



Energy conservation through energy service companies: Empirical analysis from China

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HIGHLIGHTS

- We present a framework to explain why ESCOs do not operate effectively in China.
- China's ESCO industry is based on relational governance based on trust.
- Yet, ESCOs operate their business as if they are in a system of market governance.
- This mismatch is the most critical challenge inhibiting the industry's growth.

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ABSTRACT

China's energy-service companies (ESCOs) have developed only modestly despite favorable political and market conditions. We argue that with sophisticated market institutions still evolving in China, trust-based relations between ESCOs and energy customers are essential for successful implementation of energy efficiency projects. Chinese ESCOs, who are predominantly small and private enterprises, perform poorly in terms of trust-building because they are disembedded from local business, social, and political networks. We conclude that in the current institutional setting, the ESCO model based on market relations has serious limitations and is unlikely to lead to large-scale implementation of energy efficiency projects in China.

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1. Introduction

Experts, academics, and industry leaders generally agree that the market for energy-service companies (ESCOs)¹ has a huge potential in China (Gan, 2009; Li and Colombier, 2009). China's ratio of energy use to GDP (i.e., energy intensity) is one of the highest in the world, 1.5 times the world average (IEA, 2010), pointing to untapped potential for ESCOs to improve the country's energy efficiency. The Chinese government has also been stressing and actively supporting energy efficiency measures in the last decade. In 2006, the National People's Congress approved the incorporation of a self-imposed national energy intensity reduction target in the 11th Five-Year Plan, and the central government signed contracts with 1000 of China's highest energy-consuming enterprises to increase energy efficiency (Price et al., 2010; Zhou et al., 2010). In April 2010, the State Council issued Document No.

25 calling for an accelerated development of China's energy saving service industry (State Council Document No. 25, 2010).² In addition to these formally promulgated targets and national commitments, provincial governments and cities such as Beijing and Shanghai have formulated additional local policies to support the ESCO industry. For instance, in 2008, Shanghai set up a special fund to promote ESCO projects (Chen and Xu, 2010: 2).

² The policies outlined in Document No. 25 were followed by numerous guidelines and rules promoting China's energy-saving service industry. In June 2010, the National Development and Reform Commission (NDRC) and the Ministry of Finance (MoF) jointly issued the 'Interim Measures concerning the Administration of Financial Incentives to Fund the Energy Performance Contracting'. In August 2010, the General Administration of Quality Supervision, Inspection and Quarantine issued 'General Technical Rules for Energy Performance Contracting'. These different interim measures and technical rules indicate the central government's political will to promote China's ESCO industry. In the interim measures by the NDRC and MoF, the stated development goal is to develop a few large scale ESCOs by 2012. Specific financial and tax incentives outlined include offering RMB 240 for 1 t of standard coal equivalent as an financial incentive for ESCOs from the central finance budget and exempting ESCOs from business tax for revenue generated from Energy Performance Contracting (EPC) projects. For a detailed summary, see Chen and Xu (2010).

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¹ An energy service company (ESCO) is generally defined as a company which invests in, or facilitates investments in, energy efficiency projects in other host enterprises, using energy performance contracting (World Bank, 2008: 1). ESCOs in China are also referred to as energy management companies (EMCs).

Under such favorable market and political conditions, one would expect ESCOs to thrive. Yet, the development of the ESCO industry in China is far from reaching its significant potential (Gan, 2009; Li and Colombier, 2009; Limaye and Limaye, 2010) and even lags behind that of other developing countries. For instance, even though Brazil's primary energy demand is roughly 11% of China's and its energy intensity about half of China's (IEA, 2010), Brazil's ESCO industry dwarfs China's by a factor of over two (Delio et al., 2009: 12). Despite all of the potential, ESCOs have remained largely a marginal player in delivering energy efficiency goals in China. Some even claim Chinese ESCOs are a case of market failure with a limited ability to implement energy efficiency at a large scale (Hasnie, 2009 quoted in USAID, 2010: 11; World Bank, 2010). This begs the questions: why has the ESCO industry been a disappointment in China? How well are China's ESCOs placed to implement energy efficiency measures? What are the main challenges that hinder the success of the ESCO model in China? How might ESCOs structure their business plans to mitigate these challenges?

Based on on-site fieldwork, this article develops an analytical framework to explain why most ESCOs in China do not operate efficiently or effectively in the market. Using the theories of asymmetric information (Akerlof, 1970; Rothschild and Stiglitz, 1976), transaction cost (Coase, 1937; Williamson, 1975, 1985) and network embeddedness (Granovetter, 1985), we hypothesize that trust generated through social networks and relations enables firms to overcome a general market failure in the Chinese ESCO industry. Not all ESCOs are failing to grow. We argue that for many private ESCO firms, it is precisely their inability to place themselves in trust-generating local business, social, and political networks that undermines their growth potential. Public ESCOs or those spun off of state-owned enterprises (SOEs) are in a better position to serve clients, the majority of whom are government agencies and SOEs, and scale up rapidly because they are embedded in networks that foster trust. Our findings demonstrate that, among other factors, the success of the ESCO model in China depends critically on the formation of trustworthy relationships between ESCOs and potential customers. In short, the ESCO industry in China is characterized by a system of relational governance based on trust. Yet, most participants have been operating their business as if they are in a system of market governance or have been busy trying to recreate such a system, essentially copying the one they were accustomed to in Western countries where the ESCO sector first originated. This institutional mismatch is the most critical challenge for the industry's growth.

