



ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY

Developing an Energy Efficiency Service Industry in Shanghai

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TABLE OF CONTENTS

1 INTRODUCTION.....	1
2 SUMMARIES OF MAJOR PRESENTATIONS	2
2.1 Review of China's Energy Service Market	2
2.2 Overview of US ESCO Industry: Recent Trends and Historic Performance.....	4
2.3 Energy Efficiency Services Strategies in the Industrial Sector	7
2.4 Promoting Energy Efficiency Services in New Construction	8
2.5 Energy Efficiency Services Strategies in Public/Institutional Sector Buildings.....	9
2.6 Role of Financing in Building an ESCO/EMC Industry.....	11
2.7 Role of Trade Associations and Accreditation Process	13
2.8. Shanghai's Strategy for Energy Conservation and Experience with EMCs.....	16
3 MAJOR FINDINGS	17
4 RECOMMENDATIONS FOR FUTURE ACTIONS.....	19
Annex 1: Workshop Agenda.....	23

LIST OF FIGURES

Figure 1: Project Investments from Three Demonstration EMCs in China.....	3
Figure 2: US ESCO Market Trend.....	5
Figure 3: US ESCO Market by Contract Type.....	6
Figure 4: Japanese ESCO Market	15

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Developing an Energy Efficiency Service Industry in Shanghai

1 INTRODUCTION

The rapid development of the Chinese economy over the past two decades has led to significant growth in China's energy consumption and greenhouse gas (GHG) emissions. Between 1980 and 2000, China's energy consumption more than doubled from 602 million to 1.3 billion tons of coal-equivalent (NBS, 2003). In 2000, China's GHG emissions were about 12% of the global total, ranked second behind only the US. According to the latest national development plan issued by the Chinese government, China's energy demand is likely to double again by 2020 (DRC, 2004), based on a quadrupling of its gross domestic product (GDP).

The objectives of the national development plan imply that China needs to significantly raise the energy efficiency of its economy, i.e., cutting the energy intensity of its economy by half. Such goals are extremely ambitious, but not infeasible. China has achieved such reductions in the past, and its current overall level of energy efficiency remains far behind those observed in other developed economies. However, challenges remain whether China can put together an appropriate policy framework and the institutions needed to improve the energy efficiency of its economy under a more market-based economy today.

Shanghai, located at the heart of the Yangtze River Delta, is the most dynamic economic and financial center in the booming Chinese economy. With 1% of Chinese population (13 million inhabitants), its GDP in 2000 stood at 455 billion RMB yuan (5% of the national total), with an annual growth rate of 12% – much higher than the national average. It is a major destination for foreign as well as Chinese domestic investment. In 2003, Shanghai absorbed 10% of actual foreign investment in all China (*Economist*, January 17-23, 2004).

Construction in Shanghai continues at a breakneck pace, with an annual addition of approximately 200 million square foot of residential property and 100 million square foot of commercial and industrial space over the last 5 years. It is one reason that China consumed over 60% of the world's cement production in 2003 (NBS 2004)!

Energy consumption in Shanghai has been growing at 6-8% annually, with the growth of electricity demand at over 10% per year. Shanghai, with very limited local energy resources, relies heavily on imported coal, oil, natural gas, and electricity. While coal still constitutes over half of Shanghai's energy consumption, oil and natural gas use have been growing in importance. Shanghai is the major market for China's West to East (natural gas) Pipeline (WEP). With the input from WEP and off-shore pipelines, it is expected that natural gas consumption will grow from 250 million cubic meters in 2000 to 3000-3500 million cubic meters in 2005.

In order to secure energy supply to power Shanghai's fast-growing economy, the Shanghai government has set three priorities in its energy strategy: (1) diversification of its energy structure, (2) improving its energy efficiency, and (3) developing renewable and other cleaner forms of energy. Efficiency improvements are likely to be most

critical, particularly in the near future, in addressing Shanghai's energy security, especially the recent electricity shortage in Shanghai.

Commercial buildings and industries consume the majority of Shanghai's, as well as China's, commercial energy. In the building sector, Shanghai has been very active implementing energy efficiency codes for commercial and residential buildings. Following a workshop on building codes implementation held at LBNL for senior Shanghai policy makers in 2001, the Shanghai government recently introduced an implementation guideline on residential building energy code compliance for the downtown area of Shanghai to commence in April, 2004, with other areas of the city to follow in 2005. A draft code for commercial buildings has been developed as well.

In the industrial sector, the Shanghai government started an ambitious initiative in 2002 to induce private capital to invest in energy efficiency improvements via energy management/services companies (EMC/ESCOs). In particular, the government is developing a policy framework to encourage the use of energy performance contracting as the catalyst to stimulate the market for energy efficiency services. In September 2003, the Shanghai Economic Commission, the Shanghai Construction and Management Commission, the Shanghai Foreign Expert Bureau, and the Lawrence Berkeley National Laboratory sponsored the International Workshop on Energy Efficiency Services Industries to share experiences of energy services industry development in the US, Japan, and China. The major findings of the workshop are summarized in this report.

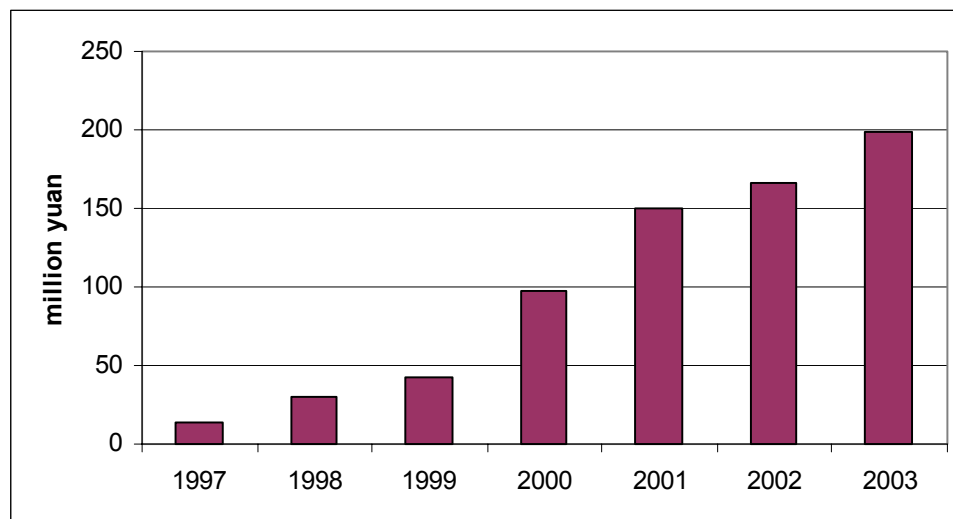
2 SUMMARIES OF MAJOR PRESENTATIONS

2.1 Review of China's Energy Service Market

China has been working with the World Bank (WB) and the Global Environmental Facility (GEF) to promote the ESCO business model in China since 1997. The WB/GEF China Energy Conservation Project aims to introduce market-based mechanisms for energy conservation in China. Phase I of the WB/GEF Project helped China to establish three EMCs, one in the city of Beijing and one each in Liaoning and Shandong provinces, to demonstrate the applicability of the ESCO business model in China.

