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Project “Removing Barriers to Increase Investment in Energy Efficiency in Public Buildings in Ukraine through the ESCO Modality in Small and Medium Sized Cities”, financed by the Global Environment Facility and implemented by the United Nations Development Programme

An Overview of the Best Practices of ESCO Market Design and Recommendations for Ukraine

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The report was prepared within the framework of the project «Removing Barriers to Increase Investment in Energy Efficiency in Public Buildings in Ukraine through the ESCO Modality in Small and Medium Sized Cities», which is financed by the Global Environment Facility and implemented by the United Nations Development Program (UNDP) in Ukraine.

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1.1. Global ESCO Market Size

Energy service companies (ESCOs) provide energy solutions ranging from generation and supply to energy efficiency and retrofitting projects.

ESCOs help consumers identify, finance and implement projects, thereby making it easier to invest. In particular, they can reduce the burden of making upfront capital expenditures and facilitate access to commercial financing.

The global ESCO market as a whole increased by around 6 percent in 2020 to **USD 33 billion**. This growth was mainly centred in China, where investment rose by 12 percent despite the pandemic [1].

Other major ESCO markets, including the United States, European markets and emerging markets and developing economies, either remained flat or contracted.

During 2020, the global ESCO market became increasingly disrupted due to physical lockdown restrictions. ESCOs in Middle East countries such as **Saudi Arabia** and **the United Arab Emirates** reported increased awareness of the need for efficient ventilation and cooling, and associated benefits for indoor comfort and health, which boosted business.

Europe accounted **for 14 percent** of the global ESCP market in 2020 while share of **the United States** was **20 percent.**

Chinese energy service companies experience strong growth in 2015-2020, the share of China in global sales of ESCO services increased **from 52 to 59 percent** within 6-year period.

The Chinese ESCO association EMCA reported that ESCOs quickly turned to using online tools and remote controls to keep their clients engaged and their business operations as robust as possible. Chinese ESCOs used 2020 as an opportunity to update their business models through greater use of smart tools and technologies.

Another important factor which supported the Chinese market was that the Chinese government also introduced additional tax incentives in May 2020 to encourage ESCO business development and innovation.

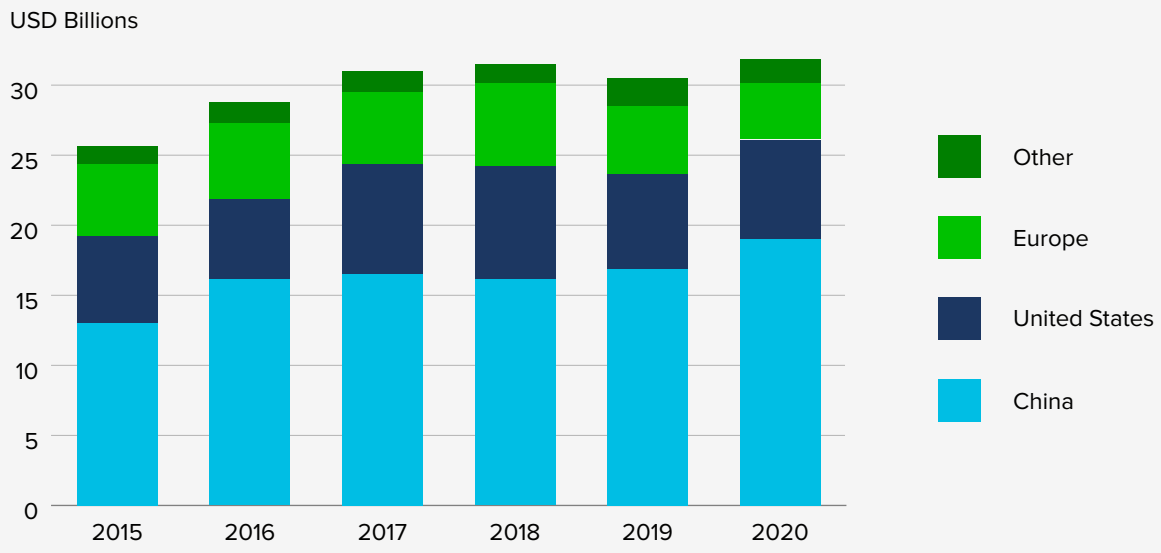

Figure 1. Global ESCO Market Size in 2015—2020

Source: IEA

1.2. Global ESCO Market Structure

Globally, ESCOs typically engage in three types of contracts in their operations:

- ***shared savings contracts;***
- ***guaranteed savings contracts;***
- ***fee for service contracts.***

The first two types are also known as energy performance contracting (EPC) and are the main business models that distinguish ESCOs from other service companies in implementing energy efficiency.

In shared savings contracts, an ESCO not only provides technical support to energy efficiency project and implementation, it is also responsible for upfront project financing. Hence, it carries both the performance risk and the financial risk of the project.

The guaranteed saving contract differs in that it is the facility owner, not the ESCO, that is responsible for financing the energy efficiency project. In such contracts, the ESCO guarantees the facility owner a certain percentage of the energy savings.

In fee for service contracts, the ESCO provides specified energy efficiency services for an agreed fee. The facility owner is responsible for financing the energy efficiency project and receives all the cost savings. The ESCO does not have to guarantee a specified level of energy savings, but nor will it get a share of the savings from the energy efficiency project. Hence, this type of contract is not performance-based.

According to IEA data, different countries demonstrate different approaches to ESCO market design. For example, in China (which is a leading global market for ESCO) both guaranteed savings and shared savings models are equally distributed accounting for 50 percent of market share each.

In ***Canada, the USA and Korea a guaranteed savings model*** is the most widespread while in ***India and Chile shared savings model*** accounts for the largest market share.

The Japanese and EU member states market is characterized by balanced structure with all the contract modalities actively used.

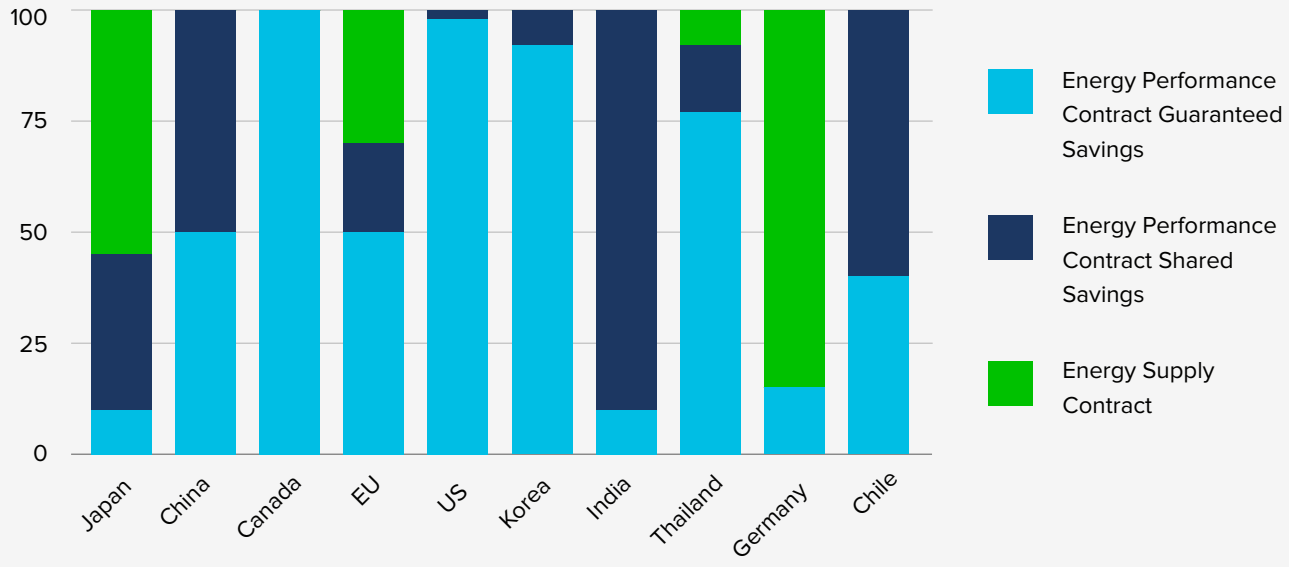

Figure 2. Global ESCO Structure of Revenues by Contract Type in 2020, %

Source: IEA

Japan, China, Brazil, Korea, India, Thailand and Mexico are characterized by the most active presence of ESCO business in the ***private sector*** while the ***public sector*** is the target customers for local ESCO companies in ***European Union, the USA and Canada***.

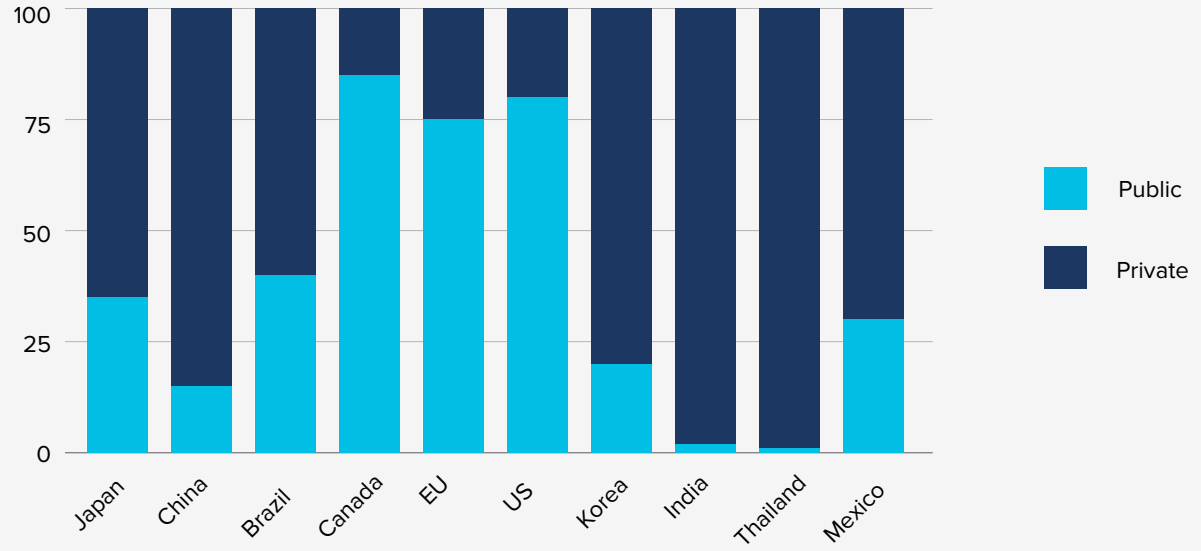

Figure 3. Global ESCO Structure of Revenues by Public and Private Sectors in 2020, %

Source: IEA

As a result of such market structure, experience from countries with the leading role of ESCO companies in implementation of energy efficiency projects in the public sector can be particularly useful for Ukraine.

Non-residential buildings take the leading market share of EPC contracts in such countries ***as Japan, Brazil, Canada, EU member states and the USA***.

