Achieving Sustainability in World Bank Energy Efficiency Projects:

Lessons Learned Developing ESCOs in China

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ABSTRACT

This article considers why some energy efficiency investment projects in developing countries may yield more sustainable results than others. The author concludes that systematic attention to institutional development is of prime importance. The story behind successful development of energy service companies (ESCOs) in China with World Bank support is cited as an illustrative example. Annual energy performance contracting investment by China's ESCOs topped USD 1 billion in 2007 and continues to grow.

INTRODUCTION

As a multinational development bank, the World Bank Group provides design assistance and financing for a variety of projects focusing on improving energy efficiency in developing countries. Over the last 20 years, some of these projects successfully sparked new or improved ways of encouraging or undertaking investments in energy conservation in industry, buildings, or transportation systems. Financiers, industries, technical service companies, and facility owners in countries as diverse as Hungary, India, Brazil, Sri Lanka, and China developed various ways to work together to implement new energy conservation investments that have withstood the test of time. In some cases, however, new programs to promote energy efficiency sputtered—some never gained

traction, and others lost steam when heavy external assistance expired. Why do some programs to expand energy efficiency investment yield sustainable and growing results, while others fail?

Promoting Energy Efficiency Investment

In most countries, but especially in fast-developing ones, there is a wealth of opportunity for energy efficiency investments that are financially profitable under current market conditions. But many of these projects remain unimplemented. Sometimes lack of information or suitable local expertise is a problem; however, the problems stymieing investment are often even more stubborn.

The financial benefits of energy conservation are primarily future energy cost savings. For some, investment of hard cash on the promise of some calculated future operating cost reduction is riskier than an investment in new fixed assets that can deliver new production and revenue. For others, seizing opportunities for expanding facilities or improving product lines to capture greater market share is simply more important for business at this particular moment. For a large portion of energy users, energy costs are only a small share of their total costs anyway, so that even if an energy-savings project generates a healthy return on investment, the overall result on the bottom line is virtually insignificant. In many cases some form of external financing is needed, and this brings additional challenges. Financial institutions are often unfamiliar with how to assess these types of cost-saving projects and the reliability of the technology proposed. As many project opportunities are small scale and dispersed, it is difficult to keep transaction costs under control unless financiers are able to take advantage of similarities among projects and bundle them in different ways. In the end, ballooning transaction costs and risks associated with contracting for both technical help and financing may cause many prospective investors to just give up.

In most countries, these problems mean that more effort than merely relying on current markets is required to realize a larger portion of the great potential for cost-effective energy efficiency investment. In some market segments, such as new building construction or certain electricity-using home appliances, regulation proscribing minimum energy efficiency levels is adopted by many governments. For other market segments, regulation may not be an effective proposition. But effort is required, especially in countries where market institutions are still evolving, to foster development of improved systems to effectively

deliver energy efficiency investment. Improved delivery mechanisms need to bring together financiers, technical experts, and customers to implement energy efficiency project packages with lower transaction costs and at significant scale. This is the challenge that needs to be addressed in developing new energy efficiency investment programs such as those supported by various World Bank projects.

Promoting Energy Efficiency is an Institutional Development Issue

Barriers such as high transaction costs, perceived high risks, and difficulties in energy efficiency deal structuring are institutional in nature, meaning that they derive from the way that business interactions are handled and the potential conflicts and risks that such interactions can create. With strong requirements for specialization, project packaging, and financial intermediation, the energy efficiency business is particularly dependent upon local business conventions and economic institutions. Overcoming these barriers through the development of improved ways to deliver energy efficiency investment, then, is an institutional development issue, and it needs to be addressed as such. The fact that projects focusing on energy efficiency investment programs are really institutional development projects is what truly sets them apart from most other energy investment projects.

DEALING WITH INSTITUTIONAL DEVELOPMENT CHALLENGES

Improved energy efficiency investment delivery will require some modifications in the ways in which various actors such as financiers, technology providers, and customers and their various contractors interact with each other. Common sense dictates that any modifications, however, must be developed within the existing framework of rules, procedures, and conventions governing economic interactions—both informal and formal. New ideas on how to implement energy efficiency projects must be adapted to local settings. The role and importance of contracts versus relationships in economic transactions, for example, vary dramatically between countries. Banking conventions vary sharply, such as security requirements for different types of loans to different types of customers. Attitudes and ease of trust in technical consultants and other service providers also vary.