Wang Shumao, the director of the local WB/GEF project management office, provided an overview of project activities. Over the last few years, the three Chinese EMCs have undertaken over 300 energy efficiency projects, with a total investment of 450 million RMB yuan (US \$54 million). The average payback period for these projects is 1.3 years, with 90% of the projects having a payback period of less than two years.

Figure 1: Project Investments from Three Demonstration EMCs in China



These projects demonstrate the huge potential of energy savings that can be captured through profitable energy efficiency investment in China – on the order of 30 to 40% of China’s current energy consumption. However, most of such investment opportunities are currently unrealized due to a variety of market barriers. Wang identified eight key barriers:

- 1) energy efficiency projects are not the main business activities for most companies;
- 2) energy cost is only a small part of overall cost of business, thus of little interest to business owners;
- 3) many companies lack technical and management personnel familiar with energy efficiency and the cost of acquiring such expertise is high;
- 4) there is a general lack of understanding of energy efficiency technologies, thus companies are not willing to take on the risks;
- 5) with capital scare, most business would deploy capital first to expand their market and production, not to invest in energy efficiency;
- 6) companies lack information on energy efficiency opportunities;
- 7) cost-savings are not directly apparent in corporate accounting; and
- 8) there is a lack of financing from local banks for energy efficiency projects.

In term of financing barriers, Chinese banks typically do not have expertise on energy efficiency technologies and thus lack the ability to assess technical risks; benefits of energy savings are not easily separated from companies’ cash flows; energy efficiency investments are typically small and come with high transaction cost; collateral values of energy efficiency projects are relatively low; and EMCs lack adequate credit history.

Building on the success of the three existing EMCs, Phase II of the WB/GEF Project aims to foster a host of new EMCs and the development of an ESCO industry in China. In addition to capacity-building activities for potential EMCs, Phase II has developed a Guarantee Facility to address the financing difficulties for emerging EMCs. The

Guarantee Facility is designed to leverage lending from domestic commercial banks to create a large pool of capital for energy efficiency projects.

Zeng Shanyou, the president of China Economic and Technical Investment Guarantee Corporation, which manages the WB/GEF Guarantee Facility, stated at the meeting that the WB/GEF Guarantee Facility (funded by GEF at US \$22 million) is designed to operate on a commercial basis. Therefore, an effective risk mitigation strategy is critical not only to provide EMCs sufficient guarantee to secure commercial loans, but also to protect the capital of the Guarantee Facility.

The Guarantee Facility will be the first risk-taker in case the cash flows from the energy efficiency projects are insufficient to cover loan payments to the lenders. This arrangement will greatly reduce the risk to lenders, thus making it easier for banks to make loans to EMCs for energy efficiency projects. In the current trial period, the Guarantee Facility will cover 90% of the loan amount, up to 10 million RMB yuan for any single project.

Sun Hong, the president of Shandong Energy Management Company, presented the experience of her company in pursuing energy efficiency projects in the Shandong province. She emphasized that capacity-building, market-positioning, and risk-mitigation are three critical areas for emerging EMCs. EMCs need to develop internal technical expertise in energy efficiency technologies to differentiate themselves from potential competitors. They also need to understand the potential market for energy efficiency services and identify the appropriate market segments to match their technical expertise. Over the last few years, the Shandong EMC has targeted large industrial users in iron and steel, petrol-chemical, and construction material industries, and has developed specific products lines to serve these end-users.

Furthermore, EMCs need to develop their unique risk management strategies to mitigate customer credit risks, engineering risks, performance risks, and policies risks. She believes performance-contracting offers win-win solutions for promoting energy efficiency in China. Government agencies should do more to raise the societal awareness of energy conservation and help create a more attractive business environment for EMCs.

2.2 Overview of US ESCO Industry: Recent Trends and Historic Performance

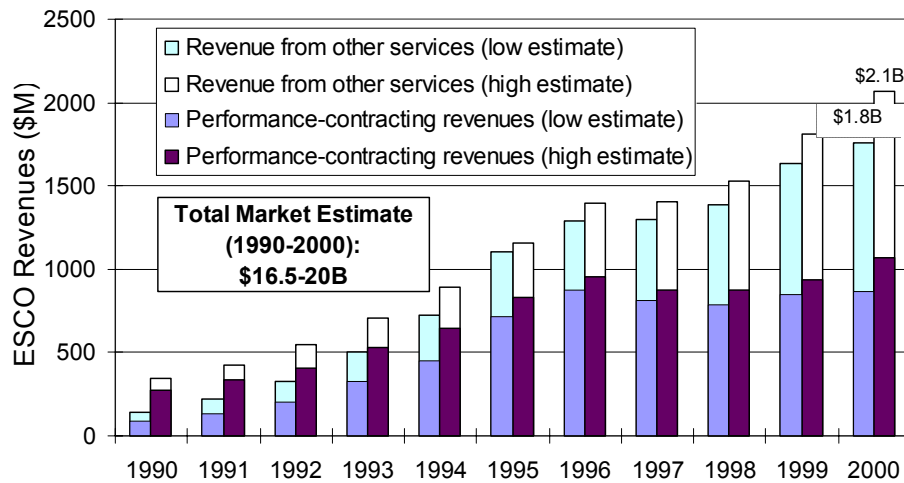
Charles Goldman of Lawrence Berkeley National Laboratory (LBNL) summarized the historical development of ESCOs in the US. ESCOs are businesses that offer improvements in end-use energy efficiency by combining engineering expertise with financial services. Performance-contracting – in which the ESCO's compensation is tied to project performance – is a core part of an ESCO's business plan.

The US ESCO industry began in the 1980s in response to utility demand-side management (DSM) programs, which offered incentives to promote the installation of energy efficiency technologies. In the 1990s, the US ESCO industry went through rapid growth and consolidation. Some utilities started to set up ESCO subsidiaries as well. Since 2000, many ESCOs have broadened their business scope to include more onsite

generation, load management, and commodity procurement services, in response to restructuring and competition in the electric utility industry.