Industry is in focus of ESCO companies in ***China, Korea, India, Thailand and Mexico.***

The residential sector accounts for a notable market share in ***Brazil and Korea.***

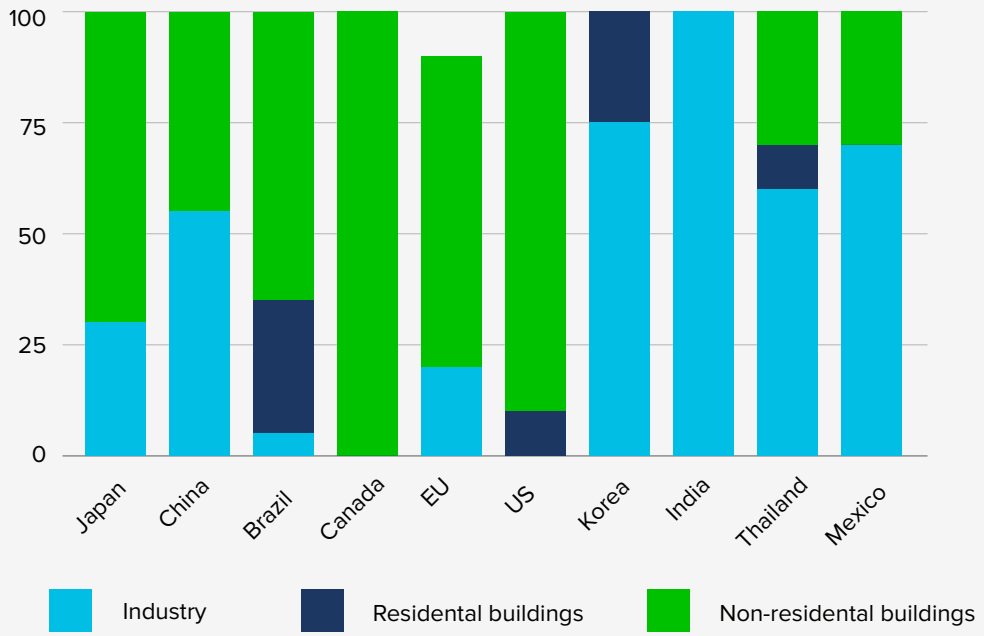

Figure 4. Global ESCO Structure of Revenues by End-User Sector in 2020, %

Source: IEA

It can be noticed that there is no uniform ESCO market structure. Each country defines priorities for ESCO intervention taking into consideration potential for energy performance improvement, availability of alternative sources of financing as well as maturity of the energy efficiency market.

2. Key Modalities of ESCO Market Operation

As both ESCOs and their clients may by their nature come from either the private or public sectors, there are many different potential types of contractual relationships between them.

In all cases, they involve a certain amount of risk transfer from the energy user (client) to the ESCO [2].

2.1. Public ESCO - Public Client

A public-sector ESCO is not a structure one finds everywhere around the world.

Such a structure would essentially have an added value in either unblocking the public sector market by eliminating the need to have a public procurement process, or concentrating the necessary expertise in one location, instead of spreading it around many different government organizations (ministries, agencies etc.).

One of the mechanisms to have been used was the use of Super ESCO's owned by the public sector and targeting only, mainly or mostly public sector facilities.

There have been only a few examples of public-sector ESCOs serving public-sector energy consumers, some of which are presented below.

Belgium

Set up by the Belgium federal government, ***FEDESCO*** was created as a public ESCO with a focus on the implementation of energy efficiency projects in federal public buildings. FEDESCO, a limited liability company under public law, was structured as a subsidiary of the Federal Participation and Investment Company, a government-owned financial holding. It was started with capital of EUR 1.5 million (USD 1.8 million) from the Kyoto Fund, increased to EUR 6.5 million (USD 8.0 million) in 2007 [3].

Starting in January 2007, FEDESCO obtained the exclusive right to apply EPC to federal buildings and to manage turnkey EPC projects on behalf of building occupants, in collaboration with the Federal Building Agency. The objective of FEDESCO's proposal was to apply the EPC shared savings model and to use public-sector financing to address the needs of at least half of all federal buildings, thus creating a potential market at the federal level ranging from 500 to 800 buildings in the following years.

Croatia

Croatia launched an ESCO approach in 2003 under an initiative of the World Bank and the Global Environment Facility through a first ESCO company.

HEP ESCO Ltd, a subsidiary of HEP, a utility-based, state-owned company 100 percent owned by the Croatian national electricity company, was launched as the first ESCO in the country, in the form of a public-based facility. The aim was to create an energy efficiency market and increase awareness of its benefits through the use of EPC. The other objective was to create an ESCO company to demonstrate that the ESCO business could survive on the market while being profitable and leading the way to the development of a private-sector ESCO market.

HEP ESCO developed its market ***mainly in the public sector*** since, as a public-sector entity, it did not have to go through public procurement procedures and was therefore in a privileged position in being able to negotiate contractual agreements on a sole-source basis. Public-sector facilities became the main source of clientele for HEP ESCO in its first five years of operations. In 2009, a new budget law entered into force in the country, which allowed budget users (government facilities) and municipalities to go into debt by taking out credits and loans. The Ministry of Finance issued an opinion that contracts signed with ESCOs, either public or private, were commodity loans and should be treated as debt. Consequently, in HEP ESCO's experience this change had an important negative influence on the ESCO market, bringing ESCO projects into competition with the real investments budget users and municipalities needed to make, for example, in the civil construction of new schools, hospitals, roads, public lighting systems or extensions of the latter. With such investments, energy efficiency was not regarded as a high enough priority in countries such as Croatia, where the need for new facilities and institutions is crucial for normal life.

HEP ESCO invested 24 USD million in energy efficiency projects between 2003 and 2010. From this amount, 83 percent was invested in the public sector and 17 percent in the private sector.

From the total amount invested 11 USD million (47 percent) was invested in the building sector, which mostly includes hospitals and schools, along with 9 USD million in public lighting (37 percent) and 4 USD million in industry with cogeneration projects (16 percent).

Germany

The first large statewide public EPC program, the ***"Energy Saving Partnership (Energiesparpartnerschaft)"***, to be launched in Germany was initiated by the Federal State of Berlin by grouping more than a hundred public buildings into two building pools. This idea was successful, and in the subsequent fifteen years, more than twenty large EPC tenders were launched. The most prominent example of a facilitator has been BEA (Berlin Energy Agency), but a number of other regional energy agencies (EA-Northrine-Westphalia, KEA – Klimaschutz – und Energieagentur Baden-Württemberg, Bremer Energiekonsens, the State of Hessen and as well as the German Energy Agency and many others), all public-sector entities, also became involved. They all developed adapted model contracts for their initiatives, which laid the basis for EPC contracts in federal, state and municipal buildings in many regions.

In this context, the EPC market was mostly developed through large projects in public buildings (pools), hospitals, leisure facilities and the like, making the public ESCO-public sector arrangement the backbone of the market.

On the other hand, many of these programs also relied on the use of private-sector ESCOs going through public procurement processes to select them.

Uruguay

Uruguay defined its energy policy in the early 2000 with energy efficiency as one of its key strategies. Actions have been implemented in this regard in order to stimulate the development of a sustainable ESCO market. To support this trend, the Energy Efficiency Act addressed procurement and contracting mechanisms for public institutions, introduced tax exemptions, and supported the implementation of adapted financing mechanisms for energy efficiency projects. The Act was quite supportive of the introduction of the EPC and has good prospects for local and regional business.

In 2004, the ***Uruguay Energy Efficiency Project (UEEP)*** was developed by the World Bank with the support of a Global Environmental Facility grant. As investments in energy efficiency projects were very limited in the country, it was proposed to use this project to address the market barriers through the development of a public utility-based ESCO (USCO). The national and publicly owned Uruguay Electricity Company (UTE) developed an ESCO operation within its rank, and the EPC concept was launched. Under this initiative, UTEUSCO would develop, implement and finance investments in energy savings using the EPC shared savings concept.

The program was designed for USCO to act as a public Super ESCO, meaning that it would support the development of local private-sector ESCOs and provide

them with the finance to implement their own projects. It initially focused its market on public-sector facilities, given the favorable legal framework and the reduced client risk associated with the project.

The components of the UEEP program that were linked to the development of the EPC concept included the following:

- support for the creation and development of USCO, as mentioned above;
- support for the development of private-sector ESCOs through training, operation, support and financing mechanisms;
- creation of the ***Uruguay Energy Efficiency Fund (FUEE)*** to support private-sector ESCOs implement energy efficiency projects.

On the financing side, a dedicated guaranteed fund (FUEE) was created to work through financial intermediation institutions.

FUEE was managed by ***the National Development Corporation (NDC)***, an entity dependent upon the central government. So far, two commercial banks (BROU and BANDES) have signed agreements to participate in this financing system for energy efficiency projects.

2.2. Private ESCO - Public Client

This is the most common way that ESCOs have been operating in OECD countries.

Many countries have developed national and regional programs to enable public-sector facilities to benefit from EPC programs and reduce their energy operation costs. This model has proved quite interesting but also challenging, since each program needs to develop its own public procurement mechanisms, which need either to adapt to the current legal framework or work in parallel to change it, as needed.

The public procurement process has proved a challenge when it comes to interesting ESCOs, as the cost of submitting proposals is usually high, and the evaluation process is not always focused on selecting the best-value proposal.

It is often based on other elements given public procurement rules (such as the lowest cost), which are not outcome-based and limit both the ability of the private sector to make innovations as well as the particular technical knowledge and expertise of the public-sector procurement team.

There are as many models here as there are countries that have developed them.

Austria

In early 2000s, a ministerial order laid the foundations for a ***"Federal Contracting Campaign"*** involving around 300 federal buildings. It became the largest EPC program in the country and evolved rapidly, affecting approximately 550 buildings bundled into 17 pools, which have only been outsourced to ESCOs in the 2000s. By the early 2010s the Austrian Energy Agency had almost entirely left the ESCO market facilitator arena.

As far as the business models that have been used in the market are concerned, they have mostly been labeled "energy-contracting", two basic business models being distinguishable in the national market:

- ESC, performance-based supply of useful energy, and EPC, a performance-based energy savings business model:
- The IEC model, combining supply (preferably from renewable energy carriers) with energy conservation measures in the entire facility, while simplifying M&V procedures through quality assurance instruments.

Canada

The Federal Buildings Initiative (FBI), an energy sector initiative of the federal department of Natural Resources Canada, was officially launched in 1991. Two years later, the first project using an EPC shared savings approach was implemented, recruiting private-sector ESCOs for their technical and financial strengths in order to benefit the government sector.

Efforts were indeed made to overcome different ministries' budget constraints in the federal government by promoting the use of private, third-party financing by ESCOs.

The Federal Contracting Policy was amended to

allow federal departments to enter into such service contracts and acquire energy services with an energy management firm with a view to implementing energy efficiency improvements.

In 20 years (1993-2011) the FBI program has attracted 320 CAD million (250 USD million) in private-sector investments and generated over 43 CAD million (34 USD million) in annual energy savings and annual GHG emissions reductions of 285 Kt. This was achieved through 87 projects in over 7 thousand buildings, or by retrofitting about one-third of all federal buildings.

2.3. Public ESCO - Private Client

This structure, although possible, has not developed a dedicated market due to the reasonable perception that the public sector would take the place of any private-sector ESCOs that were already present in the market or had yet to be developed.

The concept of the Super ESCO presents a possible mechanism for using the strength of the public sector as a way to attract private-sector end-users while relying on the expertise of private-sector ESCOs to carry out the work.

This would require both shared savings and guaranteed savings schemes to make it fully workable.

Etihad ESCO in Dubai is a good example of such a structure.

3. ESCO Market Supporting Infrastructure

International experience around the world shows that there are some financing options for ESCO projects in public buildings that can help address some of the barriers to energy efficiency implementation. These options can be represented as a ***"financing ladder"*** (Annex 1) to help guide policy makers in selecting one or more options that can then be designed to provide accessible financing products [4].

