Institute for Industrial Productivity

CASE STUDY

Creating a Secondary Market for Energy Efficiency Project Finance in China

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SECTOR	COUNTRY/REGION	THEME	TOPIC
Cross-sectorial	China	Finance	Secondary market for energy efficiency / ESCo

SUMMARY

This paper considers the benefits and drawbacks of developing a "secondary market" mechanism for financing energy efficiency projects in China. Just as the secondary market successfully promoted home sales and growth of the housing industry in the United States, a secondary market for efficiency projects could promote the rapid adoption of efficiency technologies and growth of the energy service industry in China. It could do so by addressing the liquidity needs of energy service finance providers and making more capital available to project developers. Government policy amplified—and recently rescued—the U.S. secondary mortgage market, and an effective Chinese secondary energy efficiency market would likely require strong regulation and oversight. This paper outlines the rationale for government intervention and proposes some behavioral-financial experiments to test the concept.

The Need for Solutions

Our analysis begins with the premise that the Chinese government will rely heavily on energy efficiency measures to meet stringent new targets for carbon dioxide emissions reductions. We then hypothesize that secondary markets can help mobilize the capital and institutions required for this effort by reducing risks and lowering transaction costs for investors, which would speed the pace at which project developers, especially energy service companies (ESCos), could take capital from successful projects and move on to new ones. Great care would be needed to secure investments and make them transparent, but the rewards from a rapidly expanding market could well be worth the effort.

We acknowledge the ongoing debate about the ability of secondary markets to generate capital. Stiglitz observed that only a small fraction of the energy of financial markets is directed to the "primary function" of actually raising and allocating capital, and described secondary markets as a kind of "wholesale" trading of claims having little to do with generating capital. Still, he acknowledged that markets, and sometimes even secondary markets, can increase social welfare.[1] We have found some examples of the use of secondary markets to build capital resources for meeting environmental and energy policy goals.

Secondary markets have been used to trade environmental ownership rights. The market worked in the case of sulfur dioxide, but failed spectacularly in the case of carbon under the Clean Development Mechanism. Nascent domestic carbon trading in China holds few lessons for us at present. But these markets resemble commodities futures markets more than secondary securities markets. Trading commodities—whether pork belly futures or emissions rights—involves tangible things that have value in themselves and that do not depend on the creditworthiness of their sellers or future cash flows and do not require liquidation of some pledged asset if cash promised in return for purchasing a note should stop flowing to the buyer.

Secondary markets for energy efficiency exist, and the European "white certificates" market presents a compelling case for the concept. This program converts quantitative efficiency targets into tradable certificates, which utilities may acquire in order to meet mandatory targets, portfolio standards, or quantitative intensity

1 Joseph E. Stiglitz, "Financial Markets and Development," Oxford Review of Economic Policy, Vol. 5, No. 4, pp. 55-68.

 | This paper has been submitted for the eceee Summer Workshop on Industrial Energy Efficiency, 2012

or demand reduction goals.[2] The "white certificates" market resembles commodities trading more than stock or bond trading, but tweaking the market to link targets and initial financing of projects to generate energy savings might work for China.

We examined whether simpler solutions already exist in China. Simpler solutions would be ones normally present in financial markets and that are created and operated by local market players, particularly banks. Examples are financial leasing and forfaiting.

Financial leasing exists in China and appears to be a good match for the ESCo business model. Siemens[3], Anji Leasing[4], and Shandong Rongshihua Leasing Company (formerly an ESCo itself) have targeted the ESCo market. At this time, however, the leasing penetration rate in China is well below rates in the United States and Japan, for example.[5]

We interviewed a number of experts in China about their experience, particularly with forfaiting. In general, the length of ESCo performance contracts, the continuing nature of ESCo obligations, and the uncertainty related to monthly customer payments exceed the comfort zones of most banks. Shanghai Pudong Development Bank (SPDB) is developing a forfaiting business for ESCo projects, but has only used the mechanism for one project with a state-owned enterprise.[6] SPDB also issued RMB 2 billion to Shanghai Electric Architecture Saving Co. Ltd, owned by Shanghai Electric and Schneider Electric, for financing ESCo projects to include forfaiting, but we have no assessment of that program at this time.[7]

