ESCO models for the retrofit of existing buildings in China

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1. Project background

The global building sector accounts for approximately 30% of total energy consumption and related CO_2 emissions. This represents approximately 10 billion tonnes of direct and indirect CO_2 emissions using CO_2 emissions data from in 2011 [1]. Given this impact, "green building" and energy efficiency renovation strategies of the 12th 5-year plan plays a key role in supporting the Chinese transition to a low carbon economy.

In support of the renovation strategies, KPMG conducted a study commissioned by GBPN (Global Buildings Performance Network) on factors affecting the use of ESCO models for the retrofit of existing buildings in China. The research focused on good practice ESCO examples worldwide, their success factors and applicability to China, and interventions which could stimulate the Chinese ESCO market.

In this study, KPMG analyzed international best practices and identified factors that were important to the success of ESCO internationally. KPMG also undertook research within China to assess barriers to development in the Chinese ESCO market for buildings and shared the results of the international research with practitioners in China to assess the implications of international experience for China. This report summarizes key findings and recommendations to China's ESCO market.

2. Hurdles in Chinese ESCO market

The ESCO market in China is still only 15 years old. However, following the active promotion through policy incentives and public awareness campaigns, China's relatively young ESCO market has already a journey similar to that which has occurred over the last 40 years of ESCO in the USA.[2]. Currently, industrial projects still dominate the ESCO market in China and account for over three-quarters of the market with buildings projects only accounting for one-quarter. However, despite the challenges in the market place, the survey conducted by YIMR of building owners, property management companies, and energy service companies suggests an ongoing support for ESCO as a method for supporting energy efficiency in China. Participants highlight ESCOs as a tool to reduce initial investment and project risk of energy user and provide a win-win solution for participating parties.

Despite these advantages, KPMG's research identified several main obstacles that are restricting ESCO market development for building retrofits. These obstacles include:

- Insufficient market drivers Building owners and operators do not yet feel pressure to drive energy efficiency projects, which creates a problem for ESCOs/EPC as well as other models. KPMG's research identified four primary reasons for the lack of drive. First, energy costs are not a significant enough to concern building owners/operators

[1] Trends in Global CO_2 Emission 2012 Report
[2] World Bank: Three major bottlenecks need to be breakthrough for Energy Performance Contracting Market in China

either as a total amount or as a proportion of their overall expense. Secondly, there is no mandatory standard for building energy consumption, and therefore limited obligation to continuously improve energy savings. Third, ESCO providers are more attracted to pursue the larger projects that can be found in the industrial market rather than the relatively smaller projects available in the building sector. Finally, the understanding of the cost savings and other benefits of energy efficiency is relatively low amongst building owners and operators in China and the opportunities not sufficiently compelling.

- Integrity related to energy-saving measurement and verification. The standard and methodology of energy-saving amount is built on the basis of integrity between engagement parties. Measuring and verifying energy savings can be more complex for building projects than for industrial projects due to the wide range of factors that can influence energy usage. Therefore, there is a high risk of conflict or disagreement between the ESCO and its client during implementation.
  Mutual trust is a key prerequisite for parties to be willing to enter into a contract and then to be able to successfully execute it. M&V standards are important tools for creating an objective external reference. China has developed M&V standards, however, the standards lack detailed operational guidelines and cases studies, so ESCOs and their partners cannot extract methodological and empirical references. ESCO companies report that receiving anticipated payments can be difficult as clients may not agree on the actual scale of energy savings or may refuse to honor the contract for other reasons (i.e. management changes, enterprise restructuring, etc). The perceived risk of dealing with clients in the building sector makes many ESCOs more hesitant to pursue projects in the sector.

- Financing. At the moment, most of the energy service companies in China are small and medium-sized enterprises, and therefore have a weaker credit profile and corresponding difficulty in accessing loans. Moreover, banks also lack adequate capacity to assess future earnings of EPC projects in buildings, so they are cautious about making loans for such projects.

- Other Factors. Besides the above three hurdles, research also indicated that the qualifications, technical skills and operational capabilities vary significantly amongst ESCOs. Due to a low threshold for being recognized by the government as an ESCO and the financial and tax incentives offered for projects by the central government, the number of energy service companies has increased rapidly in recent years. According to data from EMCA, the number of registered companies grew annually by 1,000 in 2010 and 2011 compared to an annual increase of only 300 companies per year from 2006 to 2009. As a result, interviewees believe that a number of companies with comparatively weaker qualifications and technical skills entered the market, which has affected perceptions and potential project risks.