The "steps" in the ladder show the progression from strictly public financing to market-based commercial financing.

Moving up the ladder requires the increasing participation of commercial financing and financial markets with improved maturity.

Unfortunately, in most developing countries, commercial finance is generally not available for public agencies, so governments have to rely on the lower steps in the financing ladder.

3.1. Energy Efficiency Revolving Funds

Energy efficiency revolving funds (EERFs) offer viable options for governments to stimulate ESCO projects in the public sector. Such funds have been successfully deployed by national or state governments, with assistance from the World Bank and GEF, ***in Armenia, Bulgaria, and Romania*** and are now being replicated in ***Mexico, Kosovo*** and elsewhere.

EERFs are designed to provide initial investments in public energy efficiency projects.

Unlike one-time concessional funding or grant programs, which eventually taper off as the market approaches maturity, EERFs are considered more sustainable, since well-performing projects help fund future ones. Such a structure is especially advantageous for lower-budget, less creditworthy public agencies, since financing is generally cheaper and comes with a longer tenor than those that would have been provided by the commercial banks.

They offer a range of long-term financing options for public-sector energy efficiency projects, such as:

- Loans to public agencies that are creditworthy and have borrowing capacity or to ESCOs that

provide services to these public agencies, such as those offered by ***the Bulgarian Energy Efficiency Fund;***

- Energy services agreements (ESAs) with public agencies that have little or no borrowing capacity and/or do not have the capacity to contract with or manage ESCOs. Under an ESA, the fund offers a full package of services to identify, finance, implement, and monitor energy efficiency projects. The public agency is usually required to pay to the fund all, or a portion, of its baseline energy bill to cover the investment cost and associated fees during the contract period. The fund can then engage ESCOs to provide some or all of the implementation services using performance-based agreements;
- Risk-sharing facilities, designed to refute lenders' perceptions that energy efficiency projects are inherently riskier than their traditional investments. These provide partial coverage of the risk involved in issuing loans for energy efficiency projects;
- Forfeiting or sale of ESCO receivables. Forfeiting is useful in situations where an ESCO is providing its own equity for project financing. It is a form of transfer of future receivables from one party (the seller — an ESCO) to another (the buyer — a financial institution).

The presence of EERFs in a market is also beneficial to ESCOs, particularly those looking to make the public sector a larger share of their project pipelines. Undercapitalized public clients that would have initially required ESCOs to take over most of the financing responsibilities would then be able to take on a larger share of that burden. This could cascade into more energy efficiency projects in the future for the same public agencies, as cash is freed up by realized energy savings.

3.2. ESCO Guarantee Funds

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. 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.

3.3. ESCO 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.

In these structures, the credit risk arising from energy efficiency debt-financing is shared between a financial institution and the government.

The RSF financiers can elect to have a ***single tranche*** or ***multiple tranches*** in place, depending on each other's risk management needs. Under a single-tranche

structure, the majority of the risk can be assumed by the government in order to attract private-sector participation.

In a ***single-tranche RSF***, the government may elect to take the majority of the risk (ex. 70-80 percent) and leave the balance to the other financial institution. The structure can be further customized to manage the risk of the government investment.

If the government wants to temper its risk exposure but still entice private investment, a two-tranche RSF can be used in which the first wave of credit losses is more evenly split between the parties, but majority of the risk balance is still taken by the government.

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 percent) 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.

RSFs are feasible in markets where commercial banks are liquid and risk-tolerant of energy efficiency projects, and there is enough ESCO activity to generate a pipeline for the RSF to fund.

3.4. Energy Savings Capture Model

The Energy Savings Capture mechanism is based on ***recovering or "capturing" the cost savings from an energy efficiency project to fund additional project investment without requiring additional capital infusion or increasing the public debt.***

The cost savings will generally reduce the budget for energy costs in subsequent years. This approach involves keeping the energy budget constant, paying the reduced energy bills from the energy budget, and placing the cost savings in a separate budget account annually for a specified period of time.

The funds can then be used for investments in new energy efficiency projects. The amount of energy cost savings captured and set aside in the account is determined by appropriate measurement and verification (M&V) of project results.

This approach was adapted ***by World Bank in Montenegro, Uzbekistan and Belarus***.

3.5. 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.

3.6. Best Practices of Energy Efficiency Support Facilities: 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.

Serving as the primary legislative framework for Thailand's energy efficiency policy, the Energy Conservation Promotion Act (ENCON) established the ENCON fund to provide financial support for energy conservation programs. ***The Department of Alternative Energy Development and Efficiency (DEDE)***, an agency under the Ministry of Energy, manages the ENCON fund and used its proceeds as initial funding for the EERF, covering a ten-year investment horizon.

Originally, the EERF was launched for a pilot period of only three years, with supplemental investments provided by six participating banks. This was subsequently extended by seven years in five phases, after which the EERF will cease to receive a budgetary allocation from the government and will be sustained instead by the banks' own capital.

In course of time, the DEDE signed agreements with eleven ***participating banks (PBs)***.

A standard contract between DEDE and PBs facilitates disbursements that will be used by the latter to lend to clients for their energy efficiency projects.

The EERF is structured to lend to participating banks ***at 0.5 percent*** (reflecting administrative costs and the banks' credit risk), the latter flowing the funds to the energy efficiency programs with a 50 THB million cap per project at 4 percent per annum defaults. Project costs in excess of the cap are then covered by the banks.

PBs, which then flow the funds to energy efficiency projects, are required to cap their lending rates at 4 percent per annum and their loan size at 50 THB million

(1.25 USD million) per project. Should projects require funding beyond THB 50 million, the commercial banks should provide the balance.

The target market of funding by the EERF comprises buildings, factories, ESCOs, and project developers. Eligible facilities must meet at least ***one of the following requirements:***

- ***minimum installed electrical demand of 1,000 kW;***
- ***minimum installed transformer capacity of 1,175 kVA;***
- ***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. 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.

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.

The EERF disbursed 210 USD million to fund 335 energy efficiency and renewable energy projects between 2003 and 2010, or 46 percent of the 453 USD million total project cost. This resulted in 154 USD million of annual energy savings by 2009 and a three-year average payback period.

The value of the EERF was limited not just to its actual investment outlay, but also in its ability to stimulate investments in energy efficiency by other stakeholders.

Because the EERF passed on below-market interest rates, the commercial banks were able to mobilize more of its capital. As their risk perceptions of energy efficiency projects improved, the banks increased their capital exposure, rather than simply matching the EERF's outlays.

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. 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 50 THB million project size cap precluded larger-scale projects 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.

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.

Because of its key role back then in Thai energy efficiency financing, the facility also paved the way to streamlined lending procedures, reduced loan-approval times, and decentralized responsibilities for implementing energy efficiency financing.

4. Best Practices of Energy Efficiency Facilities Market Design Using Funding from the International Financial Institutions

4.1. The HEP ESCO (Croatia)

The World Bank supported the creation of the HEP energy service company within ***Hrvatska Elektroprivreda d.d.*** (HEP—the national power utility) with the objective of developing, financing, and implementing energy efficiency projects on a commercial, for-profit basis, using local businesses as key delivery agents.

The HEP ESCO found a niche market, financing energy efficiency projects for the public buildings of local authorities (administration buildings, schools, etc.), hospitals or universities, and street lighting.

It implemented 31 energy efficiency projects on a commercial, for-profit basis, for a total cumulative value of 29.5 USD million in energy efficiency investments.

With the objective of increasing its profitability and positioning itself as a market leader, the HEP ESCO entered new market segments, including greenfield renewable energy projects - a notable example was the Hrast biomass cogeneration project.

Being a utility-based ESCO had both positive and negative consequences. On the positive side, the HEP ESCO benefited from HEP's positive corporate image and gained access to HEP's customer database for data mining and customer-sector identification.

Additionally, loans to the HEP ESCO were made through HEP, which is a creditworthy client.

But one of the major drawbacks of being a subsidiary was the need to apply HEP's human resources and compensation policies, which were not adapted for a fast-growing company that needed experienced staff.

4.2. Renewable Resources and Energy Efficiency Fund of Armenia (R2E2 Fund)

The Armenian government established the ***R2E2 Fund*** in 2005 with the mandate to promote the development of Armenia's renewable energy and energy efficiency markets and to facilitate investments in these sectors.

Under the ***World Bank–Global Environment Facility's Energy Efficiency Project,*** the R2E2 Fund provides turnkey services (energy audit, procurement, detailed design, financing, construction, and monitoring) for energy efficiency upgrades in public buildings using output- and performance-based contracts.

The project was designed to develop, test, and disseminate replicable and sustainable models for the provision of energy efficiency services through the use of energy service agreements (ESAs).

At the end of the project in 2016, 62 ESAs totaling 9.89 USD million were signed by the fund. The fund more than doubled the project's key indicator targets, with energy savings of 520 million kilowatt-hours (kWh) and greenhouse gas (GHG) savings of 137,569 tons of carbon dioxide (versus the project targets of 215 million kWh and 50 549 tons CO2).

Energy savings averaged almost 51 percent, and payback periods ranged from 2.6 to 8.8 years. The repaid amount is 2.6 USD million, and there are no defaults—in fact, several have made early repayments.

In addition to energy savings, the procurement scheme encouraged the development of a local ESCO industry and introduced new technologies, such as LED bulbs, condensing boilers, solar photovoltaic (PV), and heat pumps.

Many beneficiaries have reported substantial improvements in their building conditions and in operations and maintenance savings, which they have used to invest in extending service and completing internal repairs and renovations.

4.3. Shandong Green Development Fund

The Shandong Green Development Fund (SGDF) illustrates how public administrators can organize a long-term lending facility to achieve local energy efficiency objectives. Considered an economic center, the province of Shandong is located on the eastern coast of the People's Republic of China.

The SGDF is a 1.5 USD billion, twenty-year catalytic fund targeted at climate change mitigation and adaptation measures for the province, including energy efficiency interventions.

Investments will be made on a revolving basis to subfunds at an initial ratio of 55 and 45 percent from public (Qingdao Municipal Government) and IFI finance (Asian Development Bank, Agence Française de Développement, Kreditanstalt für Wiederaufbau, and Green Climate Fund) respectively.

The revolving structure of the SGDF is potentially attractive for Chinese ESCOs with several projects already in their pipelines.

In the context of Shandong's climate finance environment, the SGDF would function as an anchor investor which could potentially attract further investment, such as private paid-in capital and concessional sources of financing.

Although the SGDF's effective cost of funds may not match the sub-commercial rates offered to developing countries by some climate finance programs, it would still represent a discount relative to that offered by commercial banks, particularly those still risk-averse towards energy efficiency financing.

4.4. China National Energy Conservation Centre

From 2009 to 2017, an international project financed with World Bank loans and GEF grants was aimed at supporting innovation in energy conservation financing and policy improvements, as well as the NDRC and ***the National Energy Conservation Centre.***

These projects involved 350 USD million of ***loans from the World Bank*** and 13.5 USD million of grants from 2009 to 2017.

The NDRC is the Chinese partner, while the China National Energy Conservation Centre was responsible for day-to-day project management.

Three Chinese banks, ***China Import and Export Bank,*** ***Huaxia Bank and Minsheng Bank***, were the local financial institutions that re-lent the World Bank loans to finance energy conservation, waste-heat utilization and coal substitution projects in such industries as iron and steel, electricity, chemicals, building materials and petrochemicals.