While the need to customize new investment project delivery ideas into local institutional settings may be easy to understand in principle,

the principle is still often ignored, probably because it is time-consuming and difficult. Some efforts have focused primarily on placement of new large amounts of capital for energy efficiency investment in local financial institutions and then faced problems of poor fund disbursement. Lack of capital in local markets is rarely the true barrier—the main problem is usually inadequate systems for developing projects and accessing funds. Problems in achieving results have also arisen in various short-term attempts to transplant to developing countries models developed elsewhere (such as utility demand-side management programs or energy performance contracting models developed in North America) without careful attention to big differences in the relevant economic frameworks.

Institutional development efforts take time and perseverance. Time is needed for those with new ideas and those with intensive, practical understanding of local organizations and business practices to blend together possible improved project delivery systems. Time is needed to pilot initial concepts and to adjust and adapt. Time is needed to propagate concepts that look promising and to gather momentum and support. But eventually the payoff in results can be both large and sustainable, as basic systems have been created which can continue to work over the long term.

AN EXAMPLE—DEVELOPMENT OF ENERGY SERVICE COMPANIES IN CHINA

A vibrant energy performance contracting industry has developed in China over the last ten years. An unheard-of concept in China in 1996, this energy efficiency investment business model was launched from scratch in 1997 by three pilot Chinese companies, supported by the Chinese government, the World Bank, the European Commission and the Global Environment Facility (GEF). The ESCOs (also called energy management companies in China—EMCs or EMCos) are commercial, profit-seeking companies which identify, design, and implement energy efficiency projects for a variety of clients. According to their energy performance contracts signed with those clients, the ESCOs complete procurement, finance or assist in arranging financing for parts or all their projects, oversee construction, and sometimes assist in asset maintenance. They receive compensation from their clients based on

achievement of the actual energy savings agreed in their contracts.

The three pilot ESCOs pioneered the business beginning in 1998, adapting the energy performance contracting concept to the Chinese market. This was a difficult process, involving various ups and downs and requiring about four years before serious investment scale-up could begin. The business evolved with distinctly Chinese features. As profitability was demonstrated and the model gained some legitimacy, other companies began to pick it up. A second support project was launched in 2003, helping China establish a national EMC Association (EMCA) and a new loan guarantee program for ESCOs. During 2004-2007, the business grew very rapidly.

The Early Years: 1997-2003

In the 1990s, China was in the midst of a transition from a planned to a market economy. There was growing interest in how to promote energy conservation through market mechanisms. Intrigued by the possibilities of the ESCO model, policymakers involved in energy conservation partnered with the Bank to see if the model might work under Chinese conditions. The government sponsored the establishment of three new pilot commercial ESCOs, and the Bank organized technical assistance, funding for initial pilot projects, and a loan for operational scale-up.

The three companies developed a full-service, shared-savings energy performance contracting model, under which they financed projects for clients. Ideas on market development, contracting methods, project management, and financial management were introduced by North American experts. Some ideas were heavily relied on, some were used with modification, and some were basically discarded. For example, while many contracting principles were adopted from abroad, contract templates from North America were quickly abandoned in favor of very simple contracts focusing on basic responsibilities and financial flows that were more amenable to Chinese customers.

The three companies began conservatively with small projects that showed success and provided a platform for gradual growth. While one company eventually developed an attractive business line for building complexes, simple projects in industry dominated (eg. boiler or kiln replacements, adoption of variable-speed motor technology, renovations to utilize waste heat or gas, etc.). With energy savings relatively easy to calculate for such investments based on prior experiences with the given technology, anticipated energy savings cash flows to be shared

and the sharing ratio were usually stipulated by mutual agreement upfront in contracts. Payments to the ESCO would follow an agreed payment schedule as long as the host enterprise acknowledged that the equipment operated as promised and any agreed basic initial tests showed satisfactory results. All projects were relatively short term, such that the ESCOs would recover their investment and a healthy profit within three years or less, and then clients could retain all benefits from the assets thereafter. Host enterprise repayment risks emerged as the dominant project risk. Relatively short-term contracts helped mitigate this risk, but the companies also developed sophisticated repayment risk management strategies, focusing on careful client selection and reliance on different types of counter-guarantees.

Particularly during 1999 and 2000, the just emerging energy performance contracting business ran into serious challenges at local levels, because the mixed financing-equipment procurement-service business defied established business categorization. Local authorities argued about how the business should be taxed. Auditors were at a loss as to how to treat assets created by the ESCOs in host enterprises. Some local officials even declared the business to be "illegal." Through active discussion and the unwavering support of the central government, practical solutions were gradually found.

