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CHINA'S BOOMING ENERGY EFFICIENCY INDUSTRY

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PHOTO CREDIT: SHENWU

SUMMARY

China's energy efficiency industry[1] is emerging as a high growth sector with the country projected to spend as much as Rmb2.1 trillion (USD300 billion)[2] over the next five years on products and services that cut energy use.[3] The key drivers of this development are the Chinese government's determination to curb the country's expanding energy appetite as well as higher production and energy costs. Firms that develop cost-effective energy-saving technologies, particularly for the most energy-intensive industries, are poised to capture the opportunities. If successful, these enterprises will not only become profitable, but will also help lead China to a more sustainable energy future.

FINANCIAL SUCCESS

In the past few years, Chinese energy efficiency companies have been riding a wave of impressive growth. Zhuhai Huisheng Energy Technology Development Company – a manufacturer of integrated energy conservation systems for commercial properties - reported that its 2007 gross revenues topped Rmb35 million (USD5 million), a growth of over 300 percent from 2006. Xi'an Ruichi Metallurgical Equipment Company – a producer of regenerative power for smelting furnace systems – reported that its 2007 gross revenues reached Rmb30 million (USD4 million), an increase of 36 percent since 2006. Meanwhile, Beijing Sinen En-Tech Company – whose specialized industrial wastewater treatment technologies reduce energy and water consumption – reported that its 2007 gross revenues achieved Rmb100 million (USD14 million), growing 400 percent from 2006.

The biggest success however, is Beijing Shenwu Thermal Energy Company. As recently as 2004, the firm – which produces advanced energy-saving industrial combustion and heating furnaces – had annual gross revenues of less than Rmb40 million (USD6 million). In 2007, Shenwu's gross revenues surpassed Rmb2 billion (USD286 million), with the company controlling 70 percent of the Chinese steel industry's regenerative heating sector.

STEP FORWARD

More important than just booming revenues, China's energy usage as a whole appears to have become more efficient. For the first half of 2007, the Ministry of Environmental Protection announced that China's energy intensity per unit of GDP fell by 2.78 percent – almost double the rate of decrease for the entire 2006 (see Box 1: China's Challenge).[4] Such improvements were especially true in some of China's most energy-intensive sectors. For example, the China National Coal Association reported that the coal industry's energy consumption[5] in 2007 dropped by 10.89 percent compared to 2006[6] while its coal production for the first eight months of 2007 increased by 11.23 percent compared to the same period in 2006.[7]

CURRENT DRIVERS

The recent energy efficiency advances are due to a combination of more aggressive government policies, higher energy and production costs as well as an increasingly competitive environment for Chinese energy-intensive firms. As a result, many firms are facing tightening profit margins and must find ways to cut costs. One desirable option - generate savings from decreased energy consumption. It is this need that is driving the current demand for energy efficiency technologies and services.

Aggressive Government Policies

The 11th Five-Year Plan (FYP) energy efficiency target calls for China's energy intensity per unit of GDP to be reduced by 20 percent from 2005 to 2010.[8] To meet this target, the Chinese government has begun implementing a series of strict measures to encourage energy savings. In his speech to the October 2007 Seventeenth Communist Party Congress, President Hu Jintao pledged that the government would aggressively foster the adoption of energy efficient technologies.[9] The pledge followed the April 2007 establishment of a high-level State Council working group headed by Premier Wen Jiabao that is dedicated to ensuring the five-year plan's energy reduction targets are met. The group in June 2007 announced that the government will focus its efforts on cutting the energy consumption of energy-intensive industries, including steel, nonferrous metals, construction materials, and chemical processing.[10] Such high level focus has unleashed a series of central government initiatives ranging from the rating of government officials on the energy efficiency performance of their jurisdictions, elimination of tax incentives for energy-intensive enterprises, and new central government-backed investment funds (see Box 2: Central Government Energy Efficiency Initiatives).