Experts differ on why forfaiting has not made more headway.[8] One camp favors the "evil bank" theory, which basically boils down to the problems of an overregulated, immature, and possibly corrupt banking sector. The experts suggest that because the largest Chinese banks are state-owned, they get directed to underwrite policy objectives, particularly at the provincial or local level, where they are most directly regulated, and they end up with inefficient and nonperforming investments. They also note that risk-based lending still lags in China because of de facto limits on interest rates, and that informal lending and "entrusted loans," in which third parties lend to borrowers through banks,[9] cannot be adapted to forfaiting because of transaction costs and transparency issues. The availability of capital is also constrained because of what Lardy calls "financial repression," the practice of limiting the interest rates that banks can pay depositors.[10]

Others cite what would in the Western academic literature be recognized as "asymmetry of information" between sellers and buyers of debt. This issue is qualitatively the same type of problem as Akerlof, in his Nobel prize-winning work, described as "the market for lemons".[11] Quantitatively, Moerman has evaluated this problem by studying the performance of secondary debt portfolios. She noted that secondary debt market traders' incomes depend on "timely loss information," especially about negative changes in debtors' cash flow.[12] That is, unless buyers know when the debtors whom they have acquired start losing money and take some action to protect themselves, their debt securities are going to lose money. Buyers, of course, rediscovered this basic fact at a cost of trillions of euros in losses after the 2008 financial collapse.

It would be difficult to say who is more to blame for the lackluster performance of the "simple solutions" for efficiency financing in China, the banks or the borrowers. The answer is almost certainly that it is some of both, suggesting that public policy intervention of more than one type is likely to be required to make secondary efficiency securities markets efficient in China. For example, environmental investors such as Tsing Capital and others interviewed for this research confirm that lack of transparency in enterprise accounting makes the use of anticipated cash flows for securing investments a very risky and unattractive proposition. Next we turn to an examination of whether China's business climate is conducive to testing model mechanisms that would enable developers to cash out their assets to obtain new financing—a secondary market—and therefore increase the availability of debt financing more rapidly to achieve deployment of energy efficiency technologies.

Conditions Favoring Energy Efficiency Project Finance in China

The policy environment for testing a secondary market is favorable in China. The Chinese government recently set a target of cutting

2 S. Baden, P. Fairey, P. Waide, P. de T'serclaes, and J. Laustsen, "Hurdling Financial Barriers to Low Energy Buildings: Experiences from the USA and Europe on Financial Incentives and Monetizing Building Energy Savings in Private Investment Decisions." Proceedings of 2006 ACEEE Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington DC, August 2006."

3 "PowerU Successfully Cooperated with Siemens Leasing on Several Energy Efficiency Projects," China Energy Saving Industry Network, November 2011, http://www.china-esi.com/News/13690.html.

4 "Anji Leasing Plans to Invest 5 Billion to Expand the Financing Leasing Business in Energy Conservation and Environmental Protection," China Energy Saving Industry Network, December 2011, http://www.china-esi.com/News/13684.html.

5 2011 World Leasing Yearbook, Euromoney, United Kingdom, January 2011.

6 "SPD Bank Devotes Financial Service to Green Industry," SPD Bank, 2012, http://www.spdb.com.cn/docpage/c446/201112/1216_446_23138.aspx; Zhou Xuanqian, SPD Bank First Provides Factoring Financing for ESCo, Shanghai Financial News, February 14, 2012, http://w.ww.shfinancialnews.com/xww/2009jrb/node5019/node5051/node5055/userobject1ai88995.html.