The central government also sponsored an active campaign to disseminate the emerging success of the first three ESCOs. A variety of additional companies, many from the private sector, began to pick up the model. In November 2003 the new ESCO loan guarantee program was launched, and in April 2004 EMCA was created to also help further propagate the business. Both efforts are being supported by the GEF.

Recent Results

The size and importance of China's ESCO industry have grown especially strongly during the last several years. Probably about 40-50 core, well-established, and knowledgeable ESCOs were operating in China in 2007, while the total number of companies reporting experience with at least one energy performance contract exceeded 400. Most of the companies involve private shareholders. Investment in energy conservation projects using energy performance contracting in 2007 was four times the 2005 level. Although still new to the energy and financial communities at large, many government and business people involved in energy conservation work have now at least heard of the concept,

which was not true only two to three years ago.

As shown in Figure 2, annual investment in energy efficiency projects through energy performance contracting reached over USD 1 billion in 2007. Investment in 2008 is expected to be yet higher.

The total energy savings that will be generated over the lifetime of the assets created (about 10 years, on average) through these investments also has grown sharply each year. Based on the energy savings and carbon emission reduction rates actually achieved in 226 investments supported through the ESCO loan guarantee program, estimated energy savings from 2007 energy performance contract investments total about 53 million tons of standard coal equivalent (see Figure 3).

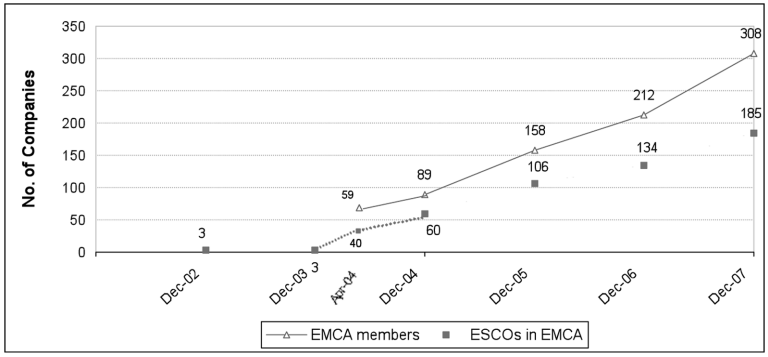

Figure 1. Growth in EMCA Member ESCOs

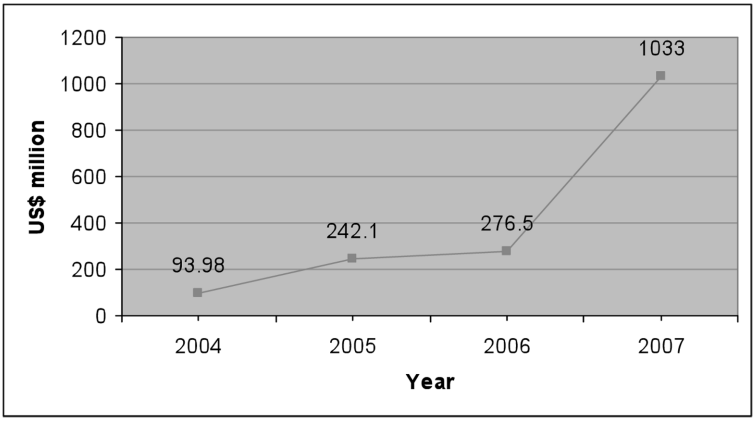

Figure 2. Growth in Energy Performance Contracting Investments in China, 2004-2007

Associated carbon dioxide emissions reductions from 2007 investments alone total about 38 million tons of carbon, rising from just over 4 million tons of carbon in 2004.

Current Characteristics of the Industry

China's ESCO industry is now highly dynamic, and is it growing and changing rapidly. There are a wide range of companies and increasing numbers of business variations.

The number of relatively small energy performance contracting projects with building customers has grown quickly. Among 386 energy performance contract projects from 57 ESCOs reported to EMCA in EMCA's Fall 2007 survey, just over one-half were with building customers. Most of these projects involve commercial building establishments, as government agency procurement and accounting conventions still preclude energy performance contracting in many types of public buildings (although this may change soon). Industrial customers accounted for a little under one-half of the reported project sample. However, energy performance contracting with industrial customers still accounted for about three quarters of contracted investment. While the average investment per project was about $1 million, the average size of industrial projects was $1.7 million, while the average size of building energy efficiency projects was just $400,000.