The analysis draws from over 30 semi-structured interviews in 2011 with Chinese and international ESCOs located in Beijing, Baoding (Hebei), and Dalian (Liaoning), members of the Chinese Energy Management Company Association (EMCA), and energy experts. Four cases, each representing a distinct mode of ESCO operation, are presented to illustrate in-depth the role of trust and networks in China's ESCO industry. The company cases are "most different" in their ownership form, size, and regional location and demonstrate how different characteristics affect ESCOs' ability to get access to and develop business opportunities.

2. Development of China's ESCO market

Although it is indisputable that the overall number of ESCOs and their investments have been growing in China, obtaining reliable figures is challenging and many of the officially reported numbers are misleading. For instance, a reputable expert in the field claimed that "there might be 10 ESCOs in China" (Interview 051811), while another concurred that most Chinese ESCOs are not "real ESCOs because ESCOs are supposed to create a unique

Table 1

ESCO Activity in China.

Source: World Bank (2008), Delio et al. (2009), Chen and Xu (2010), Financial Times (2010), EMCA (2011)

Year	ESCOs (in Numbers)	Total Value of ESCO Projects (in million US\$)	Annual Investments in Energy Performance Contracting (in millions US\$)	Tons of standard coal reduced (Mtce)
1998	3	0	4	0
2001	3	50	4	N/A
2003	3	270	22	N/A
2004	60	514	94	6
2005	106	723	242	14
2006	134	1263	277	15
2007	185	3314	1033	53
2008	N/A	6386	1786	N/A
2009	502	8994	2989	N/A
2010	N/A	12,798	4400	N/A
2011	523	N/A	N/A	N/A

solution for the client, but Chinese ESCOs just sell the product that they make" (Interview 051211). On the other extreme, in March 2011, the central government's list of officially approved ESCOs totaled 984 (Table 1) (NDRC and Ministry of Finance, 2010, 2011).³ Most observers believe the majority of these are "phantom" companies merely taking advantage of the ESCO status to receive financial and tax benefits that were introduced in 2010 to promote the ESCO industry (Interview 051211). According to experts, "these ESCOs know almost nothing about energy performance contracting (EPC)" (Interview 051211), and "70–80% have never done ESCO-related work" (Interview 050811). A long-time industry insider put it rather succinctly: "Everyone is called an ESCO" (Interview 051211).

The consensus among industry experts is that China's ESCO industry is rather underdeveloped. On average, ESCOs in China remain small,⁴ are concentrated in a few big cities,⁵ and "instead of offering entire energy solutions by combining different systems together, current investments are made only in standardized energy-saving projects such as changing light bulbs, motors, or broilers" (Interview 051211). Many ESCOs "do not dare to change entire production processes, as in the beginning it is much easier for clients to accept smaller changes" (Interview 051011). Different studies thus describe China's ESCO industry as "immature and short-sighted" (Li and Colombier, 2009: 2), lacking technical skills and capacity (Wang et al., 2008: 1881), predominantly selling

³ It is difficult to lump Chinese ESCOs into one category. First, one needs to distinguish between technology-oriented and market-oriented ESCOs (or vendor vs. service ESCOs), with the former selling specialized technologies and equipment and the latter working together with energy consumer companies to solve particular energy efficiency problems. Second, ESCOs are owned by private companies, state-owned enterprises, non-profit organizations, or local governments, with many different shades of ownership in between. A third distinction is between domestic and foreign companies, as larger international energy companies such as Honeywell, Siemens, and Schneider Electronics have also entered the Chinese ESCO market. Fourth, the size and investment capacity of ESCOs differ substantially. Moreover, the contractual model adopted by ESCOs can range from shared savings (mainly in the building sector), to outsourcing energy management (commercial buildings such as hospitals), to guaranteed savings (other industries).

⁴ According to EMCA, the financial capacity of Chinese ESCOs is limited: 60% of the ESCOs have less than 10 million RMB registration capital; 20% has more than 50 million RMB registration capital. About 50% of ESCOs have less than 100 employees (Interview 051811).

⁵ Of the 984 approved ESCOs in 2011, 461 (47%) were located in Northern and Eastern China with 153 in Beijing and 63 in Shanghai alone, 132 (13%) located in Southern China, 228 (23%) in Central China, and 163 (17%) in Western China. The majority of ESCOs are located away from energy intensive provinces. For instance, the high energy intensive provinces Inner Mongolia, Henan, and Shanxi have four, 34, and 30 ESCOs respectively.

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