7 Zhang Sa, "SPD Bank Issues 2 Billion RMB Credit to Support ESCo," Dongfang Daily, February 20, 2012, http://www.dfdaily.com/html/136/2012/2/20/745894.shtml.

8 Leasing is a special case—it is heavily regulated in China.

9 Nonbanking institutions may not lend directly to borrowers in China but are permitted to do so if they register the loan with and pay a fee to a bank for that privilege.

10 See, for example, Nicholas Lardy, "Financial Repression in China," Policy Briefs, Peterson Institute for International Economics, PB08-8, Washington, D.C., September 2008.

11 He was describing the market for used cars in which a "lemon" is a car that does not work well. See George A. Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," The Quarterly Journal of Economics, Vol. 84, No. 3. (Aug., 1970), pp. 488-500.

12 Regina Wittenberg Moerman, "The Role of Information Asymmetry and Financial Reporting Quality in Debt Contracting: Evidence from the Secondary Loan Market," Journal of Accounting and Economics, Volume 46, Issues 2–3, December 2008, pp. 240–260.

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TABLE 1: ESCo Development in China[15]

	2005	2006	2007	2008	2009	2010	2011
Employees (Thousand)	16	21	35	65	113	175	378
Total Production Value (billion RMB)	4.7	8.3	21.7	41.7	58.8	83.6	125
EPC Investment (billion RMB)	1.3	1.9	6.6	11.7	19.5	28.8	41.2
Energy Saving (million tce per year)	0.9			12.4	17.6	10.7	16.5
CO2 reduction (million tons per year)	2.2			29.2	41.6	26.6	
EMCA Members[16]	89	212	308	385	450	560	

carbon dioxide emissions per unit of GDP by at least 40% by 2020, compared to 2005. China will need full deployment of energy efficiency to achieve that stiff goal. This emphasis should offer opportunities for expansion of the ESCo model and make it more likely that a secondary market mechanism can be developed and make a significant contribution to reaching efficiency targets.

China boasts a strong market for energy efficiency. Pressure on energy supply drives up prices and creates energy shortages and thus creates an environment favorable for energy saving. Chinese energy efficiency financial markets benefit from strong government encouragement, including investment and tax incentives. The most important policy supporting efficiency, in our view, is the imposition of stringent measures for industrial energy efficiency.

The ESCo or energy management company (ESCo or EMC) business model was introduced to China in the late 1990s. In 1997, the "China Energy Conservation Promotion Project," developed and managed by the World Bank with funding from the Global Environment Facility (GEF), sought to promote ESCOs. Through this project, three pilot ESCos were established in Liaoning, Shandong, and Beijing, respectively.[13]

The Chinese government, at the same time, continued its strong regulatory push to encourage energy efficiency practices. The nation recognized efficiency as a policy fundamental to economic growth almost from the beginning of the economic reforms in the post-Mao era. Strong requirements for industrial efficiency management and investment, along with the pressure of higher prices and energy shortages, helped stimulate the development of a private ESCo market.

By 2011[14], the ESCo market reached RMB 125 billion in production value, up from under RMB 5 billion in 2005.

Industry embraced ESCos, which were willing to finance, build, own, and operate energy-saving equipment for industrial clients, leaving the clients free to make other investments. Investment made by ESCos in 2011 reached nearly RMB 41 billion, increasing from just over RMB 1 billion in 2005.15 The annual contribution by ESCos to energy savings in China is 17 million tons of coal equivalent. (See Table 1 for a summary of the recent development of ESCos in China.)

The industrial sector naturally dominates the ESCo investment market in China, accounting for nearly three-quarters of project totals. These data are consistent with the 70% of all energy in China that is consumed by the industrial sector. Project size ranges widely due to the diversity of projects across sectors. No official data is available on the project size distribution, but according to one study, the average size of projects supported by one International Finance Corporation (IFC) facility was over 3 million euros. Projects supported by the World Bank/GEF Energy Conservation Project average over 1 million euro.[17]

Unfortunately, even this rapid development has not approached anything like the scale of demand—or at least need—for

13 Longhai Shen, "Energy Contract Management and Energy Conservation Service Industry in China," Power Demand Side Management, Vol. 9, No. 5. Sep. 2007, pp. 17-18.