The loans leveraged over 20 RMB billion of investment in energy conservation and generated an annual energy-saving capacity of 4.41 Mtce and an annual CO2 generating capacity of 10.77 Mt.

The 13.5 USD million was spent on policy study and capacity-building for energy conservation.

5. Best Practices of Super ESCO Market Design Relevant to Ukraine

5.1. FEDESCO (Belgium)

As a 100 percent subsidiary of the Federal Participation and Investment Corporation, ***FEDESCO*** facilitates and finances energy efficiency projects in federal government buildings throughout Belgium. It was founded in September 2005 as a public limited company with a capital investment of 6.5 EUR million and an additional 10 EUR million in state guarantees.

To implement projects, FEDESCO cooperates exclusively with the Federal Building Agency and enters into engineering, procurement, and construction contracts with public facilities without competition, using either internal funds or financing from commercial banks (with a state guarantee). It then subcontracts energy efficiency retrofit work to private ESCOs or service providers on a competitive basis.

In these implementation arrangements, FEDESCO bears a direct contractual obligation to repay loans from the banks and assumes performance risks for thermal retrofits.

In 2012, FEDESCO reported total energy savings of 19,883 MWh, which it valued at 1.937 EUR million. The forecast was for annual savings of 1.110 EUR million and the average payback for the measures was estimated to be 2.25 years.

Total greenhouse gas (GHG) savings totaled 9,400 tons of CO2.

FEDESCO offers lessons in the importance of taking a long-term perspective and working with other stakeholders to spread knowledge and experience.

In a short time, it has evolved from a third-party financer offering all services to a company that provides a range of services and acts as a facilitator to bring in the private sector as much as possible.

5.2. Tarshid (Saudi Arabia)

In October 2017, ***Saudi Arabia's Public Investment Fund (PIF)*** created the National Energy Services Company (NESCO), also known as ***"Tarshid"***. This new Super ESCO was created with an initial capitalization of over USD 500 million with the objective of increasing the energy efficiency of government and public buildings, public street lighting, etc., and stimulate the growth of the country's energy efficiency industry, in line with the objectives of the Government's Vision 2030 to diversify the economy and drive environmental sustainability.

All government entities are mandated to contract with Tarshid on an exclusive basis in accordance with a royal decree. Tarshid covers at least 70 percent of all projects in the country's energy efficiency sector, estimated to be a market of around 11 USD billion.

Tarshid has set up a framework for competitively procuring the services of private-sector ESCOs through EPCs to deliver energy efficiency equipment and solutions in public buildings across the country. In this process, Tarshid is also helping build the capacity of local private-sector ESCOs and preparing transaction tools and EPC templates, as well as developing guidance for the M&V of energy savings in accordance with international benchmarks.

Since early 2018, Tarshid has started the process of developing and implementing energy retrofit projects in hundreds of public office buildings, schools, and mosques, and has also started a street lighting program to replace 2.5 million existing streetlights with LEDs.

This Super ESCO model has proved to be a very interesting example of public ESCO-public sector end-user relations, while still relying on the use of private-sector ESCOs for project implementation.

5.3. The Etihad ESCO (United Arab Emirates)

Etihad ESCO is the official Super ESCO organization under the leadership of the Dubai Supreme Council of Energy.

It was established in 2013 as an initiative of ***the Dubai Electricity and Water Authority (DEWA)*** to help foster an EPC market in Dubai so that building owners from both the public and private sectors could improve energy efficiency in their buildings.

As a public Super ESCO, Etihad ESCO aimed to jumpstart the creation of a viable EPC market for ESCOs by performing building retrofits in both public- and private-sector facilities, thus increasing the penetration of district cooling, building the capacities of local ESCOs in the private sector, and facilitating access to project financing. When created, the Dubai ESCO market was expected to provide new business opportunities for joint ventures and international partnerships, as well as engage UAE national entrepreneurs in a diversified supply chain made up of financial institutions, technology providers, equipment manufacturers and service providers throughout the project development, management and reporting stages.

Etihad ESCO was transferred to ***the Dubai Buildings Retrofit Program*** as part of the DSM Strategy and had clear goals and objectives. An estimate was made as part of the DSM Strategy study revealing that of the more than 120 thousand buildings in Dubai, 30 thousand would qualify for an energy retrofit and potentially benefit from the Etihad ESCO initiative with a goal of 1.7 TWh in energy savings by 2030. These 30 thousand buildings come in all shapes and sizes, consisting of residential and non-residential buildings, as well as government and other privately owned facilities; they became the main target of Etihad ESCO.

The business model that Etihad ESCO has been deploying in Dubai since its creation was for itself to be the middleman between private and public facility owners, ESCOs and financial institutions in order to act as an effective facilitator to remove market barriers so that energy retrofits happen effectively.

Etihad ESCO prequalifies buildings from the owners' portfolios, organizes the tendering on behalf of owners, arranges financing if it is outside an owner's budget, follows up on project execution, and follows up during the guarantee phase.

As a Super ESCO, Etihad ESCO made sure it did not compete with private-sector ESCOS: quite on the contrary, it was focused on organizing and establishing a market for ESCOs. On this basis, Etihad ESCO encouraged private-sector ESCOs to participate in the calls for tenders that are published regularly on its website. ESCOs need to be accredited through the ***ESCO Accreditation Scheme of the Dubai Regulatory and Supervisory Bureau (RSB)*** in order to participate more easily in the projects being launched.

In September 2017, Etihad ESCO announced that it had initiated a project to retrofit 243 buildings in different parts of Dubai. The company is also retrofitting eight power stations for DEWA, one fuel station for ENOC, three buildings for Dubai Healthcare City, and 35 buildings for Dubai Golf.

Etihad ESCO intended to complete six ongoing retrofit projects before June 2019, including Terminals 1, 2, and 3 of the Dubai International Airport and the Airport Hotel. All six projects were expected to result in combined annual energy savings of 16.44 USD million, or 131.45 GWh.

5.4. Energy Efficiency Services Limited (India)

Energy Efficiency Services Limited (EESL) was established in 2009 as a state-owned ESCO, a joint venture of four public sector enterprises under the Ministry of Power.

EESL has emerged as an important entity in India, financing and delivering energy efficiency solutions, especially in the residential and public sectors.

India's energy efficiency market is estimated to be 12 USD billion per year.

Unlike most Super ESCOs, EESL's early success started with the residential sector under its UJALA program. EESL's approach involves aggregating demand for energy-efficient appliances and equipment, providing up-front financing using a combination of financing sources (including equity capital from promoters, along with loans from development partners and commercial lenders), and using competitive bulk procurement to improve affordability while ensuring the quality of high-efficiency appliances.

EESL has been able to mitigate up-front financing risks for its customers by making the entire up-front capital investment, through pays under an on-bill financing approach.

In case of public sector projects (like LED public street lighting), EESL has demonstrated the viability of the deemed savings M&V approach as the basis for ESPC-based contracts, paving the way for use of similar contractual models by private ESCOs.

In addition, by procuring large volumes from a variety of suppliers that meet strong technical standards, EESL is credited with helping spur development of manufacturing capacity in India and lowering the price of energy efficiency measures to make them affordable and financially more viable.

In its Street Lighting National Program (SLNP), the entire up-front investment for street lights is made by EESL and recovered from the energy savings of municipalities over the project duration, using the deemed savings M&V approach. Over 6 million street lights have been deployed so far.

EESL's initiatives have helped avoid over 8.5 GW of new electricity generation capacity.

Under its LED initiative, called UJALA, EESL has successfully deployed over 300 million (7 and 9 watt) LED bulbs over four years to households and institutional consumers (as of May 2018) through bulk procurement, distribution, quality control, M&V of savings, and after-sales and warranty servicing, and has driven the procurement price of LEDs from 4.60 USD per bulb in 2014 to 0.56 USD in 2017, triggering the retail market price to also go down from 8.20 USD to 2.20 USD during the same period.

EESL's role as a facilitator of projects implemented by private ESCOs has been limited to date.

Recently, the World Bank approved a loan that aims to help EESL develop sustainable business models using private ESCOs.

6. Regulations Ensuring Success of Super ESCO

Following observation of the progress of the various existing Super ESCOs, a few necessary regulations can be identified to make ensure the Super ESCO's success. These regulations should ideally be established at the same time as the Super ESCO itself.

6.1. Long-Term Concessional Financing for ESCOs

Business-as-usual financing, in which equity- and debt-based funds are sourced to fund energy efficiency projects, is common among ESCOs. While some financial institutions, especially international financial institutions or IFIs, initially extended equity investments, over time they have shifted to investing in energy efficiency projects using debt in order to better manage risk.

In emerging economies, multilateral development banks (MDBs) have established funds that help finance private-led infrastructure, such as ***ADB's Leading Asia's Private Infrastructure (LEAP) Fund.***

Other facilities, such as ***the Green Climate Fund (GCF)***, are designed specifically to support pipelines of energy efficiency projects financially.

Typically, investment horizons range over a decade in order to exceed the average contract durations of projects and to facilitate rollovers and the reinvestment of repayments. This is a common characteristic of official development assistance (ODA) funds, which are received by government agencies that then direct them into large-scale public energy efficiency programs or the project aggregators that directly manage energy efficiency pipelines.

Unlike most commercial debt financing, ODA lending terms are provided at near- (or even sub-) wholesale interest rates. Low financing costs can also be bundled together with guarantees that further ease the financial burden on ESCOs, particularly those with asset bases that are considered insufficient to qualify for commercial loans. Of course, securing such affordable financing is subject to satisfying criteria that are predetermined by the ODA or MDB. Another common approach is to blend these concessional sources of finance with other private or public funds to structure larger lending facilities. These can be then used to support rapidly growing ESCO markets that are weighed down by a risk-averse commercial financing environment.

IFI investments can be infused into multilateral climate funds and capital raised from multiple private investors.

6.2. Fiscal Tools and Policies

When sourcing adequate funding from financial institutions is difficult, governments employ fiscal tools to support or enable public agencies to take on energy efficiency projects.

One such tool is budget financing with capital recovery, in which sponsoring agencies such as the department or minister of budget or finance provide allocations to implementing agencies or municipalities for their energy efficiency projects. The sponsoring agencies are repaid through budget reductions across implementing agencies based on energy savings (for example, lower budgets for energy expenses).

Typically, the reductions are set lower than the expected energy savings, allowing the implementing agencies to retain a portion of the economic value resulting from their energy efficiency projects. This in turn would incentivize them to continue identifying energy-saving opportunities. ESCOs also gain from this mechanism because projects for previously non-creditworthy or undercapitalized public agencies now become financially viable, and pipelines of future projects with them become more likely.

Small municipalities are among those that would benefit the most from budget financing, as it would address the following limitations regarding municipal funding:

- insufficient municipal revenues;
- restrictions on borrowing capacity;
- restrictions on the use of funds.

In addition to financial support, sponsoring agencies may include technical assistance to help end-users identify opportunities and properly assess project risk.

Risk aversion towards implementing profitable energy efficiency projects would lessen, thus increasing the demand for ESCO services.

For example, a budget financing structure was used in the ***Municipality Services Improvement Project (MSIP) of the Macedonian government.***

In 2010, the World Bank provided funds to ***Macedonia's Ministry of Finance***, which the latter then lent on to public agencies and municipalities that met the creditworthiness criteria. Qualified use of the funds were municipal services projects, such as those on energy efficiency, that either generated revenue or reduced costs. In cases in which borrowers lacked the technical capacity to conduct in-house project procurement or design, a special implementation unit within the Ministry of Finance would supplement the client with technical advisory financing to outsource these processes. Loans issued by the Ministry of Finance were paid with the net cash flows generated by the projects. Failure to do this resulted in the Ministry of Finance exercising its right to reduce the future annual budgets of these public agencies or municipalities.