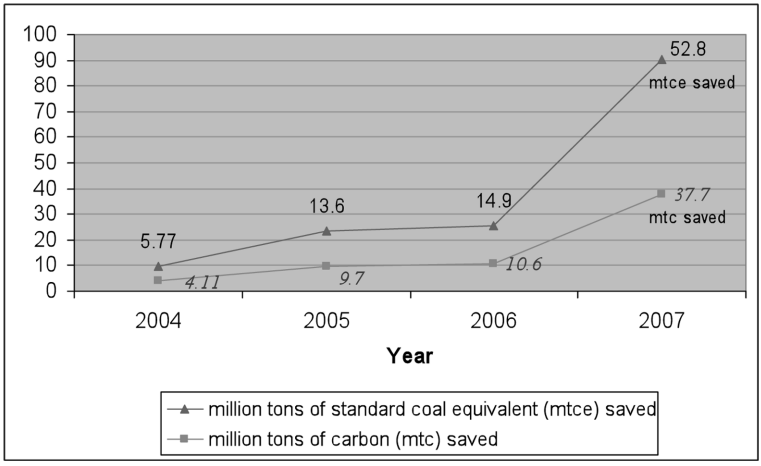

Figure 3. Growth in ESCO Energy and Carbon Emissions Saving in China, 2004-2007

Most Chinese ESCOs are small, but there are a number of fairly large ones. Twenty-two companies engaged in energy performance contracting have registered equity capital of more than $5.3 million each. However, about one-half of EMCA's ESCO membership has registered capital of less than $670,000. Some companies both have strong financial backing and are capable of undertaking major integrated energy efficiency projects. Some rely on unique relationships with a set of customers to organize a variety of project. However, the business of the largest group of companies revolves around specific energy conservation technologies and products, basically using energy performance contracting as a means to expand market share.

Guaranteed energy savings contracts are gaining popularity. In this model, host enterprises are responsible for project financing. The ESCO provides turn-key design, procurement and construction services, and a guarantee of the energy saving result. The client pays the ESCO a service fee, but the ESCO is obligated under the contract to compensate for any failures to meet the guaranteed energy savings targets specified in the contract. Although also popular for some small building energy efficiency projects, this model is used especially for large projects in industry, where ESCOs face serious financing capacity constraints. Thus, while shared savings contracts still accounted for two-thirds of the number of projects in EMCA's 2007 survey sample, guaranteed savings contracts accounted for the largest share of investment.

Formal financing arrangements between ESCOs and local banks are increasing, especially from the current loan guarantee program. However, private sources of project finance or less formal financing arrangements with shareholders or strategic partners play a major role.

Some Key Success Factors

The growth of China's ESCO industry has certainly been a remarkable success. Efforts put into the initial pilot company demonstrations in the market paid off. In this case, it proved best to begin concrete operation of the new model on a small scale, then adjust in a practical way to overcome the various issues that arose. A stable, long-term program of cooperative support was critical—involving both international and domestic parties. The central government's steady support proved essential at start-up and when operational problems surfaced. Finally, the government's current massive and comprehensive campaign to reduce energy consumption per unit of GDP by a total of 20 percent during

2006-2010 has made a major difference in creating market demand for ESCO services.

Of course, many challenges remain. Some types of business standards or company accreditation systems may be needed to ensure solid and consistent industry credibility. Links between formal financiers and ESCOs must be further strengthened. The government building market needs to be opened up for energy performance contracting. Deeper, more integrated and more sophisticated services and projects can expand benefits for clients, but this will require development of a greater number of large ESCOs in the market.

CONCLUSIONS

The experience of ESCO development in China is only one example of a number of successful recent programs to expand energy efficiency investment in various developing countries. But this example helps illustrate a common theme among energy efficiency investment efforts which have proved sustainable: successful programs in this area are really institutional development projects. In many ways, energy efficiency investment programs are very different from investment projects in energy supply, such as renewable energy projects. Weaknesses in financial viability or lack of funds for promotion or investment are rarely the real problems; the problem is more often a lack of adequate investment delivery mechanisms. Hence, provision of increased amounts of capital is rarely a solution by itself. Instead, economically efficient mechanisms need to be developed which can simultaneously foster identification and packaging of viable investment projects and ensure their access to finance. Similar to most institutional development efforts, this requires (i) careful customization to local economic frameworks, (ii) flexibility to adjust to meet evolving circumstances, and (iii) mobilization of a stable, long-term and relatively labor-intensive effort. In the case of energy efficiency financing, it also is critical to adequately address both the market/investment project development side and the financing mechanism side.

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