14 "Energy Service Industry Development during the 11th Five-Year Plan," The Energy Conservation Service Industry Committee of China Energy Conservation Association (EMCA), 2011, Beijing, China. And "2011 Energy Service Industry Development Report," EMCA, 2012, Beijing, China.

15 EMCA, ibid. "2008 Energy Service Industry Development Report," EMCA, 2009, Beijing, China. "2009 Energy Service Industry Development Report," EMCA, 2010, Beijing, China. And "2011 Energy Service Industry Development Report," EMCA, 2012, Beijing, China.

16 EMCA members include not only ESCos but also include financing organizations, law firms, and other organizations. Not all the ESCos are the members of EMCA. Some 2,354 companies have been registered by the National Development and Reform Commission as ESCos.

17 "An Impact Evaluation of China Utility-Based Energy Efficiency Finance (CHUEE) Program," Independent Evaluation Group, International Finance Corporation, May 11, 2009, Washington, D.C.

energy efficiency investment in China.[18]The current level of energy savings contributed by ESCos, after all, amounts to only 0.3% of Chinese total annual energy use.

ESCo development has been impeded by lack of financing, particularly longer-term debt financing. The data from 2008[19] show that in the typical ESCo investment, 65% of money comes from its own capital, and only 28% comes from bank loans.

All private and small- and medium-size enterprises (SME) in China—not just ESCos—have trouble getting debt financing. The state-owned enterprises receive 70% of all debt financing in China, even though they contribute less than 30% of the value added in the industrial sector. In fact, lending to SMEs is risky business—their nonperforming loan rate in 2008 was 11.6%, compared to a national average of 2%.[20]

Equity is a limited and expensive alternative for ESCos in China. One review of annual reports found that 24 companies, valued at a total of RMB 134 billion, report that part of their earnings comes from ESCo business. Only two companies provided detailed revenue figures from their ESCo businesses, and in those two cases, energy services accounted for 1.4% of total revenue in one case and 2.5% in the other. Another 11 companies, valued at a total of RMB 560 billion, report some activity in the ESCo business, but their primary business interests, valued at RMB 516 billion, focus on fossil fuels.[21] None of the companies examined focus their main businesses on energy services. One company with energy services as its main business has been approved by the China Securities Regulatory Commission to do an initial public offering.

A limited number of funds specialize in providing capital for ESCos or environmental companies. General EMC Fund, owned by China General Technology Group Co., Ltd. (a state-owned enterprise), was established in September 2011 to make investments in energy performance contracting. The Guangdong Green Industry Fund, established by the Guangdong government in 2010 in cooperation with private companies, has capital of RMB 5 billion and is focused on the ESCo business. Tsing Capital, China's first clean technology venture capital firm, has invested in three ESCos.

The Chinese energy efficiency services market in 2015 is expected to generate a total of RMB 300 billion in revenues, with investment that year expected to total RMB 150 billion.[22]To attract more resources to ESCos, the Chinese State Council has provided a variety of tax benefits for qualified firms.[23] Other incentives include interest rate subsidies and grants. Financial incentives can amount to as much as RMB 240 per ton of coal equivalent (tce) saved from the central government and RMB 60 per tce saved from local governments.[24]

Efficiency's Financial Constraints in China

Despite the incentives, well-known problems continue to interfere with efficiency investment in China. Industrial energy users exhibit the common risk preference for avoiding the loss of money over the chance to save money. In practical terms, they usually require a payback period of no more than two years to invest in energy-saving measures. Such behavioral barriers are often categorized as "financial barriers," and indeed they do lend themselves to financial solutions. Third-party finance by ESCo, for example, can help ease the risk preference bias. Other financial barriers are more directly financial in nature and include start-up company credit risk, customer risk, indifference to contract law, and constraints on foreign investment and repatriation of capital.

