out of China: "China's economic data are a bit like sausages: If you're a fan, it's best not to scrutinize how they're made" (Peaple, 2009). The almost total lack of accurate and reliable data is very well known and documented. The situation is so bad that many analysts find it almost impossible to believe the amount of FDI that continues to pour into China despite this basic feature of the market. The reasons behind the chronic lack of quality information seem to be due to national security concerns and local protectionism (Woo, 2005). More specifically, there are very few stakeholders in the entire electricity sector that have access to information on pricing or an understanding of the complex fee structures (IEA & OECD, 2006).

Poor Business Environment

There are three main obstacles within the business environment regarding FDI into the electricity sector. First is the slow process of approvals for both setting up the legal entity of a foreign company in China and for the approval of projects. It takes over 18 different official procedures

to establish a foreign company in China, 5 of which are not necessary for domestic companies. This process often takes over three months, making it much slower than the Asia and global average. Project approval is far more difficult as it involves many different government agencies at many different levels. Unlike setting up a company, the process for project approval is not transparent, but similar in that the process is significantly more difficult for foreign companies (Pittman & Zhang, 2008).

The second obstacle related with the business environment has to do with many ways in which it is officially and unofficially designed to work against foreign companies. Most importantly, the trend seem to be getting worse. For the first time, the CEOs of major international companies such as BASF, GE, Siemens have been making public complaints about how foreign firms are being increasingly unfairly treated in China (Qinglian, 2010), (The Wall Street Journal, 2010), (Chu, 2011). Many of the complaints have to do with the lack of IPR protection, the favoring of domestic companies in state bids, the change of laws dealing with mergers and acquisitions that heavily favor the domestic partners (Qinglian, 2010).

Lastly, even if there was a level legal and regulatory playing field for competition with the domestic generators, foreign companies are at a severe disadvantage. The Chinese companies involved with generation, including the Big 5, are massive in scale and well established in the market. Moreover, in addition to competition from these large players, many more domestic players are entering what little market share is left outside the Big 5. Several of these new players are directly related to local governments (Woo, 2005). In addition to this disadvantage, foreign companies face another competition challenge in the bidding process. In the case of price bidding for projects, it is almost always the case that the lowest bidder wins the project. Domestic companies frequently are able to bid much lower than foreign companies given their frequent use of lower technology and lower quality equipment. Even when domestic firms do not have a cost advantage, it is not the case it is also common that the domestic companies' bids are unprofitable (Li J. , 2010).

Cultural Factors

An export guide by the US Department of Commerce on the clean energy market in China emphasizes the importance of cultural factors for the success of FDI in China "Intercultural sensitivity is critical, and should be considered a core focus for any company working in China.

Between the two countries the ideas of law, profit, decision-making, market orientation, business relationships, and technical standards are quite different. Low awareness of how to navigate these differences will cause misunderstandings and miscommunication and can cause conflicts of interest as time goes on" (Energy and Security Group, 2008).

There are two specific areas of Chinese culture that seem to cause the most problems for westerners in doing business in China: "guanxi" and business ethics. Properly addressing these two broad and complex issues is beyond the scope of this paper. More relevant and useful is a brief description of the specific ways in which these cultural norms impact the ability for westerners to conduct business in China.

Literally translated, "guanxi" means personal connections or relationships based on cultural norms of reciprocity, exchange of social favor (Chen & Zhang, 2008). Once formed, these are often life-long bonds that persist long after the context in which the people met has dissolved (Littrell, 2002). Being network based instead of individual based, guanxi does not have to be direct in order to be a powerful force. For example, if a person is from a direct friend's network, then that person is treated with the same level of attention and effort to the same extent as if they were the direct friend (Hui & Graen, 1997).

For business, guanxi is essential for success and survival, especially with government officials who can provide opportunities or protection. Research has shown that guanxi is widely considered to be necessary for sustained success in China's business environment (Chen & Tjosvold, 2006). In terms of management, given it's extreme importance in Chinese culture and society, cultivating good guanxi is always a higher priority over job performance (Wang & Fulop, 2007).