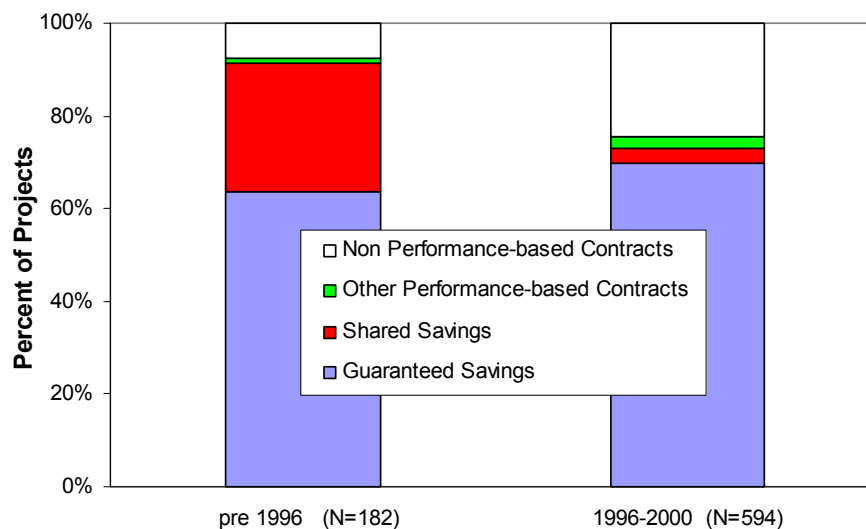
Annual project investment reached \$2 billion in 2000, after strong growth in the 1990s. Most activity (~75%) is in the institutional sector (schools, universities, government, and hospitals). U.S. ESCOs have been less successful in the private (e.g., industrial) sector. Lighting and HVAC measures are by far the most common US ESCO projects, due to the nature of institutional facilities and replicability of project design.

Figure 2: US ESCO Market Trend



There are two common models of performance-contracting: *guaranteed savings* and *shared savings*. Performance-contracting comprises an important but decreasing portion of ESCO business. *Shared savings* projects have been replaced in market share by *design/build* contracts; *guaranteed savings* projects have remained stable. Transaction costs of performance-contracting are high at 20-40% of total project costs; therefore, ESCOs are only interested in large projects (0.5 to several million US dollars).

Figure 3: US ESCO Market by Contract Type



Many state and federal policies have facilitated the growth of ESCO industry in the US. Ratepayer-funded energy efficiency programs provide incentives for adoption of energy efficient technologies as well as customer education and technical assistance. ESCO reliance on these programs has lessened as funds have decreased and the industry has matured. State performance-contracting legislation, adopted in 46 states, favors life-cycle best-value procurement over lowest-cost bids, allowing state agencies to enter into multi-year contracts. On the federal level, Executive Orders mandate target-based energy-efficiency improvements in federal facilities. Energy Savings Performance Contract (ESPC) programs pre-qualify ESCOs for indefinite-delivery, indefinite-quantity (IDIQ) contracts, reducing the transaction costs of working in the federal market. And the Federal Energy Management Program (FEMP) champions energy efficiency among federal agencies and supports ESPC programs.

Lessons Learned

The U.S. ESCO industry has been successful in institutional markets. Setting appropriate energy prices only is not enough to encourage a self-sustaining ESCO industry: government policy support and market development programs have been critical in the U.S. Prerequisites for a successful industry include: well-established contract law, access to local, long-term financing at reasonable rates, and good relationship with customers. The bottom line is that each country is unique: ESCOs have proven adaptable to a changing environment in the US and can do so successfully elsewhere.

Reactions/Questions

The Chinese participants in the workshop noted that, in Shanghai, there is interest in capturing comprehensive benefits: thus, there is a need to recognize that the private sector (i.e., ESCOs) will capture only that benefit which is economically attractive. Additionally, the reduction of peak load is a prime concern in Shanghai. Thus, it is

desirable to optimize the timing of electricity (and gas) use and provide benefits for electricity peak reductions.

2.3 Energy Efficiency Services Strategies in the Industrial Sector

In contrast to international experience where the industrial sector has been the focus of ESCO activities, the great majority of US ESCO activities are in the institutional market. Robert Dixon of Siemens Building Technologies pointed out several barriers to implementing industrial sector projects. Infrastructure energy costs are often small compared to process energy costs, and process improvements are far more customized than building improvements. Industrial customers also believe that they have the internal expertise with respect to industrial processes, and thus do not need assistance from ESCOs. Short planning horizons and dispersed corporate decision-making processes are also impediments to energy efficiency projects which could take a long time to plan and execute.

In order to succeed in the industrial market, ESCOs need to build subject matter expertise (on specific industrial processes), engineering skills to implement complex projects, and financial strength. Performance guarantees are also critical. In contrast to the building sector, non-standard technologies often drive opportunities in the industrial sector (e.g., waste-to-energy, compressed air, and etc.).

Thomas Dreessen of EPS Capital Corporation reported on his first-hand experience in establishing industrial sector ESCOs in international markets, including India and Thailand. A joint venture model between a local company and a US ESCO has proven successful. The local company provides market credibility and access to current customer distribution. The US ESCO brings experience in industrial markets and provides engineering, commercial, legal, financing, and risk management expertise. The US partner also provides access to new “proven” technologies.

Ingredients for success in an industrial performance contract include extensive interaction with client operators; critical reviews and formal approval process with client executive management; clearly defined measurement and verification (M&V) protocols; measured baselines for each component in the project; implementation details; and a financial plan. So far, the *guaranteed savings* model is the predominant financing structure in EPS Capital Corporation’s international projects.

While performance-contracting is relatively new in international markets, customers are attracted to the potential benefits of such mechanisms. Energy efficiency projects structured under performance-contracting provide positive cash flow and can be financed out of existing operating expenses; owners receive the newest “proven” technologies to reduce GHG emissions, and experience reduced work stoppages, increased production capacity, and improved product quality.

Lessons Learned

To create a successful new ESCO, it is necessary to determine its market focus and develop a plan around that focus, to create a specialized sales and technology strategy,

and to obtain the core technical competency that matches the market and technology focus. For industrial ESCOs, it is further required to acquire specialized expertise in technologies that improve per-unit energy costs, experienced “Sales Process” and “Deal Making” personnel, sophisticated contract and legal negotiating experience, ability to develop creative project financing structures, and capability to track project costs in a timely and accurate manner.

Reactions/Questions

Workshop participants were concerned with the causes for low industrial sector penetration in the US, chiefly because it is expected that ESCOs will target the industrial market in Shanghai. The speakers emphasized that US industrial penetration is only 7%, and mostly due to two factors: (1) industry “knows it all”, and (2) the institutional market is the path of least resistance. However, Shanghai’s industries may not have optimized their processes to the level of US plants, so it is possible that the former point will be less of an issue in Shanghai. The potential for development of the institutional market in Shanghai has not yet been explored, so it is possible that in the near term the industrial sector truly does represent the greatest opportunity.

Attendees also asked, “Which adds more value – the ESCO business model or expanded technical capabilities?”. Both speakers agreed that the business model is the key to ESCO success. Engineering expertise has been available for a long time (and continues to be provided by non-ESCO companies). The real value of an ESCO is “innovation to facilitate new markets.”

