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OFF-BALANCE-SHEET EQUITY: THE ENGINE FOR ENERGY EFFICIENCY CAPITAL MOBILIZATION

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Abstract

The International Energy Agency estimates that $24.5 trillion of energy efficiency (EE) investments will be needed through 2040. Debt- and self-financed projects are expected to contribute only a third of this capital due to multiple barriers. On the one hand, self-financed projects require upfront capital from companies' budgets to be spent on EE, which most would regard as a noncore activity. On the other hand, multiple parties face hurdles in a debt-financed project: 1) banks deem EE transactions too small and risky; and 2) most energy service companies (ESCOs) do not have creditworthy balance sheets. Leasing agreements also have unattractive rates and extract too much project value from ESCOs and/or end users. Altogether, these constraints call for nonmainstream, off-balance sheet financial structures that will shift project risks to third parties and facilitate market benefits, such as collateralization of energy savings and engagement of SMEs. Such structures include ESCO performance contracts, public–private partnership transactions, ESCO guarantee funds, super ESCOs, and other equity channels. These financing modalities require development in both the ESCO/EPC sector and EE policies, which could effectively mobilize and de-risk significant capital volumes.

Keywords: energy efficiency capital, energy efficiency finance, energy performance contracting (EPC), energy service company (ESCO), equity finance, off-balance sheet finance

JEL Classification: Q40, Q42, Q48

Contents

1. ENERGY EFFICIENCY OUTLOOK

Technical efficiency improvements, defined by the International Energy Agency (IEA) as a reduction in "the amount of energy used per unit of activity," resulted in a 4% lower global demand for energy due to improvements made from 2016 to 2018 (IEA 2018a). Efficiency gains between 2015 and 2018 displaced 3.5 billion tonnes of carbon dioxide, equivalent to $100 billion avoided capital expenditure in 2018.

In the 2018 edition of its annual Energy Efficiency Report, the IEA revealed its Efficient World Scenario (EWS), wherein the global economy would increase twofold through 2040 at the expense of "only a marginal increase in energy demand." The key condition in making this happen is that, under the EWS, all "cost-effective energy efficiency opportunities between now and 2040" will be implemented. Compared to the "New Policies Scenario" (NPS), which simply accounts for existing strategies and policies under commitments per country under the Paris Agreement on climate change, the EWS forecasts only 0.3% annual growth in energy demand through 2040 (vs. 1.0% for the NPS).

In order to meet the Efficient World Scenario, cumulative global investment in energy efficiency through 2040 must total $24.5 trillion, which is 55% more than the investment required by the NPS (IEA 2018a). Approximately 60% will be spent on transport, 30% on buildings, and 10% on the industrial sector. These investments would need to be cost-effective, meaning project costs should be easily paid back by savings from reduced energy consumption alone. Financing can be completed through "business-as-usual" means, such as an outright allocation of capital expenditure by the entity in need of the energy efficiency improvement (e.g., "self-financing"), or debt financing provided by a third-party financial institution. Self-financing is common among large organizations where either the scale of the energy efficiency project economically justifies upfront payment of the project cost or enough cash is available to pursue what are perceived as lower-return, "noncore" projects. Smaller organizations, however, would perceive such projects as onerous uses of resources, especially if the bulk of the cost requires early payment, and the benefits are not directly tied to the entity's core product or service. As for debt financing, its viability as a source of capital depends to a large extent on how financial institutions perceive energy efficiency projects. In Asia and the Pacific in particular, these projects are seen as risky – this perception typically results from a lack of understanding of either the technology or the contracting structure such as performance contracting). As a result, commercial lending terms are unavailable in such markets, ultimately harming energy service providers or project end users that have insufficient asset bases.

Unless new government policies and incentives are implemented and can sustain financial support of energy efficiency projects over the next few decades, or structural changes that favor "business-as-usual" means of financing occur, alternative modes of energy efficiency finance will be needed to meet the EWS investment requirement. Most likely, the majority of future capital would need to be mobilized through these structures, whether in the form of off-balance sheet investments or other channels such as energy efficiency funds or government-driven programs. Such modes that address various forms of risk (technological, financial, legal) of different stakeholders (energy service companies, financial institutions, end users) would be able to bridge market gaps left by relying solely on either self-financing or debt-financing energy efficiency projects. This is especially the case for Asia and the Pacific, where 1) the typical size of either an energy service provider or end user would not permit "business-as-usual" means of financing, and 2) financial support from external parties (ex. financial institutions and government agencies) is yet to have a sustainable impact on existing business models. As will be shown throughout this paper, off-balance sheet structures, particularly ESCO performance contracting and other market channels, show promise in Asia and the Pacific. However, before that, it is worth examining “business-as-usual” financing mechanisms currently being used, and how such methods could not, on their own, establish an aggressive growth trend for energy efficiency capital mobilization.

2. BUSINESS-AS-USUAL FINANCING

During the early stages of energy efficiency market development of any country, energy efficiency projects tend to rely on two types of on-balance sheet finance: self-financing and debt-financing. These are the simplest and most reliable modes of mobilizing energy efficiency capital in markets that are still jump-starting energy efficiency finance for demonstration projects across a growing list of technologies and end user classes. Self-financing projects minimize transaction costs and insulates the end user from fluctuation in interest rates. However, equity funding can be difficult for organizations that do not have a sufficient capital base or consider energy efficiency initiatives as a noncore business activity. Although smaller amounts of capital can be allocated to low-hanging fruits such as HVAC (heating, ventilation, and air-conditioning) or lighting retrofits, economic value is lost from deferring other energy-saving opportunities.

When it comes to third-party financing, debt would be the simplest option. Frequently, banks find that cash flows from energy savings are insufficient to collateralize and secure a loan. Project finance is generally not an option for energy efficiency projects, whose average sizes are typically small. This, combined with corresponding technology risks and market risks (ex. fluctuations in utility rates), would call for collateral from the end user’s or the participating ESCO’s fixed assets. As a result, the scale of energy efficiency projects and the number that can be carried out under this mode of financing become severely limited, especially for entities that are not deemed creditworthy. As regards banks and other financial institutions, de-risking their exposures from energy efficiency projects would also be necessary. Compared to debt transactions with banks, leases are processed faster and approvals are made more frequently. However, annual financing costs charged by leasing companies have been higher than those by commercial banks. This failure to compete with commercial debt shifted demand for energy efficiency financing away from lease-based structures.

In developing markets such as in Southeast Asia, business-as-usual mechanisms, particularly using external debt, are a primary source of funding for energy efficiency projects. The graphic below shows a partial list of private and state-owned financial institutions in the region involved in energy efficiency or green financing.

On the road to the EWS scenario, however, the self-financed, debt-financed, and lease-financed modes, which are all the transactions made on the balance sheet of the energy end user, have their growth constraints. Such limitations may cap the ability of business-as-usual energy efficiency financing to mobilize no more than a third of the $24.5 trillion capital requirement through 2040. It has become very clear that more innovative financing channels will have to be employed to bridge the larger balance of the energy efficiency capital gap in the next two decades.