Even favorable trends can become problems when they conceal the enormity of a need. Bank debt financing for energy efficiency investments expanded by an order of magnitude between 2005 and 2010. Equity financing for efficiency investment went from almost nothing to several tens of billions of RMB per year. As a benchmark to measure the significance of these increases, we will take for comparison the amount of money invested during the period in coal-fired power plants. A well-known data point for Chinese energy growth is the construction of one coal-fired power plant per week, the average for the period. The highly-efficient coal-fired plants being built in China are remarkably cheap by international standards, but the total still comes to about RMB 350 billion per year (US$50 billion).[25]

Another index is the market value of shares in traditional oil and power companies. The most valuable company in market valuation in China—and perhaps the world—is the state-controlled, vertically integrated oil company Petrochina, valued in late 2010 at RMB 3.6 trillion (~US$530 billion).

In 2010, Chinese banks loaned over US$15 billion to customers for energy efficiency projects, more than 10 times the amount they loaned in 2004 (see Figure 1). We base this estimate on a bank survey conducted in 2009 by the International Finance Corporation (IFC), a branch of the World

18 Zhenhua Xie, Vice Chairman of the National Development and Reform Commission, estimates that national investment in energy efficiency and carbon emissions reduction in the 11th Five Year Plan period (2006-2010) totaled RMB 2 trillion (over US$290 billion). See http://intl.ce.cn/specials/zxxx/201011/23/t20101123_21990631.shtml.

19 "2008 Energy Service Industry Development Report," EMCA, 2009, Beijing, China.

20 Shaofeng Xu, "Financing SMEs: where is the most appropriate way," Chinese Financial News, September 2009, Beijing, China.

21 Market value data were retrieved on April 18, 2012.

22 EMCA, 2011, ibid.

23 "Notice on Policy Issues on VAT, Business Tax, and Corporate Income Tax to Promote the Development of the Energy Conservation Service Industry," December 30, 2010, http://www.chinatax.gov.cn/n8136506/n8136593/n8137537/n8138502/10638381.htm.

24 "Interim Measures on Financial Incentives Fund for the Energy Performance Contracting," issued 2 June 2010, http://www.ndrc.gov.cn/zcfb/zcfbqt/2010qt/t20100609_353606.htm.

25 The cost of an ultrasupercritical coal-fired power plant, with a thermal efficiency of 45%, is only about 1,000 euros per kW. Source: Wang Yanjia, Tsinghua University, internal report for the State Electricity Regulatory Commission.

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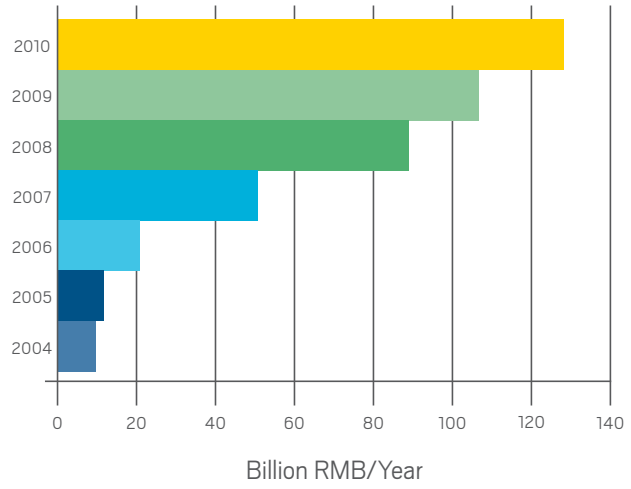
Bank.[26] The IFC conducted a survey in 2009 to determine whether its energy efficiency loan guarantee program—called CHUEE—had an impact in China. The independently conducted review was ambivalent about the success of the CHUEE program, but provided valuable new data on the scale of debt financing for energy efficiency in China.