The key impact of guanxi on doing business in China is in how it makes contracts far less relevant than they are in the west. In Chinese culture contracts do not have the binding power that they are assumed to have in Western culture. On the contrary, the equivalent of contracts in Chinese culture are that of informal memorandums in Western cultures. As a result, in China contracts are only used as rough guides pertaining to the duties and responsibilities of each party. Given the importance of guanxi, in the case of disagreements or disputes, each side is expected to meet face-to-face and work out a solution instead of referring to the contract to find solutions

(Littrell, 2002). The most important effect of the low importance Chinese culture places toward contracts is that they do not see the signing of a contract as the end of negotiations. Instead they see negotiations as on on-going process that does not end. In the absence of a legal document to serve as the foundation for the business exchange, personal relationships serve as the key element by which all issues are measured (Pye, 1982). As a result, foreign firms must adapt to using people-orientated approaches in order to develop trusting relationships that will then replace the contract as the foundation for the business exchange (Ghauri & Fang, 2001).

"Business ethics" is a misleading term given that implies universality. "Western business ethics" would be a much more accurate term, given that business ethics rely heavily upon Western philosophical principals as its theoretical foundation (Whitcomb, Erdener, & Li, 1998). In order to effectively present this issue in a way that can be understood by westerners, it is essential to carefully choose which terms are used. For example, it would be far more useful to use the term "enticements" rather than the term "bribery". This is due to the fact that the term "bribery" in Western culture explicitly entails unethical behavior. For example, the only difference between the terms "incentive" and "bribery" seem to be that the former is ethical and the latter is not. This judgment is one that can only exist in a subjective worldview and a specific set of values that the individual almost always views as objective (Steidlmeier, 1999).
Westerners all accept cross-cultural management as a legitimate and necessary discipline in that managers from one culture must adapt to different cultures. While westerners can adapt our ways of managing and interacting, they seem to have far more difficulty in adapting their ethics. While westerners tend to view other parts of their culture as relative, they seem to view their ethics as absolute and thus have a great deal of difficulty to adapt to a different code of ethics. Although there are core values that almost all cultures hold in common, there are some differences. In studies comparing the business ethics of several different cultures, many similarities can be found. However, there are two key areas with significant differences: bribery and employee relations (Whitcomb, Erdener, & Li, 1998).

In one comparative survey of business ethics, only two respondents (1%) claimed that bribing a middleman $500,000 was unethical. Instead, the vast majority (59%) stated that it "is not unethical, just the price paid to do business" (Whitcomb, Erdener & Li, 1998). In three other types of ethical cases where bribery was not the key ethical issue, the decision of Chinese and

Americans were very similar. However, each group used different processes of reasoning to defend their decisions (Tian, 2008).

2.3. Opportunities for FDI

Despite the many challenges in the market there remain several opportunities, but they perhaps are not where and to the scale that most people would expect. In review, there are no direct opportunities in trading, transmission or distribution. In terms of generation, it is possible to enter the market, but given the formal and informal obstacles for FDI in generation, it is not recommended for the many reasons already outlined in this paper. In general, it is not recommended to pursue the ownership or partial ownership any of the direct inputs into the electricity market. This is due to two basic facts: 1) the legal system and business environment is weighted heavily against foreign companies and 2) foreign companies will always be at a price disadvantage to domestic competitors.

There are two basic different types of opportunities in China's electricity sector. The first type pertains to the opportunities explicitly promoted by China's central government. The second type is the actual opportunities identified by foreign experts.

2.3.1. Opportunities Promoted by the Central Government

The official opportunities for FDI in China's electricity sector are generally promulgated in a three different ways. The first and most direct method is by the NDRC and the State Administration of Commerce's Foreign Investment Guidance Catalogue. This document explicitly states where FDI is forbidden, where it is discouraged, and where it is encouraged. The 2011 update of the catalogue incorporate the same areas of emphasis as were described in the 11th and 12th FYP in section 2.4. (US-China Economic and Security Review Commission, 2011). These areas include energy-saving technology and new energy (Dezan, Shira & Associates, 2011). It is important to note that even where FDI is explicitly forbidden, such as in transmission and distribution, there are still opportunities to participate in the supply of equipment and services (Fung & Chu, China's 12th Five-Year Plan: Energy, 2011).