Workshop participants also inquired about ESCO failures in the US and how they had been dealt with. The speakers emphasized that the industry has produced billions of dollars of successful projects. From their individual companies’ perspectives, savings guarantee that shortfalls are only in the range of 0.1%. Those shortfalls that occur are attributable to ESCOs’ lack of control over internal factors such as energy analysis and project structuring. In truth, ESCOs are conservative in their energy savings guarantees, and the industry as a whole has established standards (International Performance Measurement and Verification Protocol (IPMVP), National Association of Energy Service Companies (NAESCO) code of ethics, NAESCO accreditation). Furthermore, while energy savings may erode over time, this is usually counterbalanced by rising energy prices, which makes it easier for ESCOs to meet their savings guarantees.

Finally, it was asked whether the speakers intend to start up operations in China. They pointed to the lack of financing infrastructure as the largest barrier to ESCO market entry and explained that ESCOs will not risk their working capital unless financing is assured.

2.4 Promoting Energy Efficiency Services in New Construction

Robert Watson, of the Natural Resources Defense Council (NRDC), pointed out that the new construction market offers the best opportunities to cost-effectively reduce building energy use and its impact on the environment, because the marginal cost of raising building energy efficiency is lowest when they are first built. If such opportunities are

not captured, resource waste could go on for many years due to the long lifetime of buildings.

However, historically, ESCOs have played only a minor role in the new construction market, due to several factors. ESCOs are not typically connected to new building owners and their decision-making processes. They are often called in to reduce buildings' operating cost after the buildings have been built and operated for some time. Performance-contracting may not be appropriate for new construction projects due to the lack of baseline energy performance data. Also, ESCOs are typically too small to take on major new construction projects and their focus is too narrow – typically targeting only energy costs.

Watson suggested that Shanghai needs to develop a comprehensive market transformation strategy for improving building energy efficiency with the following components: 1) energy efficient building demonstrations, 2) technical development of standards, 3) “early adopter” incentive programs, 4) training for building sector and code officials, 5) implementation and enforcement of building codes, and 6) increased stringency of the codes.

He also emphasized that building codes implementation is more important than the stringency of the codes. Incentive programs for “early adopters” or buildings that go beyond the existing codes are important tools that promote code implementation.

2.5 Energy Efficiency Services Strategies in Public/Institutional Sector Buildings

Donald Gilligan of Predicate observed that the public and institutional buildings markets can be attractive to ESCOs, complementing the industrial markets that the first Chinese EMCs are targeting. He described the barriers to, and advantages of, public/institutional markets, the enabling legislation required to facilitate ESCO entry into the public/institutional markets, the critical market success factors, and the elements of a model program.

The barriers to establishing an ESCO business in public/institutional markets include the no-risk environment inhabited by public agency managers, their long and complex decision-making processes, their established procurement practices for construction services, and the generally longer paybacks for energy efficiency projects in public/institutional buildings.

However, the advantages of public/institutional markets, when compared to industrial markets, are customer stability and credit, long customer time horizons, and a strong public interest in energy efficiency measures, which lower the operating costs of public facilities.

Public/institutional buildings programs usually require exemptions from public bidding laws in order to permit negotiated performance contracts. It is therefore important to have a “champion” within government program with strong connections to government executives and substantial technical/financial expertise.

The critical success factors for public/institutional buildings programs include the identification and minimization of project risks for both the customer agency and the ESCO; the identification and removal of program bottlenecks (usually identifiable individuals in either the buildings management or treasury agency); an emphasis on energy efficiency as a way for building managers to generate cash flow to pay for needed capital improvements; and, published, transparent program rules and regulations with accelerated decision timetables.

Model Program

A distillation of experience in US state and federal public/institutional buildings programs has produced a model program that features:

- a) a pre-qualified ESCO list;*
- b) a “champion” agency that assists institutional sector customers in developing and implementing projects;*
- c) a reasonable competitive structure that gives customers the ability to choose between ESCOs without undue burden;*
- d) standard project contract terms, pre-approved by both ESCOs and the sponsoring government; and*
- e) sufficient financing, with relatively simple terms and application processing, to implement the projects developed in the program.*

Steve Morgan, of Ameresco, described his company’s experience with energy efficiency projects in institutional buildings. He has found that customers in this market are often driven by the following concerns: electric reliability (and therefore interest in distributed generation), energy price volatility—given their need for stable costs because of annual budgeting of agencies; inadequate capital for the replacement of aging equipment; government mandates to cut energy usage and costs; and reductions in government budgets due to economic recession and the need to search for operational savings.

Most institutional sector retrofits target basic building functions such as lighting, space conditioning and water heating. Typical installed measures include: lighting retrofits, HVAC retrofits, controls/energy management systems, boilers and chillers; motors/drives, building envelope (insulation, windows, and doors), appliances, and water conservation measures. In addition, public building projects also offer ESCOs long-term service and maintenance opportunities including fuel procurement.

Morgan concluded that in the US, the institutional sector is the best fit for ESCO services. Technology and financing options are ESCOs’ strongest offerings. Flexibility in responding to individual client needs is important. The long-term nature of the relationship provides solutions to emerging needs.

Robert Dixon of Siemens Building Technologies pointed out several distinct barriers to implementing energy efficiency projects in the institutional market. Laws often prevent long-term contracts, and procurement is based on lowest bid rather than being value-based. The bidding process is long, and life-cycle cost-effective measures may not be

implemented. Laws prevent long-term debt, limiting financing options. Buyers are often uninformed and risk-averse. There may be many “buyers” in one agency – a single person can stall a whole project.

However, several states in the US have developed “Best Practice” models. For example, the states of California and New York have successfully implemented performance-contracting programs. Key elements of these programs include:

- Enabling and encouraging legislation (laws, goals/mandates),
- Expanded contract terms (12-15-18 years),
- Significant and technology-based state funding contributions, and
- Broad definitions of allowable technologies.

Ingredients for Success in the Public Sector	
<u>Needed Framework</u>	<u>Advantages to Customers</u>
<ul style="list-style-type: none"> - Enabling legislation - Encouraging legislation - Clear goals and timelines - Local champions - Strong ESCOs - Financial providers willing to support long-term energy projects - Patience 	<ul style="list-style-type: none"> - Program works with existing budgets - Limited capital funding required - Risk avoidance – shifts risk to ESCO - Allows clients to focus on core challenges - Saves money and time - Guaranteed financial results

Reactions/Questions

Workshop participants asked how ESCOs ensure that energy efficiency is maintained. Speakers noted that the performance contract arrangement helped to ensure that the customer’s bill savings from energy efficiency projects was maintained, either because the ESCO performed ongoing Operations and management (O&M) procedures, trained customer staff in O&M procedures for installed equipment, or guaranteed a certain level of dollar or energy savings.