FIGURE 1: Bank Lending for Energy Efficiency Has Expanded Rapidly In China



Note: Data for 2009 and 2010 were not available from the Chinese government or the International Finance Corporation. These data (darker colored bars) are extrapolated here as a function of past lending growth and published estimates of national energy efficiency improvements.

Secondary Markets and Risk Mitigation

To make creation of a secondary financial market for energy efficiency project finance worthwhile, the market would have to reduce risk and, therefore, interest rates. The difference in rates—the quantitative difference in risk—between the primary and secondary markets would offer the opportunity for project developers to realize profits before the end of the standard performance contract term, providing developers with capital to develop new projects. Unless that risk can be quantified through some estimation method, the secondary market could not plausibly be expected to work. This section attempts a quantification of that risk reduction.
The baseline question is: What is the cost of equity for energy efficiency project development in China? We know from experience that investors consider the following variables when they judge whether a project or business meets their hurdle rate for investment, over and above the risk-free cost of capital:

- Equity premium
- "Beta," or the performance of a business sector with respect to market cycles
- "Size" risk, or higher risk for small and medium cap companies
- Technology risk
- Country risk

We can add up these risks and the interest rates that reflect them and then try to determine how much a secondary market can reduce each one of the risks. We can then add up the reduction to see if the value of the secondary market mechanism is worth the trouble. In the case of a foreign investment in a small company in a heavy industrial sector that grows and slows with the business cycle and which carries normal risks otherwise, the hurdle rate for most investors will exceed 20%. In fact, most venture capitalists are looking for a few really big hits with successes that garner 50 or 100% per year or more. That is how they rationalize investing in start-ups that fail within 5 years some 90% of the time.

The risk-free cost of capital is very low in most markets in 2012, usually averaging less than 2%. The equity premium is usually substantial. We can assume that it exceeds 6% for most investors. Beta is project specific. For the purposes of this exercise, we can ignore it because a secondary market would not change anything with regard to a project's correlation with general market conditions. Size risk cannot be ignored in the efficiency project market,[27] because the market is immature, and in China, to be sure, no ESCo is of sufficient size or maturity to have escaped the size risk problem. Because a company is new and needs money, it is riskier. We can assign an arbitrary value to this—say, a 3% premium.

Also, for our purposes, we can ignore technology risk, country risk, and specific risks. In the case of the last item, we can assume our hypothetical investment does not carry any special risk, and we can also assume that the technology is proven and that the investment is purely domestic. Thus these terms recede into the background.

Some of the best rationales for a secondary market—the reduction of technology risk and customer risk after a project has been performing for 1 or 2 years or more—are sometimes identifiable and sometimes subsumed in other categories such as equity risk (customer risk cuts across several categories). We could imagine that project performance over a 2-year period would prove something and thus reduce equity, technology, and size risk by several percent. Perhaps we could cut the required rate of return from 20% to even 10%.

26 CHUEE originally stood for "China Utility Energy Efficiency Program," which reflected the World Bank's intent to develop projects and disburse lending through a private gas distribution utility company in which the International Finance Corporation (IFC) was an investor. However, the IFC dropped the utility approach in China and redesigned the program to leverage private bank lending. The revised program would guarantee a portfolio of private bank loans to industrial customers. The IFC chose the Industrial Bank of Fujian as its main private banking partner, a bank in which the IFC already had a major equity investment.

27 Michael W. Barad, "Technical Analysis of the Size Premium," Ibbotson Associates, September 1, 2001, www.morningstar.com, retrieved March 15, 2012.

But that assumption would probably be wrong. The "market for lemons" problem comes vividly into view here. Take the mortgage market, for example. A homeowner who comfortably serviced a mortgage in 2007, 2008, or 2009 might have had her situation radically altered by job loss, decline in home values, and other factors beyond her control. To the investor looking at an initial investment in the mortgage, it would be very hard to say risk had gone down much, because the customer had a job and savings in 2007. What if that were no longer the case in 2012?