In addition, local governments have launched their own initiatives, including more stringent regulations and new subsidies. For example, the governments of Shandong, Shanxi and Jiangsu provinces in 2007 have each respectively provided more than Rmb2.1 billion (USD300 million), Rmb1.5 billion (USD215 million) and Rmb500 million (USD72 million) in subsidies and grants to energy efficiency-related projects.[11]

BOX 1. CHINA'S CHALLENGE

Although China has significantly improved its overall energy efficiency in the last twenty years, it has struggled to keep up with the trend in recent years. China was unable to reach the 2006 energy objectives, reducing its energy intensity per unit of GDP by only 1.23 percent, well short of the necessary target of 4 percent under the 11th Five-Year Plan. The setback was the result of explosive growth in the Chinese heavy industrial sector, which overwhelmed energy productivity gains.[1] There was also a lack of institutional capacity, such as no clear designation of a specific enforcement body, government agencies being focused on energy production rather than conservation, and a lack of research institutions.[2]

Notes

1. Lawrence Berkeley National Laboratory, China Energy Group, Lin, Zhou et al, "Achieving China's Target for Energy Intensity Reduction in 2010: An exploration of recent trends and possible future scenarios," December 2006.
2. Wang Wingyuan, "Presentation: Efforts in Moving Towards a Low Carbon Future: China's Energy Conservation and Renewable Energy Laws," February 13, 2008.

Rising Energy Costs

Equally important as the new government policies are higher energy costs, a key factor that encourages energy-intensive industries to cut back their energy use in an attempt to reduce expenditures. From January to August of 2007, the price of Chinese thermal coal – coal used to produce electricity – jumped by 10 percent to Rmb426.5 (USD61) per ton with its 2008 contracted price already surpassing Rmb492 (USD70) per ton.[12]

BOX 2. CENTRAL GOVERNMENT ENERGY EFFICIENCY INITIATIVES

- *"Top 1,000 Enterprise Energy Savings Program":* Launched by the National Development and Reform Commission (NDRC) in 2006, the scheme commits China's 1,000 largest state-owned enterprises, which together consume one-third of the country's energy, to specific reductions in energy consumption.
- *Energy efficiency performance evaluation:* Beginning in 2008, the political and administrative abilities of local government leaders will be evaluated on the energy efficiency performance of their jurisdictions.
- *Elimination of financial incentives for energy-intensive industries:* The Ministry of Commerce abolished in 2007 export tax rebates for 553 highly polluting and resource consumption products, such as steel, cement and electroplated aluminum. State-owned banks are also being discouraged from providing loans to such businesses.
- *Closure of highly polluting enterprises:* The Ministry of Environmental Protection in 2007 shut down the equivalent of 1 megawatt of small coal-fired power plants, 18.43 million tons of steel and iron processing facilities, 30 million tons of cement producing facilities, and 1.7 million paper manufacturing factories.
- *Financial support for energy efficiency:* The Ministry of Finance in 2007 provided Rmb23.5 billion (USD3 billion) in grants and subsidies, of which Rmb7 billion (USD1 billion) are to support 10 national energy efficiency projects.
- *Stronger regulatory infrastructure:* The National People's Congress is amending the "Energy Conservation Law" while the State Council plans to issue a revised "Medium and Long-term plan for Energy Conservation."

Source: Xinhua, "Energy efficiency and reduction pollution: A multidimensional policy approach for macro-economic controls," December 5, 2007.

While the Chinese government continues to keep electricity prices below costs, it has steadily increased power tariffs.[13] In 2006, the average on-grid power selling price topped Rmb0.46 (USD0.066) per kilowatt hour (kWh), an increase of over 6 percent compared to 2005.[14] For 2007, the government has not raised the electricity fees due to inflationary concerns. Any slight increase in power prices will have a significant impact on the single-digit profit margins of energy-intensive Chinese firms, which are in constant and fierce competition to produce less expensive products. For instance, the Chinese aluminum electroplating industry, where electricity accounts for up to 40 percent of its total manufacturing expenses, reports that a mere Rmb0.05 (USD0.007) per kWh increase in electricity prices will raise production costs by an additional one percent or Rmb800 (USD114) per ton.[15]