Attendees also asked whether incentives for ESCOs are provided through laws and/or regulations. Financial incentive programs are typically funded by utility ratepayers, and often are targeted to customers, not ESCOs. In the utility DSM era, they were funded through a portion of the utility’s revenue requirement (this is still the case in some states), while many states that have deregulated their electric industries have legislated a public benefits surcharge on customers’ bills to fund energy efficiency incentive programs.

2.6 Role of Financing in Building an ESCO/EMC Industry

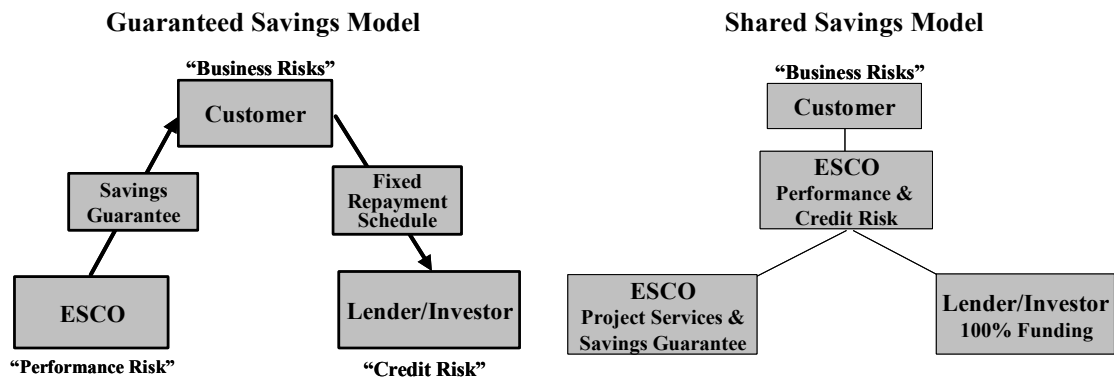
Thomas Dreessen of EPS Capital Corporation highlighted the role of financing in the success of the ESCO industry. He also pointed out the distinction between ESCOs and banks in project financing: an ESCO is a service company, not a bank!

Project financing is the critical ingredient for development of an ESCO industry. An ESCO cannot invest its working capital to develop and implement energy efficiency projects unless reliable and commercially viable long-term project financing is readily available in the local market. Lack of local sources of project financing is the most significant barrier to building an ESCO/EMC industry.

The lack of reliable and commercially viable long-term financing for energy efficiency projects will preclude development and growth of an ESCO industry in new international markets because it necessitates the use of the *shared savings* business model. The cause of this financing barrier is not a lack of available funding capacity. Rather, it is an inability to access existing funds due to a fundamental disconnect between traditional asset-based lending to corporations vs. cash flow-based financing to energy efficiency projects. Breaking down this barrier is difficult because energy efficiency markets are not sufficiently developed to interest local banks in investing in setting up an energy efficiency project lending infrastructure.

Guaranteed Savings vs. Shared Savings Models

Under a *guaranteed savings* contract, the customer assumes “business risk” (market risk), the ESCO assumes performance risk, and the bank holds the credit risk. A *shared savings* contract differs in that the ESCO assumes both the performance and credit risks.



It is important to assign risks to those who can best manage them – and banks can manage credit risk far better than an ESCO – because doing so reduces overall costs. For this reason, the *guaranteed savings* model is now used for 90% of performance contracts in the US.

The *shared savings* structure is a good introductory model for developing markets because the customers assume no risk; however, it limits long-term growth and competition of the ESCO and financing industries. The *guaranteed savings* structure is difficult to use in introducing the ESCO concept to developing markets because it requires customers to assume investment repayment risk; however, it does foster long-term growth of the ESCO and financing industries.

Dreessen offered the following policy recommendations to address the financing challenge for ESCOs in international markets. First, interested government agencies and other industry stakeholders should develop an International Energy Efficiency Financing

Protocol (IEEFP) that becomes the “blue print” for local and regional financial institutions to finance end-use energy efficiency projects. The IEEFP would establish and standardize:

- Procedures for evaluating energy efficiency projects,
- Risk assessment guidelines,
- Investment criteria,
- Loan, security, ESCO, and construction agreements, and
- Loan applications and data.

Secondly, interested governments should create a Financing Fund for energy efficiency projects funded by a national charge on energy costs that becomes a market driver for local banks to establish an energy efficiency lending infrastructure and for end-use consumers to implement energy efficiency projects. The funds could be used to increase bank returns, guarantee loan losses, and cover extended repayment terms for local banks that utilize the IEEFP, and/or buy-down interest rates for customers.

These policies would provide several benefits: standardize credit analysis and approval; create a sustainable commercial lending sector for financing energy efficiency projects; train local/regional banking staff to finance energy efficiency projects (capacity-building); eliminate or shift currency devaluation risk away from ESCOs; and assist in rapid development of an ESCO industry.

Reactions/Questions

Workshop participants pointed out that although there are problems with the *shared savings* model, Shanghai cannot wait for the local banking industry to develop its project financing infrastructure before implementing energy efficiency projects, and inquired whether it is possible to get foreign investors to contribute and manage this fund. Shanghai, however, is not short of funds – the Bank of Shanghai was present at the workshop. The speaker again stressed the importance of obtaining *local* financing for ESCO projects.

The question of the *legal* assurance that savings persist was raised as well. The speaker emphasized that the ESCO must have the authority to provide project maintenance (often through a second party) in order to maintain control over savings.

It was also asked whether ESCOs in the U.S. are licensed. Most jurisdictions do not have licenses for ESCOs, although there are professional licenses for engineers. The closest proxy to a license for ESCOs would be NAESCO’s voluntary accreditation program – which grants accreditation to qualified ESCOs in the US.

2.7 Role of Trade Associations and Accreditation Process

Donald Gilligan, of Predicate LLC, described the role of trade associations in fostering growth of the ESCO industry. NAESCO is a twenty-year-old national association in the US, with about 120 members, including ESCOs, equipment manufacturers, engineering

firms, energy consultants, utilities, and finance companies. NAESCO membership has been fairly stable during the last decade.

NAESCO provides several important benefits to its members. At its semi-annual conferences, NAESCO presents a program of speakers that educate members about the broad trends in the national economy and in the energy industry that will affect ESCOs, as well as an afternoon of presentations and an exhibitor hall that acquaint ESCOs with new energy efficiency products and services and offer vendors the opportunity to network with ESCOs. Additionally, NAESCO leads the ESCO industry's efforts to develop quality control standards, such as the IPMVP, and represents the interests of the industry in state and national legislative and regulatory proceedings.