How, then, can a secondary market improve upon this situation? This question is answered in the U.S. housing market by virtue of the assumption that the secondary market—Fannie May and Freddie Mac—is guaranteed, not literally by the full faith and credit of the U.S. government, but by an assumption that the government would have to bail out homeowners if they failed. The rate might not go down at all in moving from the primary to the secondary market. A government guarantee may be the only way.

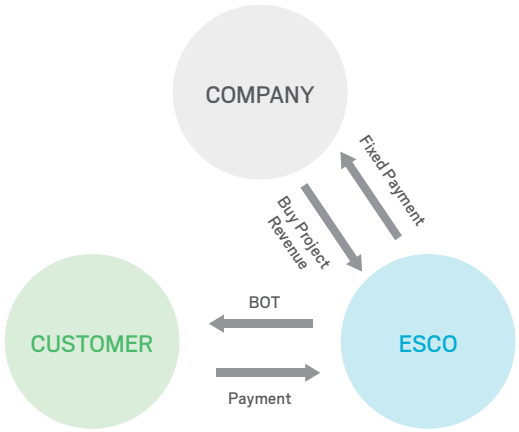
Envisioning a Secondary Market

This section describes two business models for a secondary efficiency projects market that could help reduce risk and facilitate liquidity for ESCos. The risks that we are seeking to reduce include technical risk, customer risk, regulatory risk, currency risk, economic risk, and counterparty risk; some of these risks are common and some specific to China. Full development of these models will require risk quantification measures that satisfy the due diligence requirements of the institutional buyers and financial institutions that are most likely to participate in a secondary market for clean energy projects and still enable a rate of return that matches developers' incentives to sell with investors' need to buy projects.

Project Revenue Transfer Model

This business model would allow developers to sell revenue from projects, including build-own-operate-transfer projects, to secondary investors. The ESCo would, in effect, be selling the series of fixed payments that she receives to investors. This approach is very much like forfaiting, except that it would involve tradable securities rather than one-time deals between a banker and her customer. The contracts between the ESCo and the customers remain unchanged from the point of view of the customer. The process could unfold as follows:

1. The ESCo finances, designs, builds, owns, and operates an energy efficiency project for its customer.
2. The project operates at least one year to ensure performance of the project technology and that the customers pay and pay on time.
3. The buyer acquires the rights to project revenues.
4. The ESCo transfers customer payments to the buyer for the period of the energy performance contract.



Project Contract Transfer Model

This model would allow the ESCo to sell its project contracts outright. The buyer would receive the payments from customers directly, based on project performance. The contract of sale could require the ESCo to retain responsibility for technical issues during the contract period. The process could unfold as follows:

5. The ESCo finances, designs, builds, and operates a project for its customer.
6. After one year, projects that meet specified criteria become eligible for sale in the secondary market.
7. A buyer acquires the remaining term of the contract for a specific project.
8. The buyer assumes the rights (to payments) and obligations (to operate and maintain) of the energy performance contract, and contracts as necessary for performance.

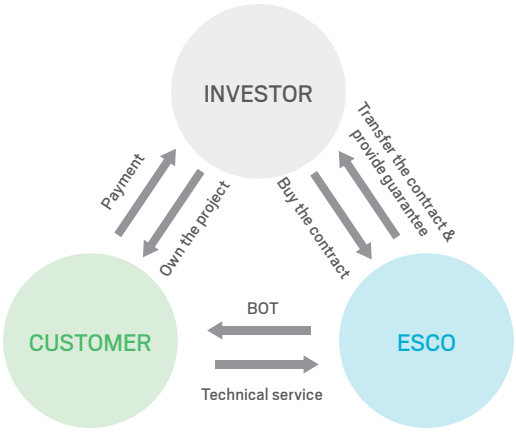


TABLE 2: Highlighted Differences between Two Models

	Revenue Transfer	Contract Transfer
Discount Rate	Low	High
Risk	Low	High
Payment Method	Fixed payment from ESCo	Payment from customers based on project performance
Relation with Customers	No direct relation with customers	Direct contract with customers
Qualifying ESCos	Proven technology, strong technical capability, good cash flow, and strong financial ability	Proven technology and strong technical capability
Appropriate Customers	Business of customer is stable	Customers have good cash flow and strong financial ability
Guarantee	No	Technical guarantee and account receivable guarantee if needed

A third model would be identical to the second one, with the exception that a provincial government could — as Fannie Mae does for mortgages — fully back and implicitly guarantee performance of the contracts.