Higher Production Costs

Not only are power prices going up, but other costs are also rising for Chinese firms. For example, the November 2007 Producer Price Index reported that production costs for the smelting and pressing of ferrous metals grew by 11.7 percent from the same month in 2006 while the purchasing price for raw ferrous metals increased by 9.7 percent (see Table 1: Producer Price Index).[16] This production price inflation was driven in part by an outpour of investment in the Chinese metal industry, which created excess demand for raw materials. From January to November of 2007, fixed asset investment in the ferrous metal mining, smelting and pressing industry jumped by 15.2 percent.[17]

Tougher Competitive Landscape

What makes this situation particularly tough for the energy-intensive industries is that they have not been able to push off the higher overheads onto consumers because of over supply caused by excessive production growth and new government export controls. For example, the Chinese steel industry's profit margins from March to September of 2007 dropped by 2.8 percent[18] while its 2007 crude steel output is estimated to have exceeded its domestic consumption by over 10 percent.[19] Steel is one of the products for which the Chinese government has eliminated export tax rebates.

FUTURE SCENARIO

These drivers for energy efficiency are likely to continue as the scenario of tighter regulations and higher costs intensifies. In April 2008, the Chinese government put into effect the amended Energy Conservation Law, which calls for local governments to annually submit to the State Council specific energy conservation plans and to enact pollution taxes on the most energy-intensive industries as well as to provide new financial incentives for qualified energy conservation projects.[20] The government is also likely to resume the electricity price hikes because of swelling energy production costs with prices for fuel and electricity in 2008 facing upward pricing pressures of over 10 percent.[21] One potential long-term impact of this scenario is that many of China's most energy inefficient firms will be forced to shut down while the remaining players will be compelled into consolidation. To remain cost competitive, the larger energy-intensive enterprises will likely increase their energy efficiency investments in order to reduce their energy expenditures. The result could be the creation of a lucrative Chinese energy efficiency industry that could be worth a cumulative Rmb2.1 trillion (USD300 billion) over the next five years.[22]

TABLE 1. PRODUCER PRICE INDEX NOVEMBER 2007

Means of Production	*Percentage Increase**
Mining and quarrying	15.1%
Industry raw materials	6.8%
Manufacturing raw materials	2.4%
Crude oil	22.6%
Gasoline	3.9%
Diesel	8.8%
Kerosene	8.0%
Coal mining and washing	6.2%
Ferrous metals smelt/ press	**11.7%**
Nonferrous metals smelt/ press	10.6%
Purchasing price for raw materials	
Fuel and power	9.9%
Ferrous metals	**9.7%**
Nonferrous metals	3.4%
Chemicals	3.6%

** Compared to same month in 2006*
Source: China National Bureau of Statistics

HOMEGROWN ADVANTAGES

Chinese firms that provide energy efficient services and technologies are not only poised to capture the domestic demand, but also the global market because of their inherent low cost manufacturing abilities. The McKinsey Global Institute found that a Chinese plant built with indigenous equipment and processes could provide savings opportunities in plant production costs as high as 80 percent compared

TABLE 2. SPECIFIC ENERGY EFFICIENCY SOLUTIONS

Industry
Cogeneration: combine heat and power systems to generate significantly more electricity and thermal energy in a single system compared to separate systems
Heat recovery: recover heat generated in the production of mechanical or electrical power
Optimization of motor-driven systems: use pumps and compressors
Steam Best Practices: optimize the use of steam across plants
Process optimization: reduce process times, such as for smelting, in transportation between process stages, and through an increase in hot charging (for energy-intensive industries)
Adoption of efficient manufacturing technologies: near-net-shape casting for steel and metal industries and near-net-shape membranes for the chemicals and food processing industries
Buildings
High efficiency heating and cooling equipment with tight building shells, including roof, wall, floor insulation, and low-leakage windows
Compact fluorescent lighting
High efficiency energy water heaters
Power Generation and Transmission
High efficiency capacity power plants, such as ultra-supercritical coal plants or advanced combined cycle gas turbines
Efficient transmission systems that minimize power losses
Standby-power reduction