The NDRC and State Administration of Commerce are not the only government body who issues guidelines for FDI. The second most important document is the Ministry of Commerce's

(MOFCOM) Catalogue of the Guidance of Foreign Investment Industries where FDI is encouraged in the following areas:

> i. Construction and operation of electricity power through the 'clean fuel' processes of: integrated gasification combined circulation technology; circulating fluidized bed technology; and pressurized fluidized bed technology.
> ii. Construction and operation of combined and heat power plants.
> iii. Construction and operation of hydropower plants.
> iv. Construction and operation of nuclear power plants (so long as the Chinese partner holds the majority of shares).
> v. Construction and operation of 'new energy' power plants (solar energy, wind energy, geothermal energy, tidal energy and biomass energy, etc.) (Nan & Moseley, 2011).

The third way the central government explicitly encourages FDI is through the official statements of its leaders. In general, these statements tend to be part of economic cooperation meetings with foreign governments. For the most part these statements tend to general in nature, and reinforce the messages given by the FYP and the official catalogues focused on FDI (Ministry of Foriegn Affairs of the People's Republic of China, 2012). One very recent relevant example provides a typical example of such statements where Premier Wen Jiabao stated that the central government would: "encourage more foreign investment in advanced manufacturing, new and high technologies, energy conservation, environmental protection, new service industries, and the central and western regions…Targets for conserving energy, reducing emissions, and controlling prices are not being met" (Flanders-China Chamber of Commerce, 2012).

2.3.2. Opportunities Identified by Foreign Market Experts

In general the opportunities for FDI can best be described by an old joke about consulting: "If you can't beat them, make your money consulting to them". Although the vast majority of the market opportunities will be dominated by domestic companies, the massive growth of the market and the need for technology necessitates that the domestic companies will require a large amount of advice and equipment. A large opportunity for foreign companies therefore exists in consulting services, and procurement opportunities (Fung & Chu, China's 12th Five-Year Plan: Energy, 2011), (Energy and Security Group, 2008). Already a large amount of business activities are outsourced by the large domestic players. These opportunities mostly reside in construction, civil engineering, and administrative functions (Datamonitor, 2011).

More specifically, a concentration of opportunities seems to exist in the area of nuclear power. This is due to the fact out of all the different forms of generation, nuclear power is the most difficult in terms of technology. However, it is important to note that once China acquires sufficient technological experience in a sector, the participation of foreign companies is then squeezed out of the sector. This has happened most dramatically in the solar sector, and is currently happening in wind power. Given the extremely high technology in nuclear power, the opportunities should remain available in the state sector for at least another decade (Fung & Chu, China's 12th Five-Year Plan: Energy, 2011), (Fung, China's Energy Sector: A clearer view, 2009).

By far the most opportunities for foreign companies exist in the area of clean technology. China's current use of clean tech is far behind what is available worldwide. Moreover, the aggressive environmental targets set by the central government does not allow for enough time for the technologies to be domestically developed. This large gap between the current supply of clean technologies and the demand created by government policy is the greatest source of opportunities for foreign companies. According to the China Research Institute, the investment potential in energy efficiency between 2007 and 2010 was 120 to 160 billion USD (715 to 955 billion NOK) (Energy and Security Group, 2008).

A US Department of Commerce export guide on clean energy opportunities in China offers a detailed list of the key areas of opportunities for foreign products and services. In terms of products in the wind energy sector, opportunities exist for dedicated operation and maintenance service companies, remote monitoring systems and control systems, wind turbine design and testing, technologies for large scale turbines (over 2 MW), software for wind resource assessment, grid integration, and wind power prediction. In the solar thermal sector the opportunities are related to aesthetic building integration, high-quality installations, and after sales service. As for solar PV the areas for foreign companies to focus are improved technology in thin-film solar panels, technology to increase the quality and decrease costs of solar PV products, technology related to conversion efficiency, interface technology for building-integrated PV (BIPV), high quality crystalline silicon technology, optimization technology and software, and ultra-thin bands for soft BIPV (Energy and Security Group, 2008).