Table 1: Partial List of Pioneer Financial Institutions Providing Green Financing in Southeast Asia

Country	Financial Institution
Cambodia	ACLEDA Bank
Indonesia	Deutsche Bank Standard Chartered Bank Permata Bank Bank Mandiri Indonesia Eximbank
Lao PDR	Bank of Lao PDR
Malaysia	Maybank Berhad Bank Pembangunan HSBC Bank AmIslamic Bank Berhad Kuwait FH Bank Rakyat
Myanmar	ACLEDA MIGI
Singapore	Development Bank of Singapore Standard Chartered Bank IFS Capital Ltd. SDCL Asia
Thailand	Kasikom Bank Bangkok Bank PCL Sri Ayuthaya Bank TMB Bank Siam City Bank Siam Commercial Bank CIMB Thai EXIM Thailand
Philippines	Bank of the Philippine Islands BDO Unibank Chinabank Land Bank of the Philippines Development Bank of the Philippines
Viet Nam	Techcombank Vietin Bank

Source: Ablaza (2014, updated 2020).

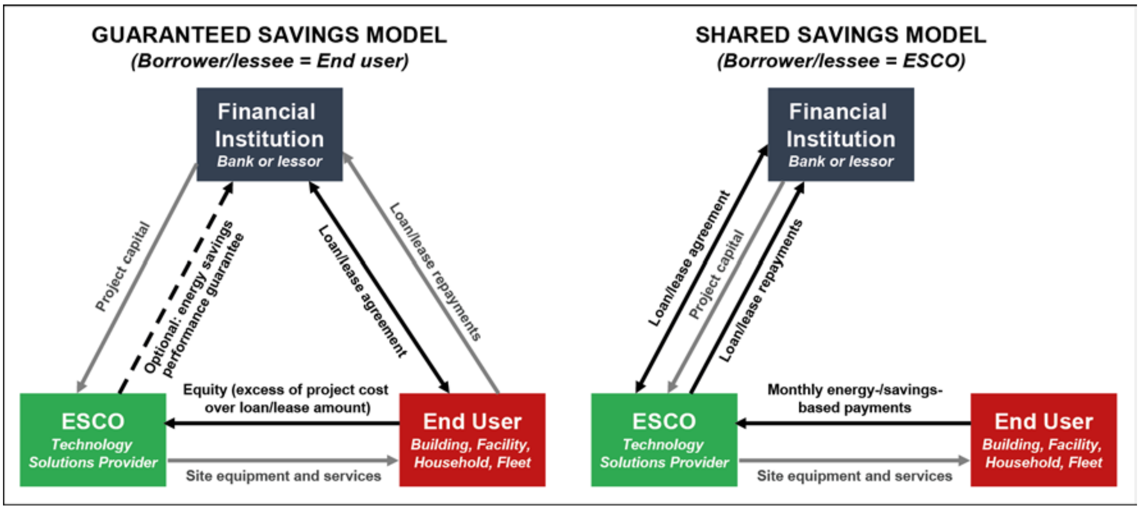
3. ENERGY SERVICE COMPANIES (ESCOS)

As mentioned earlier, the key limitation of business-as-usual financing is that energy efficiency equipment or infrastructure falls under the end user's balance sheet, consequently limiting access to third-party financing. Traditionally, accounting standards and treatments around the world permitted off-balance sheet financing, a structure in which the legal and economic ownership of an asset belongs to a party other than the asset's ultimate user. A typical example is an operating lease, under which the lessee does not include the asset and a corresponding liability in their balance sheet. Instead, the lessor's balance sheet reflects the leased asset, and regular rental payments are made by the lessee.

Recent updates to global accounting standards, such as IFRS 16, treat all leasing arrangements (including operating and finance) with multiyear tenors differently, now assigning accounting ownership to the end user, even if the legal ownership of the equipment assets remains with the lessor. While different off-balance sheet financing structures have varying cash flow and payment mechanisms depending on contractual obligations, the challenge now is to find financial structures wherein both the legal asset ownership and accounting ownership are shifted to an entity other than the energy end user. These structures are potentially vital to the acceleration of energy efficiency technology deployment in both developed and emerging markets, since the burden of upfront payment of capital and energy savings performance risks is typically transferred to a third party. These third parties are able to recoup their capital investments from guaranteed cash flows resulting from energy savings across a period of time.

In the energy efficiency industry, structures involving energy service companies (ESCOs) are emerging as one of the most common off-balance-sheet approaches to financing. ESCOs engage in various activities depending on the client's need, which include, but are not limited to, conducting energy audits of existing facilities, designing and implementing energy efficiency projects, identifying energy-saving opportunities, outsourcing energy infrastructure and technology, and directly financing or arranging the financing of energy projects (Ablaza 2019c). Depending on the contracting structure, ownership of the energy asset or infrastructure can reside in the ESCO (or even a third party) rather than the energy end user. A growing number of ESCOs engage in energy performance contracting (EPC), which helps manage financial and performance risk inherent in an energy efficiency project. Although a retrofit or the replacement of an equipment aims to reduce overall energy consumption, the energy savings ultimately realized by the end user may vary from what is expected or promised due to a range of technical reasons. Under an EPC, energy savings are guaranteed by the ESCO, provided that prespecified operating and maintenance procedures are adhered to. Measurement and verification processes are also put in place to facilitate an accurate calculation of realized energy savings. In the event that the project fails to deliver the guaranteed energy savings, the ESCO compensates the energy end user with an amount equivalent to the shortfall. Performance guarantees are frequently tied to energy savings (e.g., kWh) rather than monetary savings because volatility in utility rates represents a market-based risk that should be treated outside the energy efficiency project. Contractual utility rates are set for calculating obligations between the ESCO and the energy end user.

Figure 1: Guaranteed Savings Model and Shared Savings Model



Source: Ablaza (2019b).

The guarantee provision of EPCs significantly increases the certainty around project cash flows, which not only lessen performance risk for the energy end user but also improve the viability of project financing. In lieu of using an ESCO's asset base as collateral, financial institutions may view the guaranteed cash flows as effectively reducing the credit risk in a project. Another benefit of EPCs is that an energy end user would only deal with one counterparty: the ESCO. Also, as ESCOs take payment in the form of a share of the guaranteed energy savings or a fixed fee paid on a regular basis, end users avoid the financial burden of paying project capital upfront. In this structure, asset ownership is retained by the ESCO (or in some cases the financial institution providing project financing) and does not appear in the energy end user's balance sheet.

In 2018, the global ESCO market stood at $30.9 billion, 57% of which were ESCO transactions in the PRC (IEA 2018a). Commercial buildings represent the largest customer segment of the ESCO industry, followed by the industrial sector and the transport sector at a distant third. In Asian markets specifically, industrials actually take the largest share of the pie due to policies that encourage such projects. During the 2018 Asia Clean Energy Forum, the Asia-Pacific ESCO Industry Alliance estimated that 60% of the global ESCO market originates from Asia (Philippine Energy Efficiency Alliance 2018). A rapid development is expected for ESCO markets in the region given favorable developments in policies and improvements in capacity building, underpinned by robust macroeconomic growth.

A large-scale rollout of EPCs among Asian ESCO transactions is still met with numerous challenges. Familiarity with EPC as a concept is still lacking among stakeholders. Policies in certain countries are yet to adapt in order to fully support this structure. Public procurement laws in some countries do not accommodate EPCs as they are considered a hybrid between a "pure-goods" and a "pure-service" procurement. Also, the absence of a template or set of standards for EPCs has led to a growth impediment in several markets. In numerous instances, customized PPP contracts have been employed instead.