Summary and Conclusions

The need and demand for capital for energy efficiency investment both remain large. We recognize that further research plus experimentation are necessary to support and to prove the feasibility of a secondary financial securities market to fulfill part of that need.

No secondary market for energy efficiency projects exists per se in China. Attempts to test or develop such a market have been limited or have failed. Of note are the efforts by the Beijing Environmental Exchange and sporadic attempts at forfaiting by some of the more innovative banks. Financial leasing is another category of attempts, but is hamstrung by severe regulatory constraints.

The experts and market participants interviewed for this project admit to being skeptical that project offerors can demonstrate sufficient levels of reduction in risk to compel buyers to accept returns much lower than those sought by the primary investors. This "market for lemons" problem reflects the reality of the asymmetry in the information available to the seller and to the buyer in any proposed efficiency market security resale. Like the used car buyer, the efficiency securities buyer has far less information about whether the product that she is buying is any good or not. Although the seller of the efficiency security could argue that the successful recent performance of a project and a customer, the cautionary note on any security—past earnings may not indicate future performance—will impede buyers from significantly discounting customer and market risk.

This situation, of course, is analogous to the U.S. market for home mortgages. Only a market intervention such as that provided by a Fannie Mae or a Freddie Mac overcomes this "lemons" problem. Such interventions bring their own baggage, including moral hazard, but it should be remembered that the federally-backed home mortgage market system in the United States worked exceptionally well until recently when the system became corrupted. The requirement for oversight and regulation of any such market should be understood implicitly.

The question of who and how such backing could be provided for an energy efficiency secondary market in China is an interesting one, mainly because of the division of labor in Chinese governments in requiring and implementing energy efficiency improvements. Essentially, the central government requires, and the provincial governments implement. The center demands performance targets of provincial leaders and punishes them for failing to meet the targets. The regions are motivated to find ways to implement the targets out of pure self-preservation. Nonetheless, the logical conclusion that the provincial governments—which have money, talent, and resources—are the logical source of guarantees for secondary markets is hamstrung by the fact that the provinces have a poor record of investment performance. Many nonperforming loans and effectively bankrupt projects already have

piled up on the local markets and banking systems—especially since the financial crisis and the push to stimulate the Chinese economy. And so the provincial governments will be viewed with skepticism if proposed as the lenders of last resort.

We recommend a two-pronged approach to determine whether our assumptions—especially the one that ESCos would cash out and reinvest profits—in this paper are correct and whether the models for "securitization" of energy performance contracts discussed in this paper make sense to potential market participants. Surveys could prove or disprove the validity of our assumptions. We recommend that public policy interests cooperate to develop sound survey methods, arrange capable parties to conduct the surveys, and execute them in the near future. These surveys would provide ESCo market information and analyze the barriers and needs of ESCos.

Second, we recommend development of a prototype business structure. These efforts would involve the following steps:

- Identifying potential sets of participating parties and advising them on how to register and deploy a secondary business market mechanism.
- Working with a selected ESCo to build the human capacity to bundle, market, and sell a test-package of the rights to energy efficiency project revenues or the contracts outright.
- Encouraging an innovative Chinese province to underwrite project financing, in effect to guarantee some part of the revenues for a qualified buyer.
- Arranging a kind of "white certificates" experiment in China in which utilities could be given the option of buying the rights to efficiency contracts instead of installing wind or taking hydropower.