NAESCO also provides a bridge between the ESCO industry and the federal and state governments. While lacking the financial resources to aggressively lobby on most legislative and regulatory issues, NAESCO focuses on broad policy initiatives that focus state and federal energy efficiency resources on programs that really work, and works to help its members understand the business implications of energy industry restructuring across the country.

NAESCO operates a rigorous accreditation program for ESCOs, which consists of a formal application (including extensive technology listings, savings analysis, operational analysis, M&V analysis, and contract exhibits on up to 50 projects) by an ESCO to an independent committee. ESCO references are checked on up to 10 projects, and the submitted project data is incorporated into a national ESCO project database which is maintained, under contract with the US Department of Energy, by the Lawrence Berkeley National Laboratory. The 18 currently accredited ESCOs find that accreditation provides them with marketing benefits, and potential ESCO customers find that accreditation provides useful quality assurance and pre-qualification for bidders' lists.

Chiharu Murakoshi, of the Japanese Association of Energy Service Companies (JAESCO), presented an overview of the progress of Japanese energy efficiency services industry and the role of JAESCO.

The Japanese ESCO industry was first established in 1996. By 2000, there were 20 ESCOs doing business; all are large companies or subsidiaries of large companies. Central and local governments are seen as the largest future market, although there is little activity to date.

Barriers to ESCO industry development in Japan include limited access to financing and customers' organization structure and their decision making processes. Most projects are self-financed – limiting the size of the market. Financial institutions are accustomed to asset-based lending – they do not understand ESCO contracts and are not accustomed to making small loans. These financing barriers must be addressed if the industry is to grow.

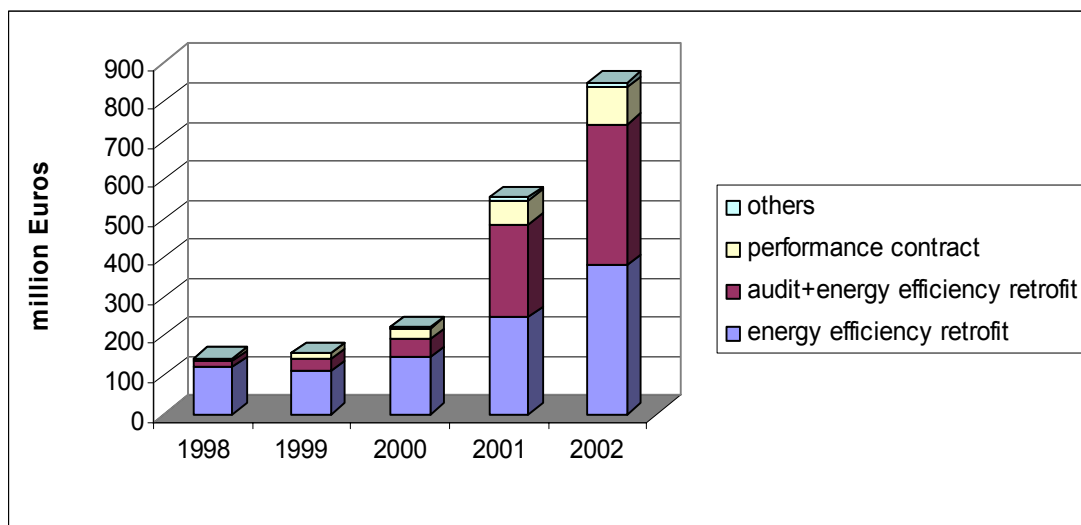
Most organizations budget on a single-fiscal-year basis, and the recognition and consent of layers of management are needed to take on long-term investments. Facility managers often have to explain the ESCO model to superiors and senior managers.

JAESCO is founded in 1999 to promote the ESCO market development, to provide information and education on ESCOs, to facilitate communication among members, to support R&D for ESCO-related energy efficiency technologies, and to provide mediation services for ESCO business dispute settlements.

JAESCO also publishes a newsletter, organizes annual conferences, exhibitions and vendor showcases, provides seminars for members, and accredits qualified ESCOs. JAESCO has organized and led ESCO study missions to the US for member companies and developed the scheme to execute performance contracts within local government agencies.

Murakoshi concluded that in the 7-year history of ESCOs in Japan, both the number of companies and projects have increased rapidly. JAESCO's efforts in strengthening government support are drawing attention to the industry. The ratification of the Kyoto Protocol is seen as an important driver for energy efficiency projects and ESCOs in Japan. Financing and customer administrative practices are key problems yet to be solved.

Figure 4: Japanese ESCO Market



For successful development of an ESCO industry in China, he suggested that emerging ESCOs should stick with traditional ESCO concepts (performance-contracting) until the market is established. Government needs to establish support for the industry such as providing adequate financing for energy efficiency projects, and government markets could be developed first.

Reactions/Questions

Workshop attendees wondered whether NAESCO accreditation assesses the ESCOs' technical expertise. Speakers responded that ESCOs' technical competence to manage all aspects of performance contracting projects – including project design, construction, M&V of savings, and O&M across major end use technologies – is verified through the accreditation application and customer reference interviews. Technical expertise with

specific industrial processes, however, is not typically evaluated by the accreditation committee, unless ESCOs submit projects from industrial customers.

In response to other questions, it was established that NAESCO/JAESCO members can be non-ESCO companies. If a company is not an ESCO but calls itself one, the association does not have any real recourse. However, it was pointed out that less ethical companies tend to avoid the organization altogether. NAESCO and JAESCO are voluntary associations and are not certified by governments.

2.8. Shanghai's Strategy for Energy Conservation and Experience with EMCs

Chen Jinhai, the director of Energy Conservation and Environment Protection Division, Shanghai Economic Commission, described Shanghai's three-year development plan for the ESCO industry. The Shanghai Contract Energy Management Committee (SCEMC) was established in 2002 to coordinate policy formulations among Shanghai government agencies to stimulate ESCO industry development. Shanghai plans to start an education campaign for all major energy users in Shanghai, and to select 150 major users for energy audits and in-depth analyses of energy conservation potentials. A network of 300 experts has been established to provide advice to government agencies and energy users. Shanghai also plans to implement 36 demonstration projects in 10 selected sectors to showcase innovative energy conservation technologies and financing under performance contracting. Shanghai's government has allocated 10 million RMB yuan for interest subsidies for energy efficiency projects, with the target to leverage 400 million yuan worth of project investment. By the end of the three-year period, Shanghai hopes to nurture 10 EMCs to serve the local market. A major conference has also been planned for 2004 to summarize and propagate the experience learned in various promotion activities targeted at the ESCO industry.

Wang Baohai, the director of Shanghai Building Energy Conservation Office, laid out the plan for promoting energy conservation in the building sector in his presentation. Over the last few years, Shanghai has added on average 20 million square meters of new housing every year, with another 10 million square meters of commercial and industrial buildings. As a result, building energy use has risen to about 16.8% of Shanghai's total energy use. It is anticipated that the pace of city construction will remain robust up to the 2010 World Expo, and the share of building energy use is likely to rise 1% per year.