3. Case studies from international ESCO market

The project research centered on identifying useful international case studies on making building ESCOs successful to share with Chinese experts.

> Market Demand

Based on the above mentioned hurdles in Chinese ESCO market for existing building retrofits, KPMG reviewed some mature mechanisms and policies in European and US ESCO market (EU Energy Efficient Directive and Energy Performance of Building Directive, NAESCO accreditation scheme, International Performance Measurement and Verification Protocol, Berlin Energy Agency, Better Buildings Partnership of Toronto, Fedesco model in Belgium) and analyzed successful ESCO projects in building retrofits (i.e. retrofits project for Empire State Building and Rotterdam swimming pool project, etc.). These mechanisms, policies and successful cases provided insights and possible solutions to the above hurdles.

From a policy perspective, Energy Performance of Building Directive (EPBD) as well as EU Energy Efficient Directive make a positive impact on driving market development. According to EU Energy Efficient Directive, member states shall establish indicative national energy efficiency target, based on either primary or final energy consumption, primary or final energy savings, or energy intensity. For specific requirements in building, member states shall set up minimum requirements for the energy performance of new building, existing buildings, building units and building elements according to EPBD. Additionally member states shall also lay down the necessary measures to establish a system of certification of the energy performance of buildings. With the publication of the Directives, market demand for existing building retrofit has increased remarkably in recent years. Besides that, since energy certificates are compulsory for transactions (i.e. purchase and tenancy), potential building buyers and tenants can have an overview of building's energy performance and preliminary estimate of future building energy costs. From the perspective of institutions or project case studies, the Berlin Energy Agency and the Rotterdam swimming pool project are interesting examples of bundling together multiple services or projects or combining guaranteed model with trusteeship model.

Interviewees in the project consistently pointed to limited drive for implementing energy efficiency as the single biggest bottleneck to ESCO growth. Many voiced confidence that other existing market barriers to ESCO growth could be solved if demand for energy efficiency were to increase. A number recommended the establishment of mandatory requirements around total energy consumption or unit energy efficiency in the building sector as a way to stimulate demand. The concept of bundling projects was seen as attractive for energy service companies, but a number of practical questions would need to be addressed in establishing a mechanism (e.g., who would have the right to coordinate on behalf of the building owners). There was also a concern that such a mechanism could become overly complex to manage.

> Measurement and Verification Standards

For the M&V hurdle, International Performance Measurement and Verification Protocol (IPMVP) provides an international reference. Besides basic information of energy-saving measurement and verification theory, IPMVP includes not only 4 programs (A, B, C and D) on energy-saving measurement, but also real cases for each program. This is the core information that would be most helpful in actual practice. Energy user and energy service company can select appropriate measurement methodology through the case studies. Moreover, IPMVP also includes a special Q&A chapter on common questions, which helps participants avoid disputes in M&V and enhances the overall quality of ESCO project.

Interviewees encouraged further work in China to analyze whether there is a possibility to improve current standards of energy-saving measurement and verification especially by providing more references through detailed cases study about ESCO projects. Guidance on impact the common external factors (e.g. weather condition) that influence the energy consumption should also be added into any updates of standards in China. In addition to updating standards, interviewees thought training should be strengthened for professional energy-saving auditors who need to be qualified to diagnose overall energy-saving amounts of a building. It is expected that those auditors should be required to master standards of energy-saving measurements and verification.

> Financing and Bundling

KPMG's international research looked to Belgium's Fedesco for insights on removing barriers to financing. In China, many registered ESCOs are small and medium-sized enterprises and may struggle to secure financing. Most super ESCOs, on the other hand, have been founded by government and/or have been registered as state-owned enterprises, they tend to have better credit ratings and get bank loans more easily. In addition, Belgian government provides external guarantees for Fedesco, which makes it easier to secure bank loans. Lastly, Fedesco has rich experience in building energy efficiency and good human resources, so it is more qualified to evaluate potential projects as well as sub-contractors' technical skills, which further enhances the likelihood of success and bankability of projects..