Currently, the US accounts for over a quarter of the global ESCO market and has still continued to slowly grow its market share over recent years. This could be attributable to its distinctive customer demographic wherein over 80% of ESCO activity is concentrated in the public sector, whereas it ranges from 10% to 40% for countries in Asia and the Pacific (IEA 2018a). Under the US Generally Accepted Accounting Principles (GAAP), EPCs are permitted to be structured as operating leases, which allow government entities to keep energy assets off their balance sheets. In Europe, where the public sector also dominates the ESCO market, similar accounting rules have also been made under the ESA2010 European System of Accounts. This ownership structure could potentially stimulate energy efficiency investments in Asia and the Pacific in the event that similar measures or asset recognition rules are passed. Penetrating the public sector could drastically accelerate the growth of ESCO industries given that portfolios of facilities and infrastructure can be combined in the same energy efficiency project, thereby improving project economics and management. In successful ESCO markets, guarantees and grants from either the government or a multilateral development bank also heighten access to funding by private financial institutions. This can be especially helpful for developing countries in Asia, where 98% of ESCOs lack suitable access to bank lending to be able to pursue their pipelines of ESCO-financed EPCs.

3.1 ESCO Markets in Asia

A growing list of energy markets in Asia are embracing the ESCO business model, as evidenced by the historical growth in ESCO market sizes. In most cases, ESCO sector development was bolstered by government and development programs that built technical competencies, energy end user confidence, and incentivized pioneer EPC transactions.

Table 2: Comparative Tabulation of ESCO Markets in Asia

Country	Market Size/Potential	Dominant ESCO Business Model	Key Barriers to ESCO Industry Growth	Enabling Government Policies and Programs
PRC	$17.6 billion (2018)	Shared savings	• Lack of commercial financing for small/medium ESCOs • Risk aversion of financial institutions against energy efficiency projects	• Required energy programs and audits for enterprises with the largest energy consumption • Capital subsidies for energy efficiency investments • Income tax exemptions for ESCOs
India	$300 million (2018)	Guaranteed savings	• Contract enforceability • Low demand for ESCO projects • Large transaction costs for smaller ESCO projects	• Partial risk guarantee facilities and other financial assistance • Standardized contract templates • ESCO accreditation process
Japan	$350 million (2017)	Shared savings	• Limited penetration into public sector	• Energy Conservation Law • Energy efficiency standards • Subsidies for energy efficiency retrofits
Malaysia	$95 million (2018)	Shared savings	• Subsidized electricity tariffs • Lack of technical know-how	• Financial incentives for energy efficiency projects under the National Energy Efficiency Action Plan • Efforts within agencies to purchase energy-efficient appliances and conduct energy audits • Capacity-building programs
Thailand	$200 million (2018)	Guaranteed savings	• Low demand due to poor understanding of the ESCO business by the private sector • Risk aversion of financial institutions against energy efficiency projects	• Energy efficiency revolving fund (EERF) • Energy Conservation and Promotion Act • Minimum Energy Performance Standards (MEPS) • Energy Efficiency Resources Standards (EERS)
Philippines	$160 billion potential (2017–2040)	Shared savings	• Lack of commercial financing for small/medium ESCOs • Risk aversion of financial institutions against energy efficiency projects	• Energy Efficiency and Conservation Act • Mandatory energy audits for qualifying establishments • Fiscal and tax incentives for energy efficiency projects

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Table 2 *continued*

Country	Market Size/Potential	Dominant ESCO Business Model	Key Barriers to ESCO Industry Growth	Enabling Government Policies and Programs
Singapore	Target market, energy users > 54TJ or Green Mark buildings	Shared savings and energy management contracts	• Slow increase in demand due to early phase-out of government incentives • Risk aversion of financial institutions against energy efficiency projects • Lack of technical know-how	• Energy Conservation Act • Green Mark scheme under the Building and Construction Authority (BCA) • Funding and grants from multiple agencies
Republic of Korea	$317 million (2018)	Shared savings	• Plateauing demand due to early phase-out of government incentives	• ESCO fund providing financing for energy efficiency projects • Mandatory energy audits
Taipei,China	$4.7 billion (2017)	Shared savings and energy supply agreements	• Energy-saving performance contracts only 22% of total ESCO business • ESCO penetration in manufacturing processes is still very limited	• Government programs to support ESCO industry and ESCO promotion • Minimum Energy Performance Standards (MEPS) • Mandatory energy efficiency rating labeling

Source: Ablaza, Llado, Asia Pacific ESCO Industry Alliance (2019).

People's Republic of China

The PRC accounted for 80% of energy efficiency gains between 2000 and 2017 (IEA 2018b). These efforts have helped towards achieving its unconditional 2030 target under the Paris Agreement to reduce carbon intensity by 60%–65% below 2005 levels. The ESCO Committee of China Energy Conservation Association (EMCA) estimates the number of ESCOs in the country to be well in excess of 6,000, most of which are categorized as SMEs and only a handful have annual revenues above RMB1 billion. ESCO investments are highly concentrated among industrial customers, with the most common projects revolving around waste heat recovery and boiler retrofits, among others. Shared savings is the most frequently used business model, with profit splits ranging from 20/80 to 40/60 (IEA 2018b). Government policies strongly promote energy performance contracting as a primary means to develop the ESCO industry. Fiscal incentives are offered to qualifying ESCO projects as a function of displaced tons of coal-equivalent, provided that a shared savings model is used and that the ESCO finances at least 70% of the project (Ma 2013). Given that most ESCOs are SMEs, service providers frequently experience difficulty accessing capital on attractive commercial rates from banks, which still shy away from the perceived risk profile of energy efficiency projects. An IFC study of the PRC's ESCO market revealed that while a limited 18.4% of ESCOs had access to bank lending, not more than 2% of ESCOs in the PRC enjoyed credit above $7.9 million, which would be needed for them to pursue their robust pipeline of ESCO-financed performance contracts (IFC 2013).

India

Energy efficiency is integral to reaching India's carbon reduction goals, with ESCO market potential estimated at $18 billion and 150 ESCOs currently empaneled by the Bureau of Energy Efficiency (Tewari 2019). The Alliance for an Energy-Efficient Economy (AEEE) represents the local ESCO and energy efficiency market players.

Of the investment potential of energy efficiency projects with a shorter payback period (less than 3 years), around half are attributed to agricultural pumping, followed by the industrial sector and commercial buildings at a quarter and one sixth, respectively (Tewari 2019). However, the latter two are the largest segments currently served by India's ESCO market. Lighting, HVAC, drives, and motors top the energy conservation measures preferred by ESCOs, which provide energy audits more frequently than full energy efficiency services. Among policies that help drive growth for the ESCO industry are demand-side management programs for agricultural and municipal sectors, as well as regulations for industrials and hotels that create more opportunities for energy efficiency. Unlike in other Southeast Asian markets, financial institutions deem energy efficiency projects to be viable sources of profit, bolstered by energy tariffs specific to commercial and industrial sectors. Furthermore, partial risk-sharing facilities (e.g., by the World Bank) exist to provide guarantees for commercial banks financing ESCO projects. Nonetheless, barriers exist that stifle further development of the industry. On top of still-lacking understanding of the business models employed by ESCOs, some potential customers choose to carry out energy efficiency projects on their own. Contract enforceability also remains an issue, as well as transaction costs that come with smaller project sizes.