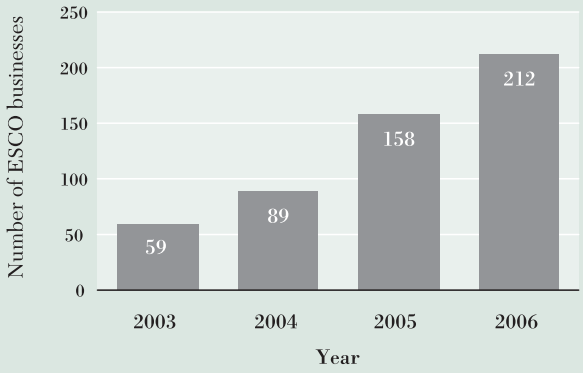
Source: McKinsey & Company, McKinsey Global Institute, July 2007

BOX 3. ESCOs: CAPTURING THE OPPORTUNITIES

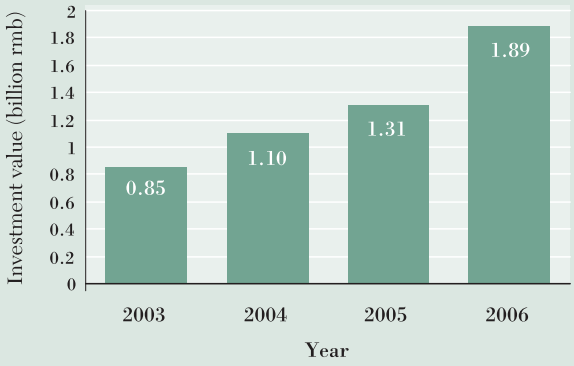
A sector poised for high growth in the energy efficient industry are energy service companies (ESCOs), firms that develop, install, and finance energy efficiency projects over a certain time period. While generally assuming the project's technical and performance risk, ESCOs earn revenue from the cash savings generated by the reduction in energy consumption.

The market size for Chinese ESCOs is estimated to be as large as Rmb80 billion (USD11 billion) with the average payback time for the invested projects to be at 1.3 years.[1] With such prospects, the industry has already experienced triple-digit growth. As of the end of 2006, the China Energy Management Company Association (EMCA) reported that the total investment value of Chinese ESCO projects reached Rmb1.89 billion (USD270 million), a growth of 222 percent compared to 2003.[2]

GROWTH OF CHINESE ESCOS



GROWTH OF CHINESE ESCO CONTRACTS



Source: China Energy Management Company Association

Notes

1. Lawrence Berkeley National Laboratory, China Energy Group, Lin, Zhou et al, "Developing an energy efficiency service industry in Shanghai," February 2004.
2. China Energy Management Company Association, Secretary General Zhao Ming, "EMCA and ESCO Industry Development in China," March 7–8, 2007.

to a similar facility constructed in the European Union or the United States.[23] Thus, Chinese-made energy efficient technologies could be significantly less expensive than their foreign competitors and be in high demand across the globe. In fact, the trend is already happening. Beijing Shenwu has a growing number of steel manufacturing patrons in Japan, South Korea and Europe due to its cost competitive industrial regenerative heating systems.

A NEW REALITY

With a growing population of over 1.3 billion, coupled with remarkable economic growth, China is and will continue to be one of the world's largest energy consumers. Fortunately, the country also has the potential to become a leader in energy efficient consumption. With stricter government policies, and increased energy and production costs, the drivers for a vibrant Chinese energy efficient industry have emerged. If such conditions continue to build up, enterprises that provide innovative energy technologies and services will not only be poised to capture the enormous economic opportunities, but will help lead China into an environmentally-sustainable reality.

The following four Chinese energy efficiency companies - Beijing Shenwu Thermal Energy Technology Co., Ltd, Zhuhai Huisheng Energy Technology Development Co., Ltd, Xi'an Ruichi Metallurgical Equipment Co., Ltd, and Beijing Sinen En-tech Co., Ltd - are highlighted here because of their success in providing key technologies and services in China's most energy-intensive sectors.