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 the 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 mechanisms 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 into ***commercial (C-PACE***) and ***residential (R-PACE)***, and cash-flow streams from property tax payments are securitized for trading in financial markets.

A key feature that makes this program even more attractive is that repayment obligations are tied to the property rather than the home or building owner. As a result, even if the repayment stream spans decades, owners are still incentivized to make improvements in energy efficiency. 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 expenditure while increasing property values. Thirty-three US states and the District of Columbia have passed legislation enabling PACE. Nineteen of these states plus the District of Columbia currently have operational PACE programs.

A more common fiscal approach to stimulating energy efficiency investments is legislation regarding financial incentives and energy audit requirements.

In some countries, frameworks for these are largely based on existing policies on renewable energy investments. Designed to improve energy efficiency project economics and bankability, fiscal incentives come in different forms, such as tax reductions and credits,

income tax holidays (ITH), zero-rating of value-added taxes (VAT) or goods and services taxes (GST) for qualified equipment, and tax rebates.

Legislative frameworks for these incentives could also include requirements for public and private entities that would ultimately raise the demand for ESCO services.

The Philippines recently joined its Asian peers in incentivizing energy efficiency projects financially after lawmakers passed the Energy Efficiency and Conservation Law in 2019. Qualified enterprises are entitled to ITH, duty-free importation of capital equipment, and additional deductions from taxable income.

A database on nationwide energy consumption and the application of energy efficiency and renewable energy technologies will be established, and minimum energy performance standards (MEPS) will be set for energy-consuming products.

More importantly, business establishments that depend on annual energy consumption are now required to:

- undergo an energy audit every three years by a certified energy auditor;
- submit an annual energy consumption report;
- reduce energy consumption based on pre-determined annual targets.

The legislation is expected to accelerate ESCO activity in the Philippines, as the need for energy audit services increases and the identification of energy-saving opportunities becomes a business priority. The new law is also expected to broaden government procurement regulations and financing modalities for ESCO contracts targeted at public buildings or municipal services such as streetlighting, water utilities and irrigation.

6.3. Utility Programs

Public utilities are capable of implementing financing mechanisms that can support ESCO project viability. On-bill financing has been utilized in some markets as a means of supporting the large-scale implementation of relatively small energy efficiency projects across a portfolio of existing customers.

The utility provides project capital to customers pursuing energy efficiency projects for their households or business establishments. A share of the energy savings is then repaid to the utility by being bundled into existing utility bills.

This bundling feature significantly reduces the credit risks posed by end-users, thus justifying a lower cost of financing than that offered by commercial financial institutions.

Customers applying for this type of financing are still screened by the utility, but utility bill payment histories can be used as proxies for the creditworthiness of traditional measures. In some cases, investor capital outside the utility can be pooled with the funds from the on-bill repayments, particularly when there is an established demand for energy efficiency projects or when the utility's available funds are limited.

Because repayments are pooled from multiple customers or ratepayers, ESCOs implementing a portfolio of projects (for example, LED upgrades for households) gain from investment diversification and reduced credit risks.

The benefits for project viability are magnified even further when the public utility itself functions as the ESCO providing the energy efficiency services, since its technological offerings can be tailored to its understanding of ratepayer behavior.

On-bill financing gives ESCOs the opportunity to offer services to customers that would have been too small to create a bankable project or to aggregate into a project portfolio without the assistance of a utility.

Although on-bill financing presents a convenient way to scale-up energy efficiency initiatives and manage risk, several conditions must be met to allow its implementation. Utilities need a sizeable balance sheet and robust cash-flow management to provide capital for projects across a multi-year horizon. In addition, billing infrastructure should be capable of accommodating such bundling of project repayments. The most critical condition, the non-fulfillment of which has precluded on-bill financing in several countries for the time being, is that legislation must allow public utilities to conduct and profit from such mechanisms.

In Brazil, the Contribuição para Custeio do Serviço de Iluminação Pública (meaning "Contribution for the Cost of Public Lighting") or COSIP is a municipal-legislated, on-bill charge or tax that is added to the energy costs that must be paid by utility customers. The funds resulting from COSIP revenues can be used solely for the modernization of public lighting.

Municipalities can also allow excess COSIP funds to be used for PPP energy efficiency projects. Because these utility collections are committed to streetlighting projects, ESCOs involved in streetlight modernization programs enjoy lower credit risks when contracting with such municipalities.

However, surveys indicate that at least 31 percent of municipalities deem COSIP revenues insufficient to cover streetlighting costs. Nonetheless, this form of on-bill financing is seen as an effective means of de-risking and making attractive energy efficiency investments in a specific sector. LED conversion resulting from COSIP funding, if implemented nationwide, could result in an energy savings rate of close to 50 percent in the public streetlighting sector, or a 2 percent gain in national efficiency.

Demand-side management (DSM) is a means for utilities to reduce energy costs on a large scale, primarily by reducing consumption during peak hours. Utilities assess the electricity usage patterns of their customers and provide rebates to them to reshape their consumption behavior. Flattening the load curve, combined with employing energy storage resources, helps avoid the higher per-kWh generating costs from either "peak power plants" or the 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 by 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 their investment and earn a return on it.

Emerging applications can also be seen in the "smart grid," where customers can potentially provide utilities with 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 intensities, 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 been restructured to unbundle generation from transmission and distribution, as well as accommodating retail competition and open access, now face challenges in crafting a role as energy efficiency financing channels for distribution utilities.

6.4. Mandating Use of Super ESCO by Public Entities

Creating a Super ESCO to retrofit public buildings but not mandating public entities to retrofit their buildings and to work with the Super ESCO will make it difficult for the latter to succeed.

Any such situation will require the Super ESCO to have a specific team of "Sales" or "Business Development" executives tasked with convincing each public entity separately of their interest in working with them in saving energy use in their buildings. In other words, creating a public Super ESCO without legislative element to direct work to it will make it harder, slower and more expensive for the Super ESCO to succeed.

There are two examples in the Middle East that illustrate this problem very clearly. ***Etihad ESCO*** was created in Dubai in 2013 without the supporting legislation mandating government entities to work with them. A soft law was passed a few years afterwards to "encourage" but not "mandate" public entities to retrofit and work with the Super ESCO.

As a result, by 2020, the problem in government buildings had only partially been addressed, and the Super ESCO was having difficulties in launching significant new projects.

On the other hand, Tarshid, the Super ESCO for Saudi Arabia, was created in 2017, and a Royal Decree was issued at roughly the same time to mandate public entities to retrofit their buildings and to work exclusively with Tarshid. As a result, by 2020 Tarshid had been moving very fast and had already launched around a hundred ESCO projects.

6.5. Exclusivity for the Super ESCO

In addition to problems in mandating the use of the Super ESCO by government entities, it is absolutely key for the government ***to avoid the public Super ESCO having to compete with another Super ESCO in the same market in order to avoid generating confusion in the market for the public entities, as they would need to organize a tendering process to select which Super ESCO to work with.***

This would unnecessarily create complexities and delay the retrofitting of public buildings. It is nevertheless possible, and may be even desirable for reasons of speed and efficiency, to have several public Super ESCOs address different distinct markets, for example, geographically, to optimize the speed of delivery or to ensure proximity to the local government.

As an example, the ***UAE has two official Super ESCOs (Etihad ESCO in Dubai and ADES in Abu Dhabi)***, and one in-house organization acting as a Super ESCO within the Municipality of Ras-Al-Khaimah. These three organizations deal with the local governments' public buildings in parallel and do not compete against each other.

6.6. The ESCO Framework

In addition to creating a public Super ESCO, drawing up a regulatory framework to accompany, simplify and strengthen its development and to make private ESCOs more confident about the markets they are working in would be another powerful move.

Typically, the regulatory framework can control the ***Accreditation or Licensing of ESCOs*** that will work in the market, as well as the use of standard ESCO contracts, which will be balanced and have a clear dispute-resolution mechanism to reassure market actors that the conditions and rules are clear and fair.

It can also draw up a standard ***Measurement & Verification (M&V) protocol***, introduce specific rules to facilitate the commercial feasibility of projects if energy tariffs are subsidized, and simplify the execution of ***Government-to-Government (GtoG)*** contracts, allowing direct negotiation of a service provided by a public entity to another public entity if that service is unique and exclusive.

6.7. ESCO Accreditation or Licensing Scheme

Creating a Super ESCO and announcing that it will generate multiple opportunities for ESCOs may create an opportunistic attitude in the sense of many companies then claiming to be “ESCOs”.

This enthusiasm can be seen positively, but the regulators have to take care that the aim is to obtain real energy savings and that they need to ensure companies working in that sector are highly competent. Therefore, to ensure that a professional market with experienced companies is being promoted and developed, it may be worthwhile to set up an ESCO accreditation or licensing scheme. This scheme should cater to companies that are already experienced, as well as to those that are beginners and want to learn and become an ESCO.

It could therefore distinguish experienced ESCOs from learning ESCOs.

One example is two schemes that officially operate in the Middle East. The first, in Dubai, is managed by ***the Dubai Regulatory and Supervisory Bureau for Energy and Water (Dubai RSB)***, which accredits companies as either provisional or full ESCOs.

The second, in Saudi Arabia, is managed by the ***Saudi Energy Efficiency Center (SEEC)***, which licenses ESCOs as provisional or full, depending on a number of criteria.

The official status of the ESCO accreditations or licenses should be made available to anyone, for example, through a website, and the rules for becoming accredited or licensed should be made very clear so that the ESCOs know what they have to do to obtain such credentials.

Additionally, to make the scheme powerful, the Super ESCO should only work with ESCOs that have an accreditation or a license. This is the case for the two examples above, where Etihad ESCO only works with ESCOs accredited by the Dubai RSB, and Tarshid only works with ESCOs licensed by the SEEC.

Over the years, different countries have put together accreditation processes that have facilitated the development of ESCOs in their respective markets.

The data below presents a list of common generic requirements for all the national ESCO recognition criteria we reviewed that could serve as good examples for the development of an ESCO accreditation process in any country. It also provides some examples of countries that are using them. These criteria are broken down into three major groups – technical, financial and business.

Business Criteria

Business criteria involve the aspects of operating a business. These are important considerations, since ESCO contracts are often of long duration, justifying the importance given to sound business.

Longevity Requirement

Longevity refers to the length of time that a business has been in operation. ESCO contracts have complex financial and technical aspects that often require a level of maturity in business processes to be able to manage financials and agreements that span many years.

Longevity is often evaluated from the perspective of a specific number of years of continuous business operations. For example, in China at least one year of operations is required, while in Dubai companies must have been operating for at least three years.

For contracts in the United States, although no longevity requirement is stated, one is implied by the requirement for projects to be submitted with at least one year's worth of performance measurements, which indirectly would mean over one year of continuous business operations.

Project Completion Investment Amount

This label refers to the total number of projects in monetary terms that an ESCO has completed.

In making a requirement of this nature, it is important to clarify the amount it is desired to examine. When the statement "project investment" is used, for example, this typically means the implementation portion of the contract, but it does not include the value of ongoing or other services being provided.

Staffing

An ESCO is usually required to demonstrate some level of staff competence and to present its organizational structure.

For the staff responsible for the mechanism to fulfil a project, this can be an important requirement for accreditation.