In terms of services, there is a large area of opportunity in green consulting. There is currently a severe lack of experience regarding energy efficiency and technology, energy auditing and energy management. This lack of experience is most notable in the large state owned enterprises (Energy and Security Group, 2008).

Once an opportunity is identified, there are a few important mitigating factors that have a powerful effect on the success of foreign companies. First and foremost is the global reputation of the company. Large and famous companies are treated quite differently than most foreign companies. One reason is that large companies offer the potential opportunity to be able to "trade" access with local companies into their home foreign markets. Another reason may be that it is important for large companies to enjoy some degree of success in China in order to serve as very public and positive examples that encourage further FDI. If large companies faced losses in China, the news would be well known in their home markets. This could "wake up" potential investors from the China Dream and result in lower FDI. In terms of the electricity sector, many experts point to Electricite de France as a good example of the benefits that come from being a famous international company (Wee & Wee, 2003).

The other most critical factor is the development of "guanxi" with the local government. As discussed in section 3.2.4. relationships are far more powerful than contracts in China. In the case of difficulties, strong relationships can prevent or solve most contractual issues. In a study of several foreign power producers that were operating before and during the bust starting in 1998, it was found that the few projects who managed to successfully renegotiate viable terms with the local governments were those with strong informal relationships (Wee & Wee, 2003).

CONCLUSION

At this point is may seem that there are almost no opportunities in China's electricity sector for foreigners. However, if any reader has such a perception, it likely has much more to do with the effect of the "China Dream". For reasons beyond the scope of this paper westerners have developed a one-sided view of China as a land of endless opportunity. As someone who has lived and worked in Beijing for more than nine years, it was a common topic of discussion for any experienced expatriate living in Mainland China. The most prevalent an obvious symptom of

the China Dream is when all of the excitement and optimistic views of the China market are not based on any specific facts, but rather just one general fact: that China has a huge population.

Almost anyone and everyone living and doing business in China for more than a few years would absolutely not be surprised nor dissuaded by the points made so far in this paper. It is only the inexperienced westerners how are infected with what I like to call the "El Dorado Syndrome". Just as we look back with amazement that Europeans could ever believe the stories of a city made of gold, so do experienced expatriates view the current excitement over the China market. Just as the legend persisted for two hundred years despite all evidence to the contrary, so does the legend of the China market persist in our societies today. Also, just like the legend of the lost city of El Dorado, there is actually some gold to be found, but it is dangerous and difficult to find. As with the China market westerners should not continue to expect that all they need to do is show up in the China market with no more preparation other than having shovels and bags to fill with the riches laying around everywhere.

As an additional illustration, I invite the reader to self-administrate a brief thought experiment that may further illustrate the effect of the China Dream. Imagine a report absolutely identical to this one with only one change: instead of China imagine it is about Russia or Brazil, or Algeria. Then ask yourself a simple question: are you then still surprised by the amount of challenges foreign companies face? For most people, the many daunting challenges would be of no surprise for any of the three nations mentioned. Anyone surprised by China, but not by the other three nations is most likely "infected" with the El Dorado Syndrome.

Given the prevalence of the El Dorado Syndrome this paper has first focused on the most important challenges and obstacles before discussing the opportunities. This is due to the fact that a realistic and educated view of the China market is the most basic requirement in order for westerners to have the potential for success in this difficult complex market. A person expecting challenges will be prepared for challenges, and while the reverse is also true. The China market is difficult, but not impossible. This report is not meant to scare away foreign investment, but rather prepare it for the difficult road ahead just as intense military training is designed to prepare a soldier for battle.

Like a winding mountain path, the market opportunities are found in the small niche spaces between the looming obstacles. And it is here that we can accept the basic premise of the El Dorado Syndrome: China is a huge market. After reviewing this paper readers should now be "cured" of the El Dorado Syndrome and now have a realistic balanced view of the reality: that it is a huge market with huge challenges.

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