NOTES

1. The energy efficiency market or energy efficiency industry is defined as businesses that offer products and services that result in improved outputs from lower energy consumption.
2. Rmb and USD conversions throughout the paper are made using April 18, 2008 exchange rates of Rmb6.99/USD1 from the People's Bank of China. USD amounts in the text are estimated to the closest billion or million range.
3. China Daily, Premier Wen Jiabao quote in "China's energy efficiency investments will reach US$300 billion in the next five years," November 28, 2007.
4. Xinhua, "The positive achievements of the energy efficiency and pollution reduction work," December 11, 2007.
5. This is the energy consumed from the production of coal.
6. National Reform Development Council Press Release: Coal industry energy consumption reduces by 10.89 percent," December 21, 2007.
7. China.com.cn, "2007 Coal Industry Activity Analysis and Future Projections," January 31, 2007.
8. National Development and Reform Commission (NDRC), "Overview of the 11th Five Year Plan for National Economic and Social Development," 2006.
9. Xinhua, President Hu Jintao quote in "Report to the Seventeenth National Congress of the Communist Party of China," October 15, 2007.
10. Xinhua, Premier Wen Jiabao quote in "Push forward the work of energy efficiency," April 25, 2007.
11. Guangming Ribao, "Shandong province prepares a Rmb2.1 billion energy efficiency fund," July 21, 2007; Xinhua, "Jiangsu provincial government creates a special Rmb1.5 billion fund for energy efficiency and pollution reductions, " May 5, 2007; Zhonghua Gongshang Shibao, "Shanxi Province spends Rmb500 million in energy efficiency," December 28, 2007.
12. Credit Suisse Equity Research, "China Basic Materials Sector," October 4, 2007.
13. Electricity tariffs are set by the National Development Reform Commission and differ greatly from region to region, from industry to industry and for different voltage levels.
14. Credit Suisse Equity Research, "China Power Grid Sector," December 3, 2007.
15. Jinniu Caishun, "China's aluminum industry facing the pain of higher costs," November 14, 2007.
16. China National Bureau of Statistics, "Producer Price Index (PPI) for Manufactured Goods Kept Jumping in November," December 10, 2007.
17. China National Bureau of Statistics, CEIC and Morgan Stanley.
18. Xinhua, "China's Steel Industry Facing the Double Tests of Higher Costs and Prices," December 4, 2007.
19. Credit Suisse Equity Research, "China Basic Materials Sector," October 4, 2007.
20. Wang Wingyuan, "Presentation: Efforts in Moving Towards a Low Carbon Future: China's Energy Conservation and Renewable Energy Laws," February 13, 2008.
21. UBS Investment Research: China Focus, Anderson, Jonathan, "How Much Hidden Energy Inflation," December 18, 2007.
22. China Daily, Premier Wen Jiabao quote in "China's energy efficiency investments will reach US$300 billion in the next five years," November 28, 2007.
23. McKinsey & Company, McKinsey Global Institute, "Leapfrogging to Higher Energy Productivity in China," July 2007.

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Beijing Shenwu designs and produces advanced industrial combustion and heating furnaces that employ the technology known as high temperature air combustion (HTAC), which is based on the principle of recycling combustion air that is reheated at extreme temperatures.

Value Proposition

Environmental Benefits:

Shenwu's patented HTAC industrial furnace systems can reduce energy consumption by as much as 60 percent and decrease carbon emissions by at least 30 percent compared to traditional systems. Shenwu estimates its technologies have reduced annual industrial energy consumption by the equivalent of 1.1 million tons of coal, thus cutting carbon dioxide emissions by over 5 million tons a year.

Economic Benefits:

Shenwu's HTAC industrial furnace systems sell from Rmb10 million (USD1 million) to Rmb100 million (USD14 million). Depending on the industry and energy costs, system users can receive a payback on their investment in 2 to 3 years.

Market Served

Shenwu serves heavy industries that require the use of high temperature boilers and furnaces, a market in China estimated to be valued at Rmb250 billion (USD36 billion). The company currently controls over 70 percent of the market for regenerative furnaces in the Chinese metal processing industry and is also aggressively expanding into the petroleum, chemical, power generation, ceramics and glass industries, as well as the commercial property sector. In addition, the company is increasing its market share of the international industrial heating sector, with a growing number of customers in Europe and Asia.