High professional standards and technical and organizational skills on the part of the staff are considered of crucial importance in all the jurisdictions we reviewed.

To guarantee successful performance, ESCOs may be required to demonstrate that their employees meet some of the following criteria:

- ***Staff Experience.*** Staff experience can range from certain degree requirements to number of years in the profession to requirements to provide certain personal certifications. In Canada, staff must have at least five years' experience;
- ***Staff Competence.*** Staff competence means the ability of staff to perform the work required to fulfil an ESCO contract. This type of demonstration might include such things as completed audits or qualifications achieved. In Dubai, ESCOs applying for full certification must prove employment of at least two staff members with an engineering degree, including one Certified Energy Procurement Professional (CEP) and one Certified Measurement and Verification Professional (CMVP). In Singapore, certified ESCOs must have at least one Qualified Energy Services Specialist in full-time employment with them;
- ***Staff Capacity.*** Staff capacity refers to the ability of an ESCO to have sufficient staff availability to perform the level of work expected of the ESCO. Staff capacity may be represented by in-house

staff or contract staff. However, if contract staff are used to augment the in-house staff, an evaluation of the former's experience and competence is still required.

Insurance Verification

In many areas insurance is a requirement for embarking on any type of construction, and in most areas, just to maintain a business, insurance may be required.

Insurance provides an indicator of a company's business viability, as many insurance claims may be challenged to sustain an insurance policy.

Insurance is generally mostly necessary to protect the stakeholders in an ESCO contract.

References from Clients

References from clients provide an avenue for the accrediting body to evaluate perceptions of an ESCO's performance by clients and building owners.

References can be provided in multiple formats (written affidavits, purchasing system database of projects, in-person discussion), each providing different levels of evaluation. In the United States, project references are used in conducting in-person reviews of project performance, and the discussion includes staffing, development, construction and post-project performance.

Project references are required in Singapore and Dubai as well.

Membership in Accrediting Association

Some accreditation bodies require that, to maintain accreditation, the ESCO must remain a member in good standing of the organization providing the accreditation.

This requirement can add to the overall cost of accreditation, but it does provide some additional ongoing interaction with the ESCO through events and training.

Ethics Agreement

In the United States, accredited ESCOs are required to have a senior officer of the company acknowledge and sign the ESCO Code of Ethics of the accrediting organization. The code of ethics includes topics like accreditation evaluation and has the goal of ensuring ongoing satisfaction of the accreditation requirements between accreditation cycles.
Furthermore, the ethics document has items that restrict an ESCO's ability to make claims about its own abilities as well as those of its competitors, and above all it aims to enforce good business practices.

Measurement & Verification Protocols

As when standardizing ESCO contracts, it is important for the regulator to standardize a ***Measurement & Verification (M&V)*** protocol in order to define the official rules for calculating the savings that are the basis of ESCO contracts.

In many cases, regulators will refer to the ***International Performance Measurement and Verification Protocol (IPMVP)***, which defines standard terms and suggests best practices for quantifying the results of energy efficiency investments and increased investments in energy and water efficiency, demand management and renewable energy projects.

IPMVP has existed in various forms since 1995, when aversion of the protocol, the North American Energy Measurement and Verification Protocol, was published. This has been updated and expanded several times since then and in 2001, IPMVP Inc. was formed as an independent non-profit corporation in order to include the international community.

In 2004, IPMVP Inc. changed its name to ***Efficiency Valuation Organization (EVO).***

It may be appropriate for the local regulators to slightly adapt the best practices and examples provided by the IPMVP protocol to the specifics of the local country or region. For example, it is unnecessary to provide examples of space-heating savings calculations in hot climate countries where only air-conditioning is used.

Also, regulators can provide additional rules that are not in the IPMVP but that might be recognized locally for specific cases (for example, the use of the so-called "Option E", which is not covered by the IPMVP and not regarded as an M&V option in all of the literature). With Option E, savings are determined on the basis of engineering calculations using typical equipment characteristics and operating schedules without field-testing or metering.

Instead, verification may consist of checking units installed and verifying the proper operation of the equipment or measure. Given the absence of direct verification of energy savings, the risks related to the ECM are placed virtually entirely with the client.

Energy subsidies and tariffs

In countries or regions where the energy used as ref-

erence for ESCO projects (often electricity and sometimes water) is highly subsidized by the government, thus favouring end-users through a lower tariff than its real cost, it will be difficult to execute commercially viable ESCO projects.

This is because the decisions on these are often taken on the basis of a payback calculation (i.e. how much does the asset owner have to invest versus how much will the energy savings bring back to him). This unfortunately does not help the government, which has an interest in developing a healthy ESCO market for energy savings to happen so that fewer subsidies are paid out.

Reducing subsidies to facilitate ESCO projects is something that most governments will consider doing, but this can be a very sensitive topic creating very negative reactions from energy users because this implies increasing tariffs.

While normally reductions of subsidies are planned to be gradual over many years, governments can nevertheless define specific reverse-subsidy mechanisms to facilitate asset-owners' decisions regarding ESCO projects.

The possible mechanisms for reversing subsidies can be developed in several forms, such as artificially higher tariffs used in Super ESCO contracts where the saved electricity kWh or water m3 price difference from official tariffs is directly paid to the Super ESCO by the government.

Other reverse-subsidy mechanisms could take the form of financial grants provided to the Super ESCO to finance projects only partially, or zero-interest loans provided to the Super ESCO by the government, or any combination of such measures.

These mechanisms need to be carefully planned on the basis of the existing level of subsidies, but they will be extremely powerful and possibly indispensable tools in accelerating the adoption of an ESCO programme in an energy-subsidized market.

Government-to-government contracts

The Super ESCO, as a government entity, will act as a procurement body to source ESCOs for the other government entities that need to retrofit their facilities. In order to do so, the Super ESCO will have to formalize its intervention through the signature of a contract between the Super ESCO and the government entities in control of the conditions of the retrofits.

Unfortunately, in many countries public procurement rules do not allow direct negotiation of government-to-government contracts without a regular procurement and tendering process. This will be a major setback to the Super ESCO's activities, as then government entities will need to organize a procurement exercise, usually through a public tender, to procure the services of the Super ESCO.

It would be highly desirable to set up regulations or exceptions to allow the Super ESCO to contract directly with government entities without the need for a procurement exercise.

This issue can usually be solved through either an executive decree or a similar action in cases where government-to-government contracts are not included in public procurement laws.

Thanks to their superior access to the market for public buildings, Super ESCOs can quickly create a retrofit market for private ESCOs.

Funding

Funding for the Super ESCO is one of the most important elements that needs to be sorted out when setting it up. If the Super ESCO is financing ESCO projects, then its work will be an easy sell to public-sector entities, as they will not have the excuse of not having a budget to do the retrofit.

Conversely, if the Super ESCO is relying on public-sector entities to pay for the retrofit, then it will have major difficulties and delays in executing its projects, as public-sector entities will have problems in allocating a budget for these projects. This may oblige entities to request a budget for the next year, but even if they are successful, the launch of retrofit projects may be delayed by a year to two years before anything can be done.

In setting up a Super ESCO, the government must therefore arrange funding for it. And it needs to be carefully set up.

If the funding relies on high interest rates, that will give the Super ESCO an additional problem in doing deep retrofits.

The cost of the finance will tend to cancel out the savings that can be generated. The only possibility to keep the same level of savings with costly finance rather than cheaper finance would then be to extend the life of the project contract.

However, that also has a limit. In some regions, such as Europe or the USA, it is very common to accept ***15 to 25 years retrofit contracts***, but in some developing-country markets, going above seven years would

be a problem. Thus, combining expensive financing with short contract periods will not allow ESCO contracts to reach the deep retrofits.

Thanks to their strong government backing, Super ESCOs are able to source funding at very affordable cost from government and from multiple third-party sources, including multilateral banks, while providing minimum collateral guarantees. They therefore simplify greatly the access to finance for private ESCOs by removing the financing barrier.

To ensure a quick signature of contracts by a Super ESCO

A Super ESCO can create tremendous savings for its cooperating government, but it needs to act fast and optimally to ensure market success. Being situated between the ESCOs and public-sector entities, the Super ESCO can optimize processes on both sides by standardizing its actions.

ESCO contracts are in general complex and new to public-sector entities that are not familiar with them. To ensure that projects are not delayed due to endless legal negotiations with ESCOs and public-sector clients, the Super ESCO can optimize its contractual processes.

The Super ESCO should create a robust and fair tendering process using standard ESCO contracts that should be balanced and not often modified to ensure the trust of the ESCOs.

Once a contract has been signed with one ESCO for a project, the same model contract should be signed with the same ESCO for another project.

In that way, both the Super ESCO and the ESCO will speed up the awarding process, thereby focusing more rapidly on execution of the project.

Optimizing contracts with public-sector entities

Public-sector entities are generally not familiar with ESCOs or their specific energy performance contracts.

It may take a very long time for the Super ESCO to negotiate such a contract if it wants to have a back-to-back model with the contract it signs with the ESCO.

Two specific actions may be required to optimize this part of the Super ESCO process, namely:

- creating a high-level framework agreement;
- getting it endorsed by the government authority regulating public procurement contracts as the model to use between the public-sector entities and the Super ESCO.
- If this is done properly, the Super ESCO will be able to "impose" its contract on public-sector entities and minimize the legal negotiations, allowing it to be signed quickly.

Risks related to a Super ESCO becoming an ESCO

After completing a few projects, the Super ESCO will have learned a lot from the ESCOs it is working with. At some point in time, given the close relationships and detailed knowledge it has developed concerning the ESCOs and their activities, it could become tempting for the Super ESCO to replace the ESCO in doing the necessary work and thus optimizing the project's profitability by removing the ESCO's financial margin. It could also happen that the Super ESCO does not find satisfactory solutions to a project by the ESCOs.

If it has enough knowledge and experience, the Super ESCO could then decide to replace the ESCO and carry out the project itself.

If the Super ESCO were to do this, however, it would have an immediate dramatic impact on the active ESCOs in the market, which will see the Super ESCO directly competing against them. The confidence of the ESCOs in working with the Super ESCO will be reduced, and trust may be lost.

A second important aspect is the risks to the project.

By sub-contracting a project to an ESCO and ensuring that the legal contract signed with the ESCO provides guarantees concerning outcomes that are backed by bank guarantees, the Super ESCO takes very little financial risk in terms of project results. Indeed, if there is a savings shortfall from the contracted guaranteed savings, the ESCO will cover the difference to the Super ESCO, thus limiting the risk to the latter. Conversely, if the Super ESCO decides to carry out the work itself, thus bypassing the ESCO, then there is no more outcome guarantee and the Super ESCO has to take on the project risk directly and in its entirety.

Some attempts have been made by ***Super ESCOs to establish themselves as an ESCO*** in markets that do not fall with their Super ESCO remit.

Two recent cases can be mentioned.

- ***Etihad ESCO, the Super ESCO of Dubai has established an ESCO under the name of Etihad Energy International in Saudi Arabia and it is responding to ESCO tenders launched by the***

Saudi Super ESCO Tarshid.

- ***EESL, India's Super ESCO, has partnered with an ESCO in the UAE to establish itself as an ESCO and to be able to respond to market tenders.***

While these attempts have not yet proved very successful, they are clearly not welcome to the ESCOs. Some ESCOs may be present in both markets where the Super ESCO is acting as both Super ESCO and ESCO, and they will fear becoming subject to the Super ESCO's possible attempts to influence not to compete against them in the market where it is acting as a ESCO in exchange for winning projects in their local market.