The pace and the amount of new construction present enormous challenges as well as opportunities for promoting building energy efficiency in Shanghai. Shanghai has developed a multi-pronged strategy to promote building energy use efficiency. First, Shanghai has set a target of 100% compliance by 2005 for all new housing to meet the national energy codes for residential buildings for the hot-summer-cold-winter zone. In 2002 and 2003, 1 and 3 million square meters of demonstration projects have been built, respectively, to meet the national residential building energy codes. In 2004, all new housing built within the inner city proper will meet the national residential building energy codes.

Second, energy codes for commercial (e.g., retail, hotel, and office space) and public buildings have been developed and are scheduled to be implemented by the end of 2003.

Thirdly, to facilitate the implementation of the residential building energy codes, compliance software has been developed and put into trial operation. Fourthly, Shanghai has accumulated a wealth of experience with a multitude of insulation technologies in various demonstration projects and is ready for mass-market deployment of these technologies.

Finally, Shanghai has issued the *Management Methods for Residential Building Energy Conservation Certification in Shanghai* and *Shanghai Residential Building Energy Conservation Measurement and Evaluation Protocol*. Buildings meeting this protocol may receive labels and other preferential benefits.

Ye Wenbiao, the president of Shanghai Energy Conservation Technologies and Service Corporation (SECTSC), presented a case study of using performance contracting in Shanghai. His company, was the first ESCO in Shanghai, with had sales of 16 million RMB yuan over 14 projects implemented over the last two years. In one of its projects, SECTSC helped a pharmaceutical company to renovate its water circulation system. The project reduced their power use from 269 kW to 100 kW, with estimated annual savings of 1.2 million kWh per year. Cost savings are significant for the clients, even after payment made to SECTSC.

However, Ye indicated that new EMCs face significant challenges. Project development cycles are long, and project financing is hard to get, making it difficult for new EMCs to earn a profit. He suggested that the government should set up a special fund to provide loans or loan guarantees for new EMCs, to broaden energy audits for major energy users, and to publicize the results of relevant enforcement actions.

Xie Zhonghua, of Shanghai Contract Energy Management Committee (SCEMC), presented its plan for the near future. He estimated that the market for energy efficiency services is about 80 billion RMB yuan in China. The SCEMC intends to nurture a host of local and joint-venture EMCs in Shanghai over the next three years, and implemented several demonstration projects in government, hospital, supermarket, and buildings sectors. Further, SCEMC would like to facilitate the development of a platform for EMCs, equipment suppliers, control technologies providers, and financial and legal services providers to work together. Moreover, SCEMC is considering drafting basic qualification requirements for new EMCs, including equity, credits, staff level, and other qualifications.

3 MAJOR FINDINGS

The Workshop provided an excellent opportunity for international experts, Shanghai government decision-makers, local and international companies interested in the ESCO business, and other interested stakeholders to share their experiences and exchange ideas on best strategies to stimulate the development of a local energy efficiency service industry in Shanghai. Several salient themes emerged during the two days of discussions among workshop participants.

There are huge potentials for profitable energy saving both in China and the US.

These savings can be captured by investing in existing energy efficient technologies. According to the WB/GEF China Energy Conservation Project, such savings are estimated to be in the range of 30 to 40% of China's current energy consumption. Based on China's energy use in 2000, this potential is about 390 to 520 million tons of coal equivalent.

These potentials are mostly unrealized due to a variety of market barriers. These market barriers include lack of information about energy efficiency technologies, lack of awareness of energy conservation potential on the part of business and property owners, and lack of adequate financing from the local commercial banking industry.

Government can play an active role, through enabling policies, to remove the market barriers to investment in energy efficiency. Experience from the US, Japan, China, and elsewhere, have demonstrated that energy price signals alone are not enough to motivate private investment in energy efficiency projects. Government agencies need to develop enabling policies and incentives to stimulate private investment in energy efficiency.

While institutional buildings have been the focus of the US ESCO industry, the industrial sector could be equally important to the emerging EMCs in Shanghai and China. Industries still dominate energy use in China, and energy intensities in many Chinese industries are higher than those in the developed economies. Therefore, it is natural that early entrants in China's energy efficiency service business have targeted large industrial users. However, with the ongoing building boom in Shanghai, energy efficiency opportunities are large in the building sector as well.

Performance-contracting offers a “win-win” market solution to improve energy efficiency both in China and in the US. Initial experience in China and over the last few decades in the US have demonstrated that performance-contracting – the core of the ESCO business model – can be highly effective in stimulating investment in energy efficiency in end-use sectors, with the additional benefits of enhancing comfort and productivity, reducing operating costs, and creating new job opportunities.

Creating viable long-term financing mechanisms is critical to the successful development of an energy efficiency service industry. The strength of ESCOs is their expertise in providing technical and financial services. Without adequate financing from commercial banks or other financial sources, the growth of the energy efficiency service industry will be limited. Therefore, developing new financing mechanisms either with local banks or by setting up a special fund for energy efficiency projects is an essential ingredient of a strategy to promote the development of an energy efficiency service industry in Shanghai. Additional funding from government agencies could also be used to facilitate commercial lenders in building their capacity for lending to energy efficiency projects, in providing partial or full risk coverage, or providing interest subsidies for the owners of energy efficiency projects.

Emerging EMCs need to build subject expertise in energy efficient technologies and develop risk management, contracting, and financing capabilities in order to succeed in the market.

An industry trade association could play a constructive role in facilitating industry growth by providing training and accreditation services, interacting with government agencies on enabling policies, and developing standard contract and measurement and verification protocols.

4 RECOMMENDATIONS FOR FUTURE ACTIONS

China's past success in energy conservation and recent experiments with energy performance contracting have demonstrated the vast potential of reducing energy waste and improving energy efficiency in the Chinese economy. Energy performance contracting has proven to be an effective market-based solution for capturing a portion of that potential. Fostering the growth of a viable energy services industry should become an important part of government's overall strategy to improve energy efficiency and to ensure the energy security of Shanghai's – as well as China's – economy.

In order to facilitate the healthy development of a local energy services industry, the Shanghai government needs to adopt a set of policies that help remove market and institutional barriers to the investment in energy efficiency projects.

An information and educational campaign targeting major industrial and commercial users of energy is only the first step. Government-sponsored or -facilitated demonstration projects will help to showcase energy efficient technologies and practices and the economic attractiveness of adopting these measures. Shanghai's plan to select 150 major energy users for energy audits and to conduct feasibility studies for energy efficiency retrofits as well as to implement 36 demonstration projects over the next three years should certainly help to create a market demand for energy efficiency services.