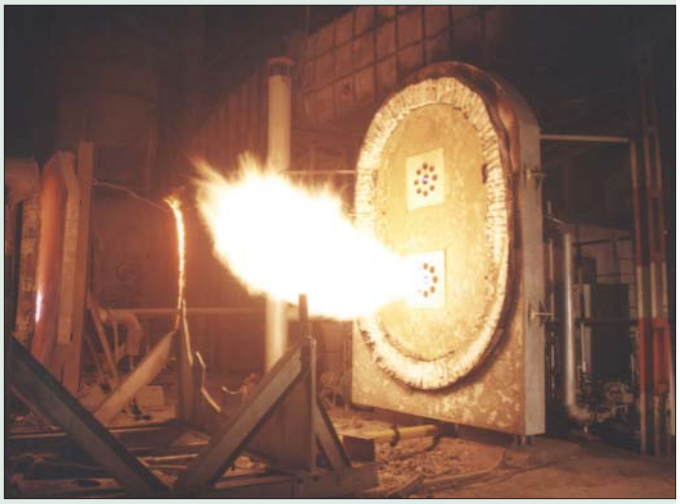
Business Model

Shenwu operates as an energy service company (ESCO), in which the firm finances the installation and operation of its systems and services by receiving a proportion of the energy savings.

Competitive Advantage

Shenwu holds 12 Chinese patents for its HTAC heating technologies, which has been recognized by the World Bank as one of the world's best. The company has been designated by the National Development and Reform Commission as a leading Chinese energy company. Shenwu heavily invests into research and development and has acquired several private industrial design institutes.

Financials			
	2006E	2007E	Annual Growth
Gross Revenues (Rmb millions)	600	2,000	233%
Gross Revenues (USD millions)	85.8	286.1	233%



A Shenwu regenerative combustor

Zhuhai Huisheng Energy Technology Development Co., Ltd

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Zhuhai Huisheng manufactures and manages integrated energy conservation systems for commercial properties, such as hotels and office buildings. The company designs customized systems that employ the use of advanced cooling, heating and lighting technologies, and facilities management processes that optimize energy use.

Value Proposition

Environmental Benefits:

Huisheng's energy management systems can reduce a building's energy consumption by at least 45 percent of its previous levels.

Economic Benefits:

A Rmb2 million (USD286,123) energy management system for a 30,000 square meter hotel can reduce the annual energy expenditures from Rmb3.5 million (USD500,715) to Rmb1.73 million (USD247,496). The payback for investment is 1.2 years.

Market Served

Huisheng currently controls 60 percent of Zhuhai city's hotel energy conservation market and has been rapidly acquiring new hotel-customers in Guangzhou, Shenzhen and Beijing. China has over 30,000 hotels with the value of the Chinese hotel energy conservation market estimated to be over Rmb100 billion (USD14 billion). Huisheng is also actively entering the energy conservation market for residential buildings, hospitals, and schools.

Business Model

Huisheng operates as an energy service company (ESCO), in which the firm finances the installation and operation of its systems and services by receiving a proportion of the energy savings.

Competitive Advantage

Huisheng operates its own building technology research center and has developed over 20 patented technologies. The firm has received financial support from the National Development and Reform Commission and the World Bank's Global Environment Facility. The firm also insures its transactions, such as payment guarantees for its equipment and services. Such risk management costs are included in the energy service contract.

Financials			
	2006E	2007E	Annual Growth
Gross Revenues (Rmb millions)	8	35	338%
Gross Revenues (USD millions)	1.1	5.0	338%

Huisheng's solar-powered water heating system

Xi'an Ruichi Metallurgical Equipment Co., Ltd

西安瑞驰冶金设备有限责任公司

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Xi'an Ruichi produces heat recovery and power generating systems for smelting furnaces that reduce energy consumption and emissions while increasing production output. Using its proprietary thermal collection and heat management network technologies, the firm's power generation technology and control systems enhance heat recovery through the preheat of flue gas and transfer of heat from molten materials.

Value Proposition

Environmental Benefits:

Users of its integrated reheating, heat recovery and power generation systems can reduce the energy consumption of smelting furnaces by as much as 13 percent while increasing production by 15 percent.

Economic Benefits:

At a cost of Rmb189 million (USD27 million), an integrated system that retrofits smelting furnaces, boilers and steam turbine generators can produce an additional annual electricity generation capacity of 194 MWh. The payback for the investment is 4 years (based on the assumption that the additional annual electricity produced costs Rmb38 million (USD5 million) - using Rmb0.31/kWh price for power).