Currently there is no sign of this happening, but it is a genuine risk. Ultimately, it may discourage ESCOs from working with a Super ESCO they see as "stealing" their knowledge to be able to compete against them more effectively.

The government authority that has decided to establish a Super ESCO will have to monitor these actions closely to avoid market distortions or even destruction of the ESCO market, as well as a loss of focus on the part of the Super ESCO on its primary market and mission.

A simple way of monitoring this is to determine the success of ESCO participation in projects launched by the Super ESCO. If some experienced ESCOs decide no longer to participate in any of the Super ESCO's projects, it will create a problem requiring further investigation.

Should a Super ESCO be for profit?

The primary reason for a government setting up a Super ESCO is generally not to create a new source of income for itself but to implement a programme to significantly reduce energy consumption in public-sector buildings, leading to cost reductions and a positive environmental impact.

The priority for the Super ESCO should therefore be to maximize the energy savings that it can contribute to generating but that should not be impacted negatively by the need to make a profit. Otherwise, the impact of the programme will be less.

7. An Overview of Best Practices of EU ESCO Market

The following Annexes provide a ***deep insight into the current indicators of EU ESCO market: [5]***

- Annex 31. Typical final energy consumption per end-use and public building type in EU;
- Annex 32: Potential ESCO market in the public buildings (per type) larger than 500 sq m of EU countries;
- Annex 33: Average duration of EPC projects in the public sector of EU countries (years);
- Annex 34: Measures implemented in EU countries to meet EED Article 5 of Energy Efficiency Directive requirements in the public sector;
- Annex 35: Market status of EPC in the public sector in EU;
- Annex 36: Market trends of EPC market in EU countries in 2017-2023;
- Annex 37: Number and size of EPC contracts in EU member states;
- Annex 38: Contract characteristics and metrics of EPC market in EU;
- Annex 39: Sufficiency and quality of providers and facilitators of EPC market in EU countries;
- Annex 40: Types of intervention sites in EU ESCO market;
- Annex 41: Types of buildings and of interventions in buildings for ESCO contracts in EU;
- Annex 42: ESCO contract types used in EU countries;
- Annex 43: Mapping of ESCO-related barriers in EU;
- Annex 44: Barriers for ESCO market in EU in 2017-2019;
- Annex 45: Regulatory barriers to ESCO market in EU;
- Annex 46: Barriers to the adoption of Maastricht-neutral contracts in EU;
- Annex 47: Financial barriers to ESCO market;
- Annex 48: Lists of accredited ESCO providers, information programs and demonstration;
- Annex 49: Enabling factors for ESCO market development;
- Annex 50: Ongoing changes in project typologies, and drivers for these changes in EU;
- Annex 51: Good regulatory practices and recommendations for ESCO market development in EU;

- Annex 52: Impact of EU financing and assistance instruments on support energy efficiency projects;
- Annex 53: Impact of ELENA instrument on support of the energy efficiency projects in EU countries;
- Annex 54: Impact of PDA H2020 instrument on support of the energy efficiency projects in EU countries;
- Annex 55: Impact of DEEP and EEFIG instruments on support of the energy efficiency projects in EU countries;
- Annex 56: Policy measures related to ESCO market based on National Energy Efficiency Actions Plans and JRC survey.

The length of EPC contract in EU countries is typical based on the sector. In general, EPC projects ***are around 10 years long.***

If public grants or IFI support is involved, the length can be much longer, as well as in more developed markets, where trust is more developed.

In particular for the public sector in EU, the length of EPCs is almost always shorter than in the private projects, probably due to a less enforced pressure on costs, thus more complex projects are possible with longer payback times.

Most of the EU countries, which have transposed the Energy Efficiency Directive, have specific legislation for facilitating the development of the energy services market and other policy measures.

This is important as legal barriers can severely hinder the market development.

For example, ***in Bulgaria***, the Energy Efficiency Act and Regulation No RD-16-347 of 2 April 2009 form the main legislative measures addressing issues related to energy services.

In Greece, the main legislative measures are the Law 3855/2010 on the institutional framework for the provision of energy services and Ministerial Decision D6/13280/07.06.2011 on Operation, Register, Code of Conduct and related provisions for energy service providers. To address legal obstacles to contracting in Germany, the Tenancy Law was revised in 2013 in order to allow the tenant to bear the costs of heat supply as operating costs when heat supply is switched to contracting.

A few countries have in place financial instruments promoting energy services in various sectors.

In Bulgaria, co-financing and guarantees for ESCO service contracts are made available through the Energy Efficiency and Renewable Sources Fund.

In Spain, the ***Jessica Holding Fund/FIDAE***, established in 2010, financed sustainable urban development projects implemented by energy service companies and other companies through a budget of 122 EUR million. The possibility for ESCOs to participate in comprehensive renovations of existing residential buildings has also been given through the Aid Programme for the Energy Renovation of Existing Buildings in the residential sector (PAREER).

In Finland, the development of the energy services market was promoted by two programmes coordinated by the Finnish Funding Agency for Innovation, namely the programme “Green Growth-Road to Sustainable economy” (2011-2015, 80 EUR million) and “Built environment” (2009-2014, 75 EUR million).

In Czechia, support to energy service providers in the form of subsidies for the installation of energy saving measures have been made available since 1999 through the State Programme on the Promotion of Energy Savings and Utilization of Renewable Energy Sources.

Many countries have in place information, knowledge & advice measures to raise awareness on the benefits of the use of energy services. These include the development of a contracting portal (e.g. Austria), various dissemination activities (e.g. Spain, Finland, Croatia, the UK) and stakeholder consultations with the banking sector (e.g. Latvia). Ireland has set up the comprehensive National Energy Services Framework, providing guidance on project development, etc. Pilot projects are implemented by some countries.

These include Ireland through its Better Energy Financing scheme and ***Cyprus*** with two on-going pilot ESCO projects in the public sector.

To support the uptake of energy contracting in the public sector, the Energy Efficiency Directive calls Member States to provide model contracts for energy performance contracting which include at least the items listed in the EED Annex XIII.

8. Best Practices of USA ESCO Market

8.1. A Brief Profile of the US ESCO Industry

The U.S. Federal Energy Management Program

The US ESCO industry has grown steadily over the past three decades to reach an annual revenue of about ***20 percent of global sales*** of ESCO services in 2020.

The US ESCO industry primarily serves the public sector, that is, federal, state and local government agencies, as well as institutional markets. Less than 10 percent of US ESCO revenues are derived from private commercial and industrial customers. The segment labeled "Housing/Other" mostly consists of multi-million-dollar projects for municipal public-housing authorities.

Even though the ***U.S. Federal Energy Management Program (FEMP)*** which came into existence in the 1990s, predates the term "Super ESCO," it is one of the earliest examples of a public institutional model close to the Super ESCO concept.

The FEMP leverages government performance contracting to help federal agencies work with private ESCOs to implement energy-saving projects that build optimization, resilience, and security.

The FEMP provides federal agencies with a broad range of information and tools to foster building optimization, affordable and replicable solutions, and project development guidance.

To date, the FEMP has helped government agencies reduce the energy intensity of their facilities by approximately 49 percent.

The following Annexes consolidate the key figures of USA ESCO market.

- Annex 23: Changes in number of measures per project in USA, 1990-2017;
- Annex 24: Dominant Retrofit Strategies in USA;
- Annex 25: Changes to Dominant Retrofit Strategies in USA, 1990-2017.

8.2. US ESCO Market Drivers

There are two main drivers in the US market:

- government mandates;
- the need for capital to address an estimated 1 USD trillion in deferred maintenance and equipment-replacement needs in public facilities.

Government Energy Savings and GHG Reduction Mandates

The federal government and most state governments have enacted legislative and administrative energy-savings mandates, which are often accompanied by aggressive, aspirational targets for greenhouse gas reductions and require significant improvements in energy efficiency. The mandates, however, usually have no funding attached.

Rather, the federal government and a number of states have taken a variety of administrative actions to promote performance contracting, such as the following:

- Competitive solicitations to create lists of ESCOs that are qualified to compete for public agency projects, and conducting educational programs to promote performance contracting with state and local government agencies;
- Development and promulgation of standardized project development and implementation processes, such as the US DOE Energy Savings Performance Contracting Toolkit;
- Requirements that public agencies either implement all cost-effective projects using performance contracts (Colorado) or demonstrate to state budget officials that capital projects for which they have requested funding could not be done with performance contracts (Kansas and Pennsylvania);
- The federal government, under the Obama Administration, mandated federal agencies to complete 4 USD billion of performance contracting projects.

Deferred Maintenance and Capital Improvement Deficiencies

At the same time, many public facilities in USA have been starved of maintenance and capital improvement funds for decades, and the meager appropriations that are made are eliminated by periodic recessions and other government fiscal crises. School facilities today need tens of billions, maybe hundreds of billions, of dollars' worth of capital improvements.

For example, an analysis by the Illinois State Board of Education estimates that Illinois public schools have accrued about 7.65 USD billion in accumulated deferred maintenance.

Since this analysis was carried out, i.e. before the COVID-19 crisis, more capital improvements will be needed to provide the increased ventilation required to make schools safe for students, faculty and staff. Another example is a recent report from the federal Government Accounting Office (GAO) that says that a majority of public schools need substantial improvements to their HVAC systems. However, most school systems have no obvious way of finding the capital appropriations they need.

Performance contracting offers a lifeline to government facility and financial managers because it simply re-purposes money that the facility is currently spending on wasted energy and the maintenance of decrepit equipment into a payment stream for energy-saving replacement equipment.

8.3. Component Technologies Build the Market in Waves

The beneficial effect of new component technologies in the US ESCO market seems to have come in waves. Each successive wave of technology builds, crests and breaks, as single-technology, low-overhead vendors effectively compete with ESCOs.

But the ESCO market keeps growing rather than fading, because ESCOs have learned that their competitive advantage lies in building their business skills, as

well as their ability to understand and integrate the best features of their competition to deliver what their customers want.

Lighting

A major technology in the first wave of the US ESCO market was the replacement of T-12 fluorescent lamps and magnetic ballasts (many of which contained PCBs) with electronic ballasts and T-8 bulbs. This retrofit cut lighting energy use by half, delivered better quality lighting, and produced cash flow from short paybacks that amortized the longer payback measures.

In the mid-1980s, ESCOs were virtually the only companies that knew about the technology, which seemed like wizardry to customer facility managers. But ESCOs had to buy equipment directly from manufacturers and stock it in their own warehouses because electrical distributors would not do so. Moreover, ESCOs financed projects from their own funds, with effective interest rates of near 20 percent, again because no one else would do it. The US ESCO industry was hence small but very profitable.

By the early 1990s, the lighting wave had broken. First distributors, then big box stores began to stock electronic ballasts and T-8 lamps. Electrical contractors learned how to install them. ESCOs, especially the business units of large companies like Honeywell or Johnson Controls, found it harder to compete for single-technology projects. Banks and other financiers offered much cheaper financing, so that profit centers also shriveled up.

But the tide kept rising because ESCOs learned to integrate the strengths of their competitors into their projects. ESCOs found that they could grow their businesses faster without expanding their staffs and overheads by partnering with lighting contractors as subcontractors and exploiting their superior auditing, materials-ordering and job site-management skills. ESCOs also recognized that the low interest rates offered by the competitive financing market enabled them to offer larger projects to their customers, with bigger profits that offset the loss of earnings from interest. Project-savings guarantees, substantiated by a credible M&V system following the international Performance Measurement and Verification Protocol (IPMVP®6 - NAESCO partnered in the development of the IPMVP), gave them access to an almost unlimited pool of project capital.