Besides Fedesco, BEA and BBP were also reviewed for their financing approach. Due to the fact that BEA's investors include government, banks and two utility companies, BEA possesses extra resources in professional evaluation of building

energy efficiency renovations and financing channels. The two utility companies could provide experts of building energy efficiency renovation to help building owners and banks comprehensively evaluate the retrofit plan's feasibility and energy-saving potential. BBP maintains close relationships within Toronto's municipal government and other PE projects. BBP can assist building energy service companies in applying for the relevant funds under Toronto Climate Change Action, which broadens the funding channels of these companies.

According to interviewees with financial institutions, despite the fact that the current market is still not mature, there is interest to enter the market in an appropriate manner. A key priority is to find mechanisms to reduce risk from projects and ESCO clients. Financial institutions generally prefer to cooperate with large ESCO companies such as state-owned enterprises' ESCOs at this moment, for these companies have higher credit ratings and stronger professional teams (in most cases). Compared with small or medium-sized energy-saving service companies, these companies can give more precise evaluation on the future energy-saving amount, which lowers the risk for banks. In addition, bank interviewees also indicated interest in technical support to assess the technology of contract energy management projects when doing the loan evaluation for these projects.

> Accreditation and Market Structure

Lastly, accreditation mechanism is a good way to assure the professionalism and technical skills of energy service companies. Taking NAESCO accreditation for instance, it divides different levels (Energy Service Provider (ESP), Energy Service Company (ESCO) and Energy Efficiency Contractor (EEC)) on the basis of retrofit types provided by energy service companies. If a building owner intends to have the building retrofit comprehensively, then he should choose companies of ESP or ESCO; if he only needs to reform a single system, then companies of EEC level can meet his demand.

The interviewees noted that among the over 2,000 service companies registered with the National Development and Reform Commission, there are very few that are in able to provide a comprehensive and customized energy service package. It is also hard to know the real capabilities of many of the registered companies and some are primarily equipment providers rather than pure ESCOs, so a stronger accreditation system could be useful. An information and awareness-building platform aimed at building owners could also accompany any efforts to update accreditation approaches. Such a platform could share successes and failures amongst ESCO projects and also maintain a "blacklist", which could help bring discipline to the market.

4. Recommendations

The study by KPMG offers the following recommendations to facilitate the development of China's existing building ESCO market:

> Stimulating the market

- **Launch compulsory energy-consumption standards.** The government should consider launching mandatory standards setting quotas for energy consumption, taking into account variations between types of buildings and China's multiple climactic regions. As pre-cursor, the government could require buildings to publicly disclose data on building energy consumption. This measure can help stimulate attention to energy efficiency in the market and build overall awareness.
- **Improve the effectiveness of incentives.** China already has a system of incentives to support ESCOs. However, these incentives could be further improved in terms of their implementation and availability. The relative size of the incentives could also be compared against those offered in other markets to help assess whether increases or changes could potentially further stimulate the market.
- **Increase scale of projects through the use of bundling.** There is merit in exploring how to bundle ESCO building projects in China to attract more ESCOs into the market.

> Enabling the market

- **Improve standards for energy-saving measurement and verification.** Disputes between energy service companies and building owners caused by energy-saving measurement set back the progress of projects and increase perceptions of risk. Improvements to M&V can potentially resolve contract difficulties and increase confidence in projects. Standards should be enhanced to provide more detailed guidance, including through the use of specific case studies to illustrate their application.
- **Innovative financing guarantee mode.** To solve ESCO project's financing hurdle, government or third-party insurance company can build a new guarantee mechanism. This report highlight one example of a model based around changing the nature of the guarantees against loses. Tools to reduce risk can increase the likelihood of smaller ESCOs obtaining financing.
- **Establish accreditation mechanism for energy service companies.** On the basis of the current registration system for energy service companies, an evaluation standard should be developed to support clients in further distinguishing the actual skills and quality of ESCO providers.

Although the ESCO market for buildings in China currently faces various challenges, interviews with experts suggest that there is still potential for broad development. The key target needs to be stimulating interest on the part of building owners and operators in improving energy efficiency. If this can be achieved, then many of the current challenges around financing, standards, and quality of ESCO companies will also move towards solutions.