Markets Served

Current customers are Chinese smelting firms. There are currently 12,000 smelting furnaces with a total metallurgic production capacity of 22.1 million tons. In the next three years, the capacity is expected to increase by an additional 2.8 million tons. As a result, the metallurgical industry's total energy demand will reach 1 million kWh. The firm also seeks to enter the cement and chemical industries.

Business Model

Ruichi operates as an energy service company (ESCO), in which the firm finances the installation and operation of its systems and services by receiving a proportion of the energy savings.

Competitive Advantage

Ruichi's systems can be installed on existing furnaces. They are indigenously developed and manufactured with the firm holding 13 technology patents, which been recognized by the National Development and Reform Commission and the World Bank. The firm also has an Original-Equipment-Manufacturer partnership with a European energy equipment firm.

Financials			
	2006E	2007E	Annual Growth
Gross Revenues (Rmb millions)	22	30	36%
Gross Revenues (USD millions)	3.1	4.3	36%

Ruichi's cogeneration smelting furnace

Beijing Sinen En-tech Co., Ltd

北京中能环科技术发展有限公司

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Beijing Sinen En-tech Company produces specialized waste treatment technologies for steam used in industrial boiler systems. The company's patented micro-filtration and membrane systems purify the used steam into high temperature water, which can be recycled and reheated back into the industrial boilers or safely disposed without further treatment.

Value Proposition

Environmental Benefits:

Beijing Sien En-tech's micro-filtration and membrane systems can reduce metal and petroleum content of used-industrial steam by as much as 90 percent. As a result, the systems reduce energy and water consumption, and wastewater pollution.

Economic Benefits:

A 100-ton per hour treatment system that costs Rmb6.5 million (USD929,900) could reduce annual water consumption by as much as 860,000 tons (based on 8,600-hours of operation at full capacity). As a result, total savings reach as high as Rmb10.84 million (USD2 million) with the investment payback period as quick as 8 months (includes annual operation costs of Rmb600,000).

Markets Served

Sinen En-tech currently serves China's oil refining industry, which annually produces over 3 billion tons of wastewater, accounting for 12.5 percent of the annual 25 billion tons industrial waste water produced in China. The majority of the firm's oil-refining customers are from Sinopec, one of the three largest state-owned Chinese oil companies, which controls 35 percent of the nation's petroleum market and operates 80 oil refining facilities.

The company plans to serve other sectors that require the use of steam boilers, such as the chemical, electrical power, pharmaceuticals, and the metallurgical industries. There are a total of 400,000 industrial steam boilers in China.

Business Model

Sinen En-tech enters into long-term after-sale services and equipment maintenance contracts with its customers. Revenues come from a mix of such after-sale services and product sales.

Competitive Advantage

Sinen En-Tech is the only Chinese supplier whose products can treat industrial steam at high temperatures. International competitors exist, such as Armstrong, but the company has significant cost advantages over the foreign producers.

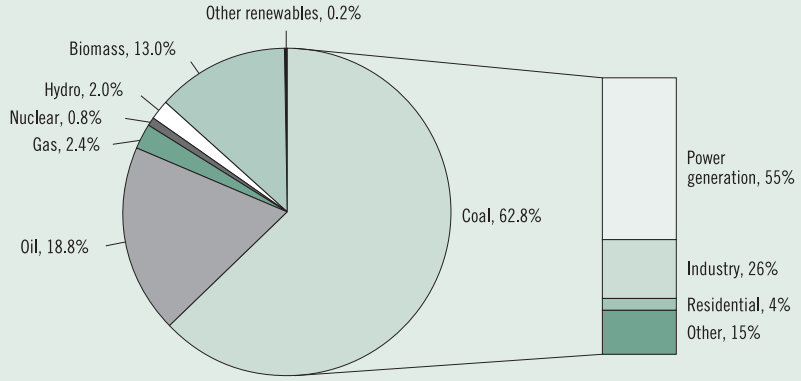
Financials			
	2006E	2007E	Annual Growth
Gross Revenues (Rmb millions)	20	100	400%
Gross Revenues (USD millions)	2.9	14.3	400%