Lack of financing remains a major barrier to the implementation of energy efficiency projects in Shanghai and China as a whole. Shanghai's proposal to set up a special fund (10 million RMB yuan) for interest subsidy should help to address this issue. However, it is even more important to create a new financing protocol with local banks and financial institutions to facilitate loans for energy efficiency projects. The interest subsidy incentive should be tied to the use of such financing protocols for energy efficiency projects. Such a link would facilitate the emergence of a industry standard project financing model and thus reduce the transaction costs for financing energy efficiency projects.

In addition, Shanghai should consider the creation of an energy efficiency fund via an energy tax or a surcharge on electricity to fund the development of the energy efficiency services infrastructure and support activities over the long term. Such long-term sources of funding have been instrumental in stimulating private sector investments in energy efficiency in the US and elsewhere.

Considering the enormous scale of building construction (approximately 300 million square feet per year) in Shanghai, the city should also adopt policies to encourage the incorporation of energy efficiency design in new buildings. Incorporating such efficient designs initially could significantly reduce the later incremental cost of improving building energy efficiency and total energy use over a building's life-cycle. Developing, implementing, and enforcing building energy codes and equipment standards should be given high priority. Providing incentives for buildings to exceed the minimum code requirements are also effective policies.

Shanghai should also consider creating a Standard Performance Contracting program for government and other publicly financed buildings. Experience of the US ESCO industry has shown that such programs have played a very constructive role in facilitating the growth of the energy efficiency service industry, as well as reducing government expenditure and providing needed building improvement.

Energy service industry associations have played important roles in other countries in stimulating ESCO industry development. They have provided education and information on the latest energy efficiency technologies to energy services companies, helped to create industry quality control standards, and represented the interests of the industry in dialogues with government agencies. The Shanghai Contract Energy Management Committee could be organized to serve similar functions, especially in the area of capacity-building for emerging energy management companies and financial institutions, creating industry standards and quality assurance, information collection and dissemination, and policy advocacy. The Committee could also serve as the focal point of international exchanges related to the development of the energy efficiency service industry.

Suggested Reading

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Wang Shumao, 2003, "[World/GEF ESCO project in China](#)," presented at the International Workshop on Energy Efficiency Service Industry, Shanghai, September 8-9, 2003.

Xie Zhonghua, 2003, "[Developing energy performance contracting is developing service economy](#)," presented at the International Workshop on Energy Efficiency Service Industry, Shanghai, September 8-9, 2003.

Ye Wenbiao, 2003, "[Practice and insight of promoting EMC business](#)," presented at the International Workshop on Energy Efficiency Service Industry, Shanghai, September 8-9, 2003.

Annex 1: Workshop Agenda

International Workshop on Energy Efficiency Services Industries

September 8-9, 2003
Shanghai, China

Objectives:

- Summarize experience and lessons learned by U.S. ESCOs and other energy efficiency service providers working in target markets that are of interest to Shanghai
- Examine alternative approaches to creating an energy efficiency services industry or achieving energy efficiency goals, drawing from U.S. experience

Conference Sponsors:

- Shanghai Economic Commission,
- Shanghai Construction and Management Commission,
- Shanghai Foreign Expert Bureau,
- US Department of Energy,
- Lawrence Berkeley National Laboratory.

Day 1: Monday, September 8, 2003

8:30 – 9 AM: Conference Registration

- Deputy Mayor Tang Tengjie will receive international experts and leaders of sponsors and organizers.

9:00-9:45 AM: Opening Ceremony,

- *Chaired by Le Jingpeng,*
- *Deputy Chairman, Shanghai Economic Commission*
- Tang Dengjie, Deputy Mayor, Shanghai
- Xu Jianguo, Chairman, Shanghai Economic Commission
- Cai Zheren, Deputy Chairman, Shanghai Foreign Expert Bureau

9:45-10:45 AM: Session (1) Overview of China's Energy Services Market

Speakers:

- Wang Shumao, Director, World Bank/GEF Project Management Office
- Sun Hong, President, Shangdong EMC
- Zeng Shangyou, Vice President, China Investment Guarantee Corp

10:45-11:00 BREAK

11:00- 12:00 AM: Session (2) Overview of U.S. ESCO industry

Speaker:

- Charles Goldman, Lawrence Berkeley National Laboratory

12:00- 12:15 PM:

Discussant:

- Professor Lin Zhiguang, Shanghai Engineering and Technology University

12:15 – 1:15: LUNCH

PM Sessions: Chaired by Jiang Lin, LBNL

1:15 – 3:00 PM: Session (3) Energy Efficiency Services strategies in Industrial Sector

Speakers:

- Bob Dixon, Siemens Building Technologies, Inc
- Tom Dreessen, EPS Capital Corporation

3:00 – 3:15 PM BREAK

3:15 – 4:45 PM: Session (4) Promoting Energy Efficiency Services in New Construction

Speaker:

- Rob Watson, Natural Resources Defense Council

4:45-5:00 PM:

Discussant,

- Professor Luo Yonghao, Shanghai Jiaotong University

Day 2: Tuesday September 9, 2003

AM Sessions:

- Chair, Sun Jianping,
- Deputy Chairman, Shanghai Construction and Management Commission

9:00 – 10:45 AM: Session (5) Energy Efficiency Services strategies in Public/Institutional Sector Buildings

Speakers:

- Donald Gilligan, Predicate, LLC (and former President of Coneco)
- Steve Morgan, Vice-President, Ameresco - Citizens Conservation Services
- Bob Dixon, General Manager, Siemens Building Technologies, Inc

10:45-11:00 BREAK

11:00 – 11:50 PM: Session 6: Role of Financing in Building an ESCO/EMC Industry

Speaker:

- Tom Dreessen, EPS Capital Corporation

Discussant,

- Professor Long Weiding, Tongji University

12:05-12:15PM: Summary by Chairman, Sun Jianping

12:15 – 1:15 PM LUNCH

PM Sessions: Chaired by Mark Levine, LBNL

1:15 – 2:35 PM: Session (7) Creating an Energy Efficiency Services Industry: Role of Trade Associations and Accreditation Processes

Speakers:

- Don Gilligan, Member of NAESCO Accreditation Committee
- Mr. Murakoshi, JAESCO

2:35 – 4:30 PM: Session (8) Energy Efficiency Strategies/Policies for Shanghai

Panelists:

- Chen Jinhai, Director, Shanghai Energy Performance Contracting Office
- Wang Baohai, Director, Shanghai Building Energy Conservation Office
- Ye Wenbiao, Director, Shanghai Energy Conservation Service Center,
- Xie Zhonghua, Shanghai Energy Performance Contracting Office

Discussant,

- Shen Longhai, deputy director, WB/China EMC Service Group

4:45-5:00 PM: Closing Ceremony Closing Remarks by Mark Levine, LBNL