Moreover, ESCOs learned that the critical financial skill was the ability to package financing from various sources, showing their customers how government grants, tax incentives and utility rebates could be leveraged with private capital to get the comprehensive projects the customers really wanted.

HVAC and Controls

Another technology wave was HVAC upgrades: new boilers, chillers and ventilation systems, including variable speed drives and digital control systems.

The larger ESCOs that are subsidiaries of international controls companies (e.g. Honeywell and Johnson Controls) expanded their service businesses, while the smaller ESCOs run by entrepreneurial engineers exploited their expertise in market segments (e.g., the Hospital Efficiency Corporation).

But, as with lighting contractors, established mechanical contractors with established relationships with the types of customers that ESCOs seek have learned that their lower overheads enable them to compete with ESCOs by offering their own performance contracts.

Solar PV

Solar PV is a more recent wave. ESCOs showed customers that a comprehensive project could cover the long paybacks of solar with the short paybacks of lighting and controls upgrades.

This advantage, however, was eroded by federal and state government incentives for solar installations (e.g. federal tax credits for 30 percent of project costs). Moreover, ESCOs were at a disadvantage in trying to compete with the lower overhead costs and simpler PPA contract structures of standalone solar installation companies.

The technology waves are continuing with even shorter cycles. The new waves are the need for resilience and flexibility in public buildings, which are problems addressed by a number of technologies, e.g. microgrids, cybersecurity, indoor air-quality upgrades, and water management. Each of these technologies is offered by a mini-industry of specialized companies that arguably have more expertise and lower prices than ESCOs for their products or services.

8.4. Risk Management

In addition to the importance of government mandates and the promotion of the performance contracts, today successful US ESCOs embody a set of common characteristics that have enabled them to survive and prosper.

Successful ESCOs tend to be conservative in target market selection, the initial screening of potential customers, new technologies, contract terms, and the reliability of software and analytic methodologies used to verify long-term project energy savings.

Examples of this risk management are:

Targeted Marketing

ESCOs have learned to focus on segments of the public facilities market, even though the private commercial and industrial market segments are at least an order of magnitude larger because they know that the ESCO offering (comprehensive projects with long paybacks) is attractive to public-sector customers. And they know that commercial and industrial customers are generally interested only in short-payback projects with a limited focus, and the customers are often much more difficult to finance.

Sales Management

US ESCOs have learned that the riskiest part of the business is the selling cycle because their projects typically take from twelve to thirty months to develop, and they can spend tens of thousands of dollars (hundreds of thousands for large federal projects) doing energy audits and engineering studies before they get a contract.

Successful ESCOs are ruthless in ensuring that their sales forces identify customers who have an urgent need for a project and in addressing the prospective customer's business issues (e.g. don't like long-term debt) before investing in expensive engineering analyses.

Contract and Construction Management

Successful US ESCOs use experts to write contracts and manage construction. US performance contracts are complex documents compared to the contracts used in other countries, and the US is a litigious society, so large US ESCOs have in-house counsel, while small ESCOs retain specialized outside counsel.

In addition to the normal base contract with terms, conditions and construction requirements, a performance contract contains schedules that may include topics such as:

- Savings guarantee;
- Baseline energy consumption and methodology to adjust baseline;
- Savings measurement and verification plan;
- Project costs and cash flow analysis;
- Financing agreement;
- Annual services fees;
- Site description;
- Equipment to be installed;
- Construction schedule;
- Commissioning plan;
- Standards of comfort;
- Training;
- Maintenance.

Even the smallest ESCOs have learned that a specialized construction manager is better than a design engineer at delivering a project on time and on budget.

Project Savings Monitoring and Verification (M&V)

A major risk element is the savings guarantee for the **10- to 25-year life of performance contract.**

Almost all US ESCO projects use the IPMVP, but ESCOs have learned that they must go beyond the technical parameters of the IPMVP to carefully define what they are actually guaranteeing (units of energy reduction not dollars) in the project contracts, as well as the customer's responsibility for maintaining the project equipment and the agreed building operating parameters (e.g. hours of operation, indoor temperature, etc.).

Successful ESCOs ensure that the customer understands the contract, approves the scope and format of the M&V reports in advance in accordance with the IPMVP, and follows up with the customer to answer questions about the reports and promptly solve any issues that surface in them.

9. An Overview of Best Practices of China ESCO Market

9.1. ESCO Market Business Models in China

Since the ESCO and EPC concepts were introduced into China in 1998, in less than three decades the country has become the largest ESCO market in the world.

China's experience with these concepts offers a valuable model for other countries seeking to use ESCOs to achieve energy efficiency and emissions reductions.

The country's strong policies for improving energy efficiency are playing an important role in this process. Other factors include effective international support and an industrial association that helps improve awareness and offers training.

China has pledged to peak its carbon emissions by 2030 and to achieve carbon neutrality by 2060. In the country's efforts to build a resource-efficient and circular economy and to improve its international competitiveness in green and efficient technologies, ESCOs have bright market prospects.

In the early periods of China's ESCO market development, the majority of the energy performance contracts (EPCs) were shared saving ones. This was partly because facility owners were not familiar with EPC business models and lacked confidence in ESCOs, and partly because government policies limited some incentives to the shared saving EPCs. Moreover, government subsidies to EPCs were only applicable to the shared saving EPCs.

This situation has gradually changed. As the ESCO market has developed further, facility owners have increased their capacity to assess and fund energy efficiency opportunities.

They are also more willing to fund energy efficiency actions and undertake the financial risks.

The following Annexes consolidate the key figures of China ESCO market.

- Annex 26: Development trends in China's ESCO market;
- Annex 27: Business models of ESCO market in China;
- Annex 28: Overview of China's main policies on ESCO;
- Annex 29: The ESCO certification system in China;
- Annex 30: China's national standards for ESCO Services;

ESCO and EPC administration

At the beginning, all ESCOs in China were subject to government approval and registration. To seek reg-

istration ***by the National Development and Reform Commission (NDRC)***, they needed a recommendation from the ***Ministry of Industry and Information Technology (MIIT).***

This system has shifted to a system of voluntary registration, namely an ESCO certification system based on the ESCO's technical competence, economic capacity and credit record. Enterprises that default on their contracts and promises are blacklisted, and information about this is made publicly available.

Tax incentives and government subsidies

The Chinese ESCOs that implement shared saving EPCs can enjoy the preferential policies of a ***"3-year exemption"*** and "***3-year half rate"*** for corporate income tax payments based on their income from such projects.

If the contracting period is shorter than six years, then the actual preferential tax period is the duration of the shared saving EPC.

Subsidies from national and local governments

EPC projects are included in the supporting scope of national budget investments and the national special budget fund for energy savings and emissions reductions.

The energy retrofitting projects that ESCOs implement via EPCs can receive subsidies or rewards, subsidies from local governments for energy savings and emissions reductions. The Interim Measures for the Management of Financial Incentive Funds for EPC Projects were issued by the ***Ministry of Finance and NDRC*** in 2010 and more than 2 RMB billion from the national fiscal budget was allocated to the special fund.

This also set the standards for central budgetary rewards of 240 RMB/tce, while the rewards from province-level fiscal budgets should be at least 60 RMB/tce.

In 2015, the Interim Measures for the Management of Fiscal Incentive Funds for EPC Projects were replaced by the Interim Measures on the Management of Subsidies for Energy Saving and Emission Reduction.

The 2015 Interim Measures stipulate that fiscal subsidies should be results-based rewards. EPC projects can receive some grants in advance, and then the subsidies should be settled on the basis of actual energy-saving effects.

In January 2020, the Ministry of Finance updated the 2015 version of the Interim Measures on the Management of Subsidies for Energy Saving and Emission Reduction and extended the duration of the financial rewards to 2022. Upon expiry, the government may consider whether to continue offering the subsidies for longer.

9.2. Financing ESCO in China

The financing policies for EPCs include encouraging banks and other financial institutions to accept the assets ESCOs invest in EPCs and their expected revenues from EPCs as collateral for bank loans, guarantees, insurance products for risk management and green bond issues.

The Beijing Environmental Exchange has set up an investment and financing platform for EPC assets where ESCOs can sell their future revenue flows from EPC projects and raise funding for new EPC projects.

The government also encourages public-private partnerships in the funding of energy efficiency projects and ESCOs and green bond issues by ESCOs. It also supports the development of EPCs by innovatively combining investments, bonds and bank lending.

Seeing lending to energy efficiency projects and opportunities as a new business opportunity, some commercial and local banks, such as the Beijing Bank, Industrial Bank and Shanghai Pudong Development Bank, offer loans for EPC projects.

Financing has been a key area in the various efforts to boost ESCO market development in China.

9.3. Policy drivers of ESCO Markets in Different Sectors in China

Industrial sector

As the world's factory, China has a large industrial sector.

Improving industrial energy efficiency has been a priority of the government's various policies and efforts to achieve improvements in energy efficiency and emissions reductions.

The rapid boom in heavy industry and construction since the early 2000s makes slowing down the industrial sector's demand for energy a difficult task. After almost three decades of strong efforts to make energy efficiency improvements, industry still accounted for 66 percent of China's primary energy consumption and 65 percent of its final energy consumption.

The main policies for industry include energy-intensity targets for key industrial sectors, products and processes, energy efficiency targets for large industrial energy users, and using energy efficiency as a criterion before new investments in industrial projects can be approved.

The enterprises on the list have to report their annual energy use and GHG emissions, subject themselves to government inspections, and release their energy and emission performance data to the general public. The government can require enterprises that are failing to meet their targets to take immediate corrective action or be forced to close down their polluting and inefficient industrial facilities.

As a result, the industrial sector has been able to meet the energy-intensity targets through the rapid deployment of efficient technologies. Apart from subsidies and tax incentives for investments in energy efficiency, the government also uses energy prices as a tool to motivate energy efficiency actions. It is strong policies promoting energy efficiency in the industrial sector and the relatively high returns from energy efficiency investments that make industry the most important component of the ESCO market in China.

Moreover, the focus on motivating improvements to energy efficiency in energy-intensive sectors in the form of technology catalogues, standards and guidance on energy efficiency auditing, benchmarking, diagnosis, measurement, monitoring, verification and certification also support ESCO services in the industrial sector.

The National Promotion Catalogues for Key Energy Saving Technologies are intended to stimulate energy savings and emissions reductions in all industrial facilities. The catalogue targets both equipment manufacturers and energy users. The first version of the catalogue was issued in 2008, and as of early 2020 it has been updated ten times.

The NDRC makes the different versions of the catalogue available on its website, and various fiscal and taxation measures are linked to the adoption of the technologies featured in the catalogue.

As the governing authority for the industrial sector, the MIIT has actively engaged in standard-setting in assessing and calculating energy savings in various industries, which can help avoid controversies over EPCs and other energy service contracts by ESCOs. For instance, in 2012, the MIIT published technology catalogues, technical guides and application case studies for energy savings and emissions reductions in eleven key industries.

In 2017, it launched an "Action Plan for Industrial Energy Saving and Green Development Standardization" (2017-2019), focusing on establishing a set of energy-saving standards for such industries as iron and steel, building materials, metallurgy and machinery manufacturing.

In August 2020, it published guides for ***Industrial Energy Saving Diagnosis (IESD)*** services in six key industries: iron and steel, cement, electronics, textiles, food and paper