Sinen's micro-filtration and membrane systems

BOX 4. CHINA'S ENERGY CONSUMPTION

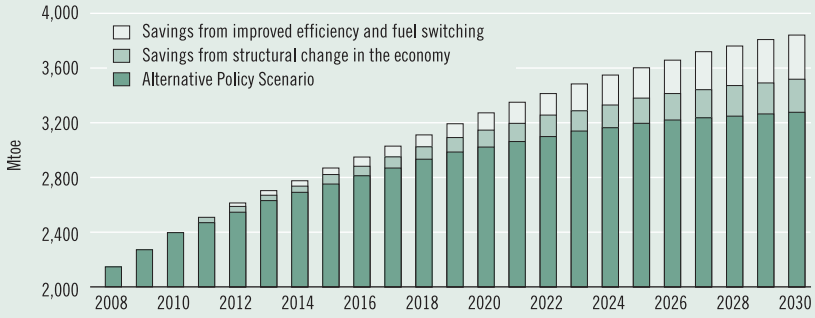
China's appetite for energy continues to surge with its primary demand reaching 1,742 million tons of oil equivalent (Mtoe) in 2005 and is forecasted by the International Energy Agency (IEA) to top 3,819 Mtoe by 2030 at an average annual growth rate of 3.2 percent. If this trend continues, China's net oil imports will jump from 3.5 million barrels per day (mb/d) in 2006 to 13.1 mb/d in 2030. In addition, the country will need to add more than 1,300 gigawatts (GW) to its electricity generating capacity at an estimated investment of US$3.7 trillion (in 2006 dollars) in the period 2006 to 2030.

Total Primary Energy Demand in China (2005)



Source: World Energy Outlook © OECD/IEA, 2007; Figure 8.1; p.262

IEA estimated that China could significantly curb the growth of its energy demand by as much as 15 percent of its 2030 projected levels of 3,819 Mtoe to 3,256 Mtoe. According to the IEA, the majority of the energy productivity improvements can be made in industry, followed by buildings, and power transmission and distribution.



Source: World Energy Outlook © OECD/IEA, 2007; Figure 11.1; p.365

- Industry can decrease its projected 2030 energy consumption levels of 1,046 Mtoe by as much as 18 percent or 187 Mtoe.
- Use of energy-efficient appliances, cooling and heating systems, and building materials, could cut the residential building sector's 2030 forecasted energy consumption levels of 442 Mtoe by as much as a respective 18 percent or 80 Mtoe.
- Improvements in power generation, transmission, and distribution could decrease the projected demand for 2030 electricity generation of 8,667 terawatt hours (TWh) by 12 percent, or 1,040 TWh.

Source: OECD/IEA, World Energy Outlook 2007, November 2007.

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New Ventures

About New Ventures

New Ventures, a project of the World Resources Institute's Markets and Enterprise Program, supports sustainable enterprise growth by providing innovative entrepreneurs with management training, business advisory services, and access to capital and markets. Functioning as a business accelerator, New Ventures is shifting alternative environmental and social markets from the margin to the mainstream and has developed a set of tools to equip tomorrow's business leaders with the skills needed to succeed in these new markets. To learn more, visit our website at www.new-ventures.org.

WORLD RESOURCES INSTITUTE

About the World Resources Institute

The World Resources Institute (WRI) is an environmental think tank that goes beyond research to find practical ways to protect the earth and improve people's lives.

Our mission is to move human society to live in ways that protect Earth's environment and its capacity to provide for the needs and aspirations of current and future generations.

Because people are inspired by ideas, empowered by knowledge, and moved to change by greater understanding, WRI provides—and helps other institutions provide—objective information and practical proposals for policy and institutional change that will foster environmentally sound, socially equitable development.

WRI organizes its work around four key goals:

- **People & Ecosystems:** Reverse rapid degradation of ecosystems and assure their capacity to provide humans with needed goods and services.
- **Access:** Guarantee public access to information and decisions regarding natural resources and the environment.
- **Climate Protection:** Protect the global climate system from further harm due to emissions of greenhouse gases and help humanity and the natural world adapt to unavoidable climate change.
- **Markets & Enterprise:** Harness markets and enterprise to expand economic opportunity and protect the environment.

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