Japan

The Japan Association of Energy Service Companies (JAESCO) takes the lead in developing the country's ESCO industry. Recently, the scope of JAESCO expanded to also cover energy management companies, which helped customers monitor and conserve their energy consumption. Among currently active ESCOs in Japan, a large majority are either a subsidiary or new business of a larger organization or utility, while a much smaller portion are stand-alone ESCOs.

The ESCO market in Japan as of 2017 was over $350 million (Maekawa and Nakagami 2019). Business models vary depending on the customer and energy efficiency project. An initial investment can sometimes be made by the customer, and the ESCO takes a fixed portion of the guaranteed energy savings as its service charge. In instances where no upfront costs are paid by the customer, the ESCO assigns a larger percentage of the guaranteed energy savings as its service charge. Shared savings contracts represent 40% of the ESCO transactions, while less than 10% are guaranteed savings contracts. The duration of most contracts is 9–10 years due to regulation by the Ministry of Finance, and the next most-common duration is 2–4 years. Projects are typically financed 50-50 between the ESCO and the client, and the majority of both their contributions are covered by financial leases. In terms of project size, amounts vary widely from below $200,000 to above $5,000,000.

Malaysia

With the implementation of the Malaysian Industrial Energy Efficiency Improvement Project, the Malaysia Association of Energy Service Companies (MAESCO) was incorporated. At a market size of $95 million as of 2018, the Malaysia ESCO industry primarily services nonresidential buildings (around 75% share) in the private sector. In contrast to the industry in Japan, 70% of ESCOs in Malaysia are stand-alone entities while the rest are extensions or subsidiaries of larger entities (Loon 2019). Despite the existence of an ESCO association, a mandatory accreditation system is yet to be implemented for industry players. Shared savings contracts dominate the market at 70%, while the balance of projects is split between guaranteed savings contracts and facility management. A strong majority of contracts have a duration beyond 4 years, and project amounts are typically below $200,000.

Some 60% of ESCO projects are financed either by the customer or the ESCO, and in some instances ESCOs can secure debt from third parties (Loon 2019). Unlike in the Philippines and Singapore, utility electricity prices are subsidized (despite a 4% annual increase in electricity tariffs), which hampers the economic viability of some ESCO projects. A lack of technical competence among ESCOs and risk aversion by financial institutions towards energy efficiency projects are among factors that hinder accelerated growth in the Malaysian ESCO industry.

Philippines

Energy efficiency as a key component of integrated resource planning gained traction with the recent passing of the Energy Efficiency and Conservation Act, which mandates required audits for entities meeting a minimum energy consumption level and provides fiscal incentives for energy efficiency projects. The resulting acceleration of energy efficiency projects factors into the forecast of a 182 Mtoe reduction through 2040, equivalent to $726 billion in savings and 45,900 MW in deferred installed generating capacity (Ablaza 2019b).

The Philippine Energy Efficiency Alliance (PE2) serves as a nonstock, nonprofit organization that succeeds the Philippine Association of Energy Service Companies. Its 54 members come from different segments of upstream and downstream energy industries, such as power generators, utilities, equipment manufacturers, and service providers. Similarly to other Asian markets, business models are centered primarily on guaranteed savings and shared savings models, a significant number of which are for chilled water plants and other air conditioning system upgrades in large commercial and industrial facilities (Ablaza 2019a). As the public sector becomes increasingly engaged in energy efficiency efforts, a PPP-ESCO (public–private partnership) model is seen as an emerging structure to pursue such opportunities. For instance, ESCOs have partnered with local government units to implement the replacement of high-pressure sodium streetlights with LED luminaires. Transport modernization and refleeting is also unfolding as a collaborative effort between national government agencies and private providers of funding and technology. PE2 aspires to strengthen the local ESCO industry through training of industry players (e.g., in performance contracting, measurement and verification, CEM certification), adoption of industry-standard performance contracting templates, and the proposed establishment of an ESCO guarantee fund or insurance facility.

Singapore

The energy efficiency and renewable energy market players in Singapore are convened by the Sustainable Energy Association of Singapore (SEAS). Services offered by these ESCOs are made viable and attractive by the fact that electricity in Singapore is priced to reflect the true cost of energy. However, despite an attractive market and policy support from the government, ESCOs face challenges that hinder their industry's growth in Singapore. The ramping up of portfolios has been lackluster since most ESCOs are not creditworthy enough to take on their project pipeline.

Although energy performance contracts have already been implemented by the Building and Construction Authority (BCA) and the Singapore Green Building Council to guarantee energy savings for building owners, the same is yet to be widespread between ESCOs and their customers. Given their lack of sufficient financing, ESCOs normally engage in fee-for-service projects rather than guaranteed performance based on pre-agreed contractual utility rates. As such, potential project pipelines become limited, with smaller customers unwilling to take project risks. Commercial banks in Singapore still view energy efficiency financing as risky, and thus are unable to extend secured loans to ESCOs, especially given their insufficient asset base.

Over 40% of Singapore's total electricity consumption comes from the industrial sector, which makes for a promising clientele for ESCOs (Neng 2019). However, the technical capabilities of these ESCOs cannot yet support major energy efficiency opportunities within the industrial plants. Most manufacturing companies have begun or finished tackling easy-to-implement energy efficiency opportunities (e.g., HVAC retrofits), leaving the specialized, process-related projects still in need of energy efficiency improvements. As in most other energy markets, ESCOs in Singapore are yet to reach the technical know-how needed to take on major process efficiency projects and receive buy-in from these industrial players.

Republic of Korea

ESCOs in the Republic of Korea are registered under the Ministry of Trade, Industry, and Energy, pursuant to Article 25 of the Energy Use Rationalization Act and Article 30 of the Enforcement Decree of the same act. The Korea Association of ESCO (KAESCO) reported that the ESCO industry started with pure lighting projects within buildings, then later diversified over recent years to process-related improvements, waste heat recovery, boilers, cogeneration, and distributed generation (Yoon 2019). The customer demographic has also changed significantly over the past decade. The share of buildings decreased from 23% in 2008 to 7% in 2018 in favor of the public sector, which rose from 20% to 33%. Generally, guaranteed savings contracts are favored over shared savings contracts. The Republic of Korea's ESCO industry enjoyed early success, with its market size trebling from $116 million in 2008 to $317 million in 2018. However, due largely to the government decision to discontinue fiscal incentives to ESCOs, the market size rapidly shrank in the succeeding year.

Thailand

In its 20-year energy efficiency plan through 2030, the Thai government tagged ESCOs as "vital mechanisms" for consulting and implementing energy efficiency projects. The local ESCO industry began in 1999, when the Global Environment Facility (GEF) pilot project conducted energy audits across four industrial facilities. Thirteen years later, the Thai ESCO Association was created to serve as an information hub for stakeholders and take charge of the accreditation of ESCOs, among others. There are currently 69 ESCOs in the association's registration list. The market size is estimated to be between $200 million and $350 million (Vechakij 2014). Nearly all ESCO activities occur in the private sector, around 75% of which are industrial customers. Almost 80% of contracts employ a guaranteed savings model, and two thirds of the rest use a shared savings model. Similarly to other Asian markets, the Thai ESCO industry experience lacks 1) access to funding by financial institutions, 2) technical know-how, especially for more sophisticated energy efficiency projects, and 3) customer demand due to minimal understanding of the ESCO business.

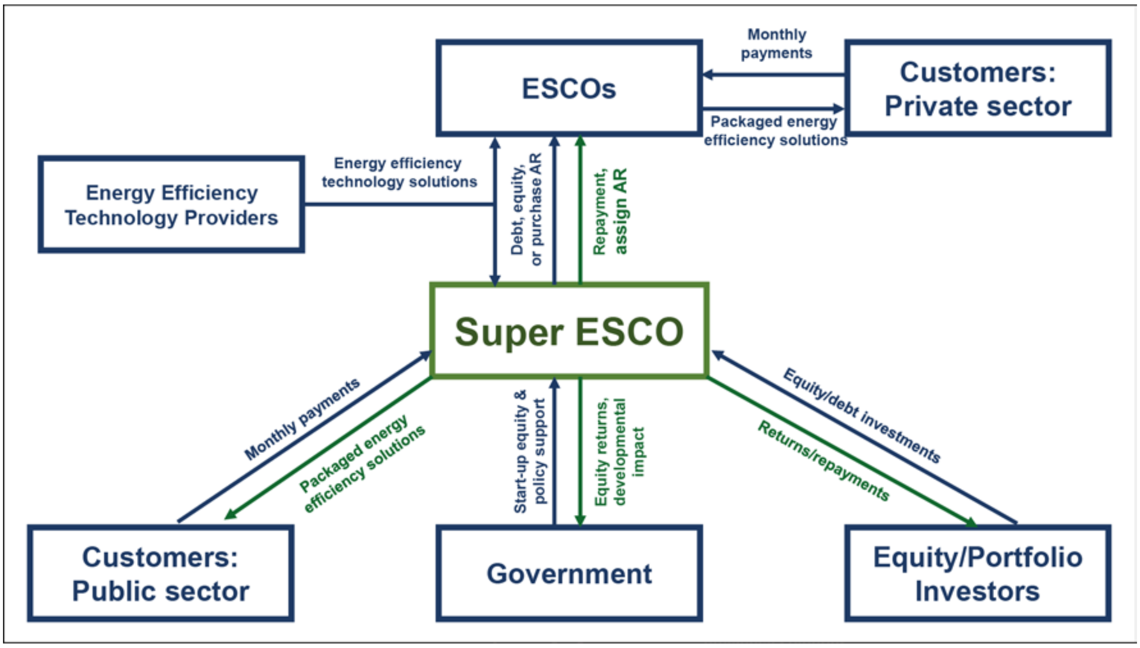
Taipei,China

The Bureau of Energy under the Ministry of Economic Affairs made minimum energy performance standards and energy efficiency rating labeling mandatory. This created a runway for growth in energy efficiency projects. The [Taipei,China] Energy Service Association (TESA) serves as a collaborative platform for ESCOs engaged in a variety of energy-saving services, such as those involving HVAC, lighting, boilers, air compressors, and energy management systems. From its beginnings in 2005, the ESCO market boomed to $4.7 billion in 2017 (Lin 2019). Guaranteed savings and shared savings contracts typically have a duration of 3–5 years and 4–8 years, respectively.

3.2 Super ESCOs

Super ESCOs are large-scale ESCOs established and capitalized by the government, aimed towards achieving a scale capable of taking on multiple EPCs and gaining access to competitive lending terms from financial institutions. This portfolio approach enjoys risk diversification similar to that of energy efficiency investment vehicles and facilitates capacity building and streamlining for other ESCO players in terms of procurement, energy performance contracting, technical competence, and so on. Today, super ESCOs have either been established or are in the process of evolving in seven countries: Armenia (R2E2 Fund), Belgium (FEDESCO), the PRC (Fakai Scientific Services Corporation), Croatia (HEP ESCO), India (EESL), Saudi Arabia (Tarshid), and the United Arab Emirates (Etihad ESCO) (Ablaza 2019c).

Figure 2: Super ESCO Structure Proposed for Southeast Asian Markets



Source: Ablaza (2014).

The void that super ESCOs can fill is the large-scale implementation of projects, which face numerous barriers. In the public sector, public agencies have limited technical capacity for conducting energy audits and procurement rules make performance contracting difficult (Limaye and Limaye 2009). As for the private sector, project financing is a preferred approach by end users and ESCOs but not by financial institutions (especially when it comes to energy efficiency projects). As most of the undertaken projects are currently in the public sector (e.g., streetlighting, public building retrofits, and irrigation pump replacements), super ESCOs have the potential to invest resources in the deliberate de-risking and generation of ESCO project pipelines across and beyond industrial plants and commercial buildings. Such resources would also include energy audit and design expertise. As a government-capitalized entity, super ESCOs could also overcome procurement issues regarding performance contracting. On their scale, super ESCOs could potentially serve as a source of third-party equity financing, particularly for greenfield and brownfield EPCs of privately owned ESCOs, thereby allowing the latter to recapitalize and pursue new EPCs. Furthermore, super ESCOs could provide technical advisory support to local financial institutions to help the latter develop financial products geared towards energy efficiency. Confidence of financial institutions in energy efficiency projects can also be improved using credit enhancement and risk management products provided by super ESCOs.

Super ESCOs can also function as the developmental pillar of a local ESCO industry through providing technical training, sharing best practices, and establishing contracting standards or templates. They can devise marketing campaigns and demonstration projects to heighten awareness of end users regarding the ESCO concept (Limaye et al. 2009). To carry out these functions, a super ESCO must not directly compete with private ESCOs, but rather create a shared platform for their growth.

4. MARKET ENABLERS

Market features or structures exist to either stimulate larger amounts of capital mobilization or manage risk, thus encouraging greater levels of industry participation to benefit of ESCOs, among others. Unlike parties involved in business-as-usual or off-balance sheet financing, providers of funding or guarantees under such special structures do not necessarily gain ownership of the asset but are nonetheless crucial in enabling certain energy efficiency transactions.

4.1 ESCO Guarantee Fund

Under energy performance contracting, there are risks that financial obligations may not be met, resulting from financial shortfalls or technological underperformance by the counterparties. An ESCO guarantee fund functions as an insurance facility that provides various types of guarantee cover depending on the financial obligation being insured (Ablaza 2019c). For example, the fund can mitigate the energy performance guarantee risk of the counterparty financing the majority of the upfront capital (whether it be the ESCO, end user, equipment lessor, or third-party investor) by partly or wholly covering deficits in net cash flows required under the EPC. Counterparty or customer credit risk can also be insured by the fund, addressing instances when guaranteed payables to the ESCO cannot be fully paid by the end user. The development of such insurance markets reduces uncertainties in EPC cash flow streams, paving the way for collateralization or even securitization. ESCOs will also be able to undertake projects with less creditworthy customers, or those belonging to more financially volatile industries.

4.2 Risk-Sharing Facilities

Grants and fiscal incentives are among the most common ways that governments mobilize capital to energy efficiency projects. Another method is to create risk-sharing facilities (RSF), wherein credit risk from energy efficiency debt financing (whether for a single project or a full portfolio) is shared between the government and another financial institution (Ablaza 2019c). In a single-tranche RSF, the government may elect to take the majority of the risk (ex. 70%–80%) and leave the balance to the other financial institution. The structure can be further customized to manage the risk of the government investment. Under a two-tranche RSF, the government can evenly split the first wave of credit losses with the other financial institutions, but take the majority of the exposure (ex. 70%–80%) of any incremental losses thereafter. Such a structure would insulate the government from losses that aggregate from relatively smaller underpayments across multiple ESCO customers, but still create an economic incentive for private financial institutions to participate in the financing process.

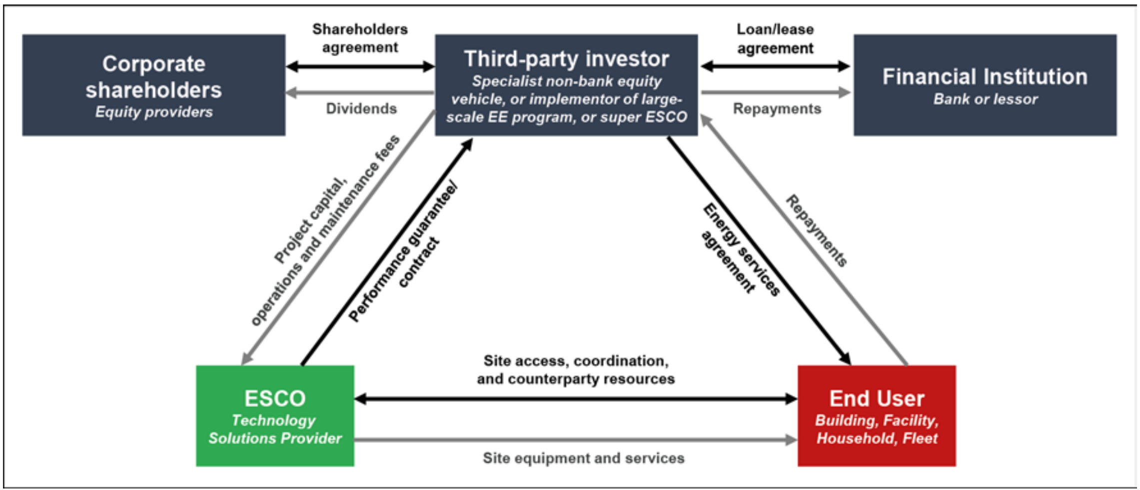
4.3 Long-Term Financing Sources

End users of energy efficiency projects can source funding from third parties via either equity or debt investment. Financial institutions such as commercial banks initially provided equity funding, however they increasingly turned towards debt investment for risk management purposes. Multilateral development banks may offer long-term debt financing to stimulate energy efficiency markets, especially in emerging economies. Since these funds are designed to support pipelines of energy efficiency projects, their investment horizons easily exceed the typical contract duration of a project. Official development assistance funds (ODAs), for example, can be flowed into either large-scale government programs or private investment vehicles, which ultimately retain ownership of the asset infrastructure. Especially in the case of ODAs, financing is provided at near-wholesale rates, typically set at a small spread above interest rate benchmarks. Although ODAs have predetermined criteria for approving funding applications, such affordable financing is valuable to ESCOs and end users that lack the asset base to qualify for commercial loans.

4.4 Portfolio Investments

The use of off-balance sheet equity significantly reduces financial risk for the end users. However, the additional risk borne by third-party equity providers, especially for large-size energy efficiency projects, might render unacceptable risk-return trade-offs and limit overall capital mobilization from this source. This can be addressed through aggregating various projects under a portfolio that would effectively improve the risk-return trade-off through diversification. Similar to conventional private equity structures, an equity vehicle can be used to pool equity (and even debt) funds, which would then be used to invest in multiple energy efficiency projects via a wholly owned project or asset management company. The project company collects repayments under energy service agreements with commercial or industrial end users, pays operation and maintenance fees to technology and service providers, and flows the resulting net returns back to the original equity and debt investors after the equity vehicle deducts its asset management fee. Projects within the commercial, industrial, and public sectors are selected based on a defined investment philosophy (ex. in terms of technology market, required payback, client profile, etc.) and are subject to technical, financial, and legal due diligence by the project company. Scoring systems reflecting the investment philosophy are sometimes used to filter and rank numerous prospective projects.

Figure 3: Off-Balance Sheet Transaction Structure



Source: Ablaza (2019a).

Although still infrequent, this financing structure is already being used around the world. Based in the UK, Sustainable Development Capital LLC (SDLC) operates through numerous investment vehicles in Ireland, Asia, North America, and the EMEA region. Projects include operational energy efficiency, decentralized energy projects, development- and construction-stage energy efficiency, and distributed energy. Hannon Armstrong, a US public company based in Maryland, invests not only in behind-the-meter and grid-connected projects but also in energy infrastructure such as transmission lines and distribution systems. As an investment partner of technology providers and ESCOs, Climargy was very recently established as one of the first investment vehicles in developing Asia to provide equity funding for energy efficiency upgrades, distributed generation, and energy storage projects through shared savings performance contracts and energy-offtake agreements.

The existence of nonbank portfolio equity vehicles actually broadens the bankable investment opportunities for debt providers such as commercial and development banks, or corporate equity partners such as energy developers who wish to diversify their portfolios. Compared to their underlying projects, these “fund-like” equity vehicles become the more creditworthy investees of the debt and equity providers. These vehicles do not therefore necessarily displace the debt finance volumes supposedly bridging the long-term energy efficiency capital gap, but rather could potentially serve as new intermediaries to deepen the reach of debt capital to energy efficiency project assets.

4.5 Large-Scale Government Programs

Governments can play significant roles in stimulating the growth of energy efficiency markets. Fiscal incentives such as income tax holidays and tax credits help improve project economics and create returns attractive enough for debt and/or equity funding by private investors. However, national or federal government can also participate in off-balance sheet financing. The forced obsolescence of low-efficiency household and street lighting has been implemented in some countries. Customers turned over their existing lamps and lighting equipment to be replaced, usually for free, with more energy-efficient technologies. In such cases, returns are not realized by the investor (the government) through the typical energy savings cash flow stream. Rather, such activities promote energy efficiency on a national scale, ultimately benefiting industry players.

Having had early success in Europe, public–private partnerships (PPPs) are starting to be considered for energy efficiency projects in Asia and the Pacific. A pioneer test case is the large-scale LED streetlighting project proposed for the State of Melaka in Malaysia. About 100,000 high-pressure sodium luminaires were targeted for energy-efficient LED luminaire replacements, which would effectively lower the overall cost of electricity and maintenance (Ablaza 2017). The Asian Development Bank (ADB) and the Melaka Green Technology Corporation (owned by the Melaka state government) entered into a collaborative agreement, which covered scoping, structuring of the transaction, and tendering. The ADB advisory support to this PPP transaction developed technical specifications, created the business case model, and conducted legal due diligence with respect to local regulations.

Programs are also developed at the municipal or local government level. In some markets, loans made for energy efficiency projects can be repaid over time via property taxes. Upon meeting qualification requirements, residential and commercial buildings receive funding from the state or local government to implement energy efficiency improvements, which could even include hurricane proofing, seismic retrofitting, and renewable energy systems. Financing mechanics may vary based on national and local government regulations. One of the most successful property-based repayment schemes in the US is the Property-Assessed Clean Energy (PACE) program. in the US Investments are categorized in terms of commercial (C-PACE) and residential (R-PACE) (IEA 2018a), and cash flow streams from property tax payments are securitized for trading in financial markets (US DOE 2020).

A key feature that makes this program even more attractive is that repayment obligation is tied to the property rather than the home/building owner. As a result, even if the repayment stream spans decades, owners are still incentivized to pursue energy efficiency improvements. Should they sell the property in the future, the balance of the payment stream is transferred to the new owner. Altogether, the PACE program reduces energy expenses while increasing property values. As of this writing, 33 US states and the District of Columbia passed legislation enabling PACE. 19 of these states plus the District of Columbia currently have operating PACE programs.

4.6 Utility-Led Demand-Side Management

Demand-side management (DSM) is a means for utilities to reduce energy costs on a large scale primarily through reducing consumption during peak hours. Utilities assess the electricity usage patterns of their customers and provide rebates to them to reshape their consumption behaviors. Flattening the load curve, combined with employing energy storage resources, helps avoid the higher per-kWh generating costs from either “peak power plants” or peak prices resulting from imbalances caused by variable renewable energy sources such as solar and wind. Off-balance sheet investments may also be made by utilities through providing more energy-efficient technologies to customers to replace their existing equipment. On-bill recovery mechanisms combined with energy savings from shaved peak loads allow utilities to recoup and earn a return on their investment.

Emerging applications can also be seen in the “smart grid,” wherein customers can potentially provide utilities access to their smart (i.e., internet-connected) appliances and equipment. The assets can be remotely turned off or switched to low-consumption settings during peak hours, and customers are compensated with a share of the energy savings. Utility-led DSM effectively serves as a portfolio of small-scale energy efficiency projects with relatively lower capital intensity (depending on the type of DSM employed) and governed by a shared savings model.

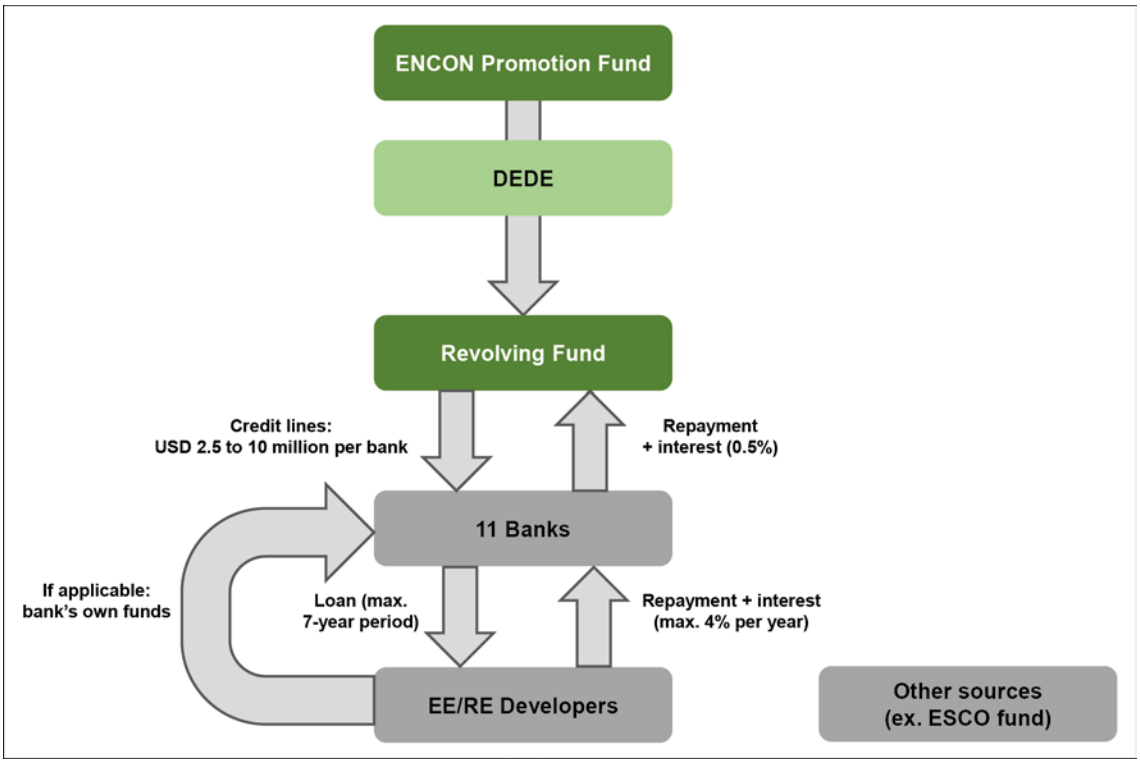
Utility-led DSM can still be promoted in vertically integrated electricity markets, particularly because the economic and financial benefits of energy savings achieved at the level of the utility customers can directly flow up to the generation side of the utility business. Electricity markets that have restructured to unbundle generation from transmission and distribution, as well as accommodating retail competition and open access, now face challenges in crafting an energy efficiency financing channel role for distribution utilities.

5. CASE STUDIES

5.1 Energy Efficiency Revolving Fund in Thailand

An energy efficiency revolving fund (EERF) was established in Thailand primarily to address financial barriers of energy efficiency projects and stimulate increased participation of commercial banks (Wang et al. 2013). The government's energy efficiency programs are managed by the Department of Alternative Energy Development and Efficiency (DEDE), an agency under the Ministry of Energy. DEDE manages the ENCON fund, which ultimately provides capital to the EERF for a 10-year period spread over five phases (UNIDO 2015). Between 2003 and 2012, $220 million were allocated for the EERF, with $60 million each for the first three phases, followed by $28 million and $12 million for the fourth and fifth phases, respectively.

Figure 4: Thailand EERF Structure



Source: Grüning et al. (2012).

A standard contract between DEDE and participating banks (PBs) facilitates disbursements that will be used by the latter to lend to clients for their energy efficiency projects. The EERF lends to PBs at a 0.5% interest rate to cover administrative costs and potential defaults (Energy Futures Australia 2005). PBs, which then flow the funds to energy efficiency projects, are required to cap their lending rates at 4% per annum and their loan size at THB50 million ($1.25 million) per project. Should projects require funding beyond THB50 million, the commercial banks should provide the balance. From the six PBs at the start of the funding program, the EERF eventually signed agreements with 11 commercial banks (Grüning et al. 2012).

The target market of funding by the EERF comprises buildings, factories, ESCOs, and project developers (Grüning et al. 2012). Eligible facilities must meet at least one of the following requirements: 1) minimum installed electrical demand of 1,000 kW; 2) minimum installed transformer capacity of 1,175 kVA; or 3) minimum commercial energy consumption (including electricity and steam) of 20 million MJ per year. These eligibility criteria were subsequently revised to broaden the fund's market as initial loan volumes were observed to be low (UNIDO 2015). As for building/factory project eligibility, the qualifying scope included, but was not limited, to efficient fuel combustion, energy loss reduction, energy waste recycling, peak shaving, power factor improvements, sunlight heat reduction, and efficient air conditioning (Energy Futures Australia 2005). Applicable uses of loan funds included the following:

- Equipment purchase cost and installation cost
- Engineering, design, and supervision costs
- Payables to ESCOs arising from a guaranteed savings model
- Operating and maintenance costs related to the equipment
- Transportation and demolition costs
- Import taxes, duties, and value-added taxes associated with any of the costs above

While DEDE sets the policies and guidelines for the disbursement and use of the EERF's funds, the PBs, as the counterparties for loans made for energy efficiency projects, are ultimately responsible for implementing the guidelines and monitoring loans. Six months after fund disbursement to a PB's client, DEDE must receive a monitoring report analyzing the performance of the project. PBs must also submit supplementary monthly reports to DEDE to ensure that EERF funds are being held by PBs for no longer than two months. Performances of PBs under the program are measured based on nonbinding individual disbursement targets negotiated by each under the EERF.

From 2003 to 2010, the EERF funded 335 energy efficiency and renewable energy projects totaling $453 million in investment, with $210 million (or 46%) being sourced from EERF disbursements. Estimated energy savings through 2009 were $154 million annually, resulting in an average payback period of 3 years (Wang et al. 2013). Beyond investment values, the success of the EERF was evident in how it reshaped stakeholder involvement in the energy efficiency sector. For commercial banks, mobilization of capital increased due to the foundational deal flow stimulated by the EERF at below-market financing rates. From merely matching the funds sourced from EERF disbursements, banks eventually took on more risk and provided more capital as they developed a better understanding of energy efficiency projects' technical aspect and business model. Also, as the EERF streamlined procedures and focused on achieving energy savings, the time it took to approve loans (and subsequently the time it took to begin implementing projects) was drastically shortened (EFA 2005). Through the EERF, implementation responsibilities were also decentralized away from the government, as banks took charge of processing loans and ensuring that guidelines set by DEDE were met.

Taking a closer look at Thailand's EERF experience, greater success could have been achieved if not for certain limitations of the program. For instance, the THB50 million project size cap precluded larger-scale projects (EFA 2005) with correspondingly larger potential energy savings. PBs were also required, under the terms of the EERF, to assume all credit risk. Consequently, they used asset-based financing, which naturally filtered out small- and medium-sized businesses that lacked sufficient collateral (Wang et al. 2013). Finally, a budget allocation specific to the marketing of the EERF could have promoted awareness of the program and contributed to a larger and more diversified deal flow for PBs.

5.2 Industrial Energy Efficiency Landscape and Third-Party Financing in Singapore

The manufacturing sector accounts for more than half of Singapore's greenhouse gas (GHG) emissions, and hence it has long been a target for cutting energy consumption. In 2016, the state announced its goal under the Climate Action Plan to improve the sector's energy efficiency at rates of 1%–2% yearly between 2020 and 2030, a rate that will be on a par with that of leading developed countries such as Belgium and the Netherlands (Soh 2016). Recently, the EDB and NEA have stepped up their grants to better help industrial facilities to be more energy efficient and competitive. The funding support for the adoption of energy-efficient technologies under the EDB's Resource Efficiency Grant for Energy (REG(E)) and the NEA's Energy Efficiency Fund (E2F) will be increased from the existing cap of 30% to 50% of the qualifying costs – i.e., manpower, equipment or technology, and professional services costs (EDB, 2018) (see table below for more energy efficiency policies in Singapore's manufacturing sector).

EDB Singapore made an effort to encourage financing for energy efficiency projects in industrial and manufacturing facilities by partnering with a commercial fund manager to pilot a third-party financing model that incorporates risk sharing (E2F Singapore 2017). Leveraging on loans from financial institutions (FIs), third-party fund managers provide companies with 100% of the upfront capital costs to finance the installation of energy-efficient technologies, systems, and equipment. At the same time, it subcontracts the design, installation, maintenance, measurement and verification services, and performance guarantee to qualified companies. In return, the companies pay for the investments from savings, based on a share of energy savings over an agreed contractual term (typically 5 to 10 years).

Unfortunately, this third-party financing pilot scheme has reported limited success so far, with a low uptake of seven projects over 9 years. This is attributed to companies' concerns about the high transaction cost involved in third-party financing, large companies preferring to tap into internal funds or borrow from banks that offer low interest rates (large companies are capable of attaining bank loans because of their high creditworthiness), and most importantly, FIs associate third-party financing with high risk.

Table 3: Energy Efficiency Policies in Singapore's Manufacturing Sector

Policy	Description
Mandatory Energy Management Practices under the Energy Conservation Act (ECA)	Enacted in 2012, the ECA serves to mandate energy efficiency requirements and energy management practices to promote energy conservation, improve energy efficiency, and reduce environmental impact, and to make consequential and related amendments to certain other written laws. A. Mandatory Energy Management Practices for Existing Industrial Facilities B. Mandatory Energy Management Practices for New Industrial Facilities and Major Expansions
Incentives and Grants: Energy Efficiency Fund (E2F)	Launched in 2017, through the provision of grants, E2F supports the energy efficiency efforts of companies in the industrial sector. It encourages owners and operators of facilities to: A. Integrate energy and resource efficiency improvements into their development plans early in the design stage B. Conduct a detailed energy assessment for their facilities to identify energy efficiency improvement opportunities C. Invest in energy-efficient equipment or technologies.
Incentives and Grants: Singapore Certified Energy Manager (SCEM) Training Grant	The SCEM program caters to engineering professionals intending to develop a career as energy managers. It offers participants the chance to acquire technical skills and competencies for managing and tracking energy usage within the organizations they serve.
Incentives and Grants: Energy Efficiency Financing Programme (EEF)	The Singapore Economic Development Board (EDB)-piloted EEF Program encourages owners and operators of existing industrial and manufacturing facilities to improve energy efficiency in their equipment and technologies (Economic Development Board 2018). Companies will be provided with upfront capital through a third-party financier to implement these projects.
Resource Efficiency Grant for Energy (REG(E))	Introduced by the EDB, (REG(E)) will replace and build upon the Productivity Grant for Energy Efficiency (PG(EE)). The aim of (REG(E)) is to better incentivize companies to achieve higher carbon abatement; the grants received by the companies will correspond to the amount of abatement achieved.
Energy Efficiency National Partnership (EENP)	The National Environment Agency (NEA) launched the EENP program in 2010. The program develops learning network activities and provides energy efficiency-related sources, incentives, and recognition in order to support companies in their energy efficiency efforts.

Source: Authors' compilation (2020).

6. CONCLUSION AND RECOMMENDATIONS

ESCO-based models could potentially accelerate capital mobilization towards energy efficiency projects. The injection of ESCOs as a third party into a typical project transaction between lending financial institutions and borrowing end users leads to an acceptable reallocation of risks. ESCOs have the technical competence to take on project risk, and the performance contracting structure removes the financial burden of energy efficiency infrastructure from the end user's balance sheet. However, the aggressive expansion of ESCOs' project pipelines is inhibited by financial and market frictions. Risk-aversion of financial institutions towards energy efficiency limit ESCOs' sources of project financing. Furthermore, ESCOs, particularly in countries wherein the industry is young, need much improvement in their technical and contracting capabilities to facilitate aggressive growth. Below are several barrier-removal interventions for ESCOs:

- Shifting EE debt finance from traditional asset-based lending to energy savings-based lending and reduce creditworthiness requirements for ESCOs
- Reducing loan pricing of financial institutions by 1) sourcing wholesale or sub-commercial long-term funding, and 2) rationalizing risk premiums through technical advisory support
- Extending long-term savings-based loans (with fixed, concessional pricing) to new “super-ESCO” entities that will serve as portfolio aggregator of commercially viable EE projects
- Creating new financial structures, vehicles, and products that would flow project equity and other forms of off-balance sheet capital
- Creating ESCO guarantee funds to help manage energy savings performance risk and customer credit risk
- Developing the monitoring and verification (M&V) and performance contracting capabilities of the ESCO sector
- Developing industry-standard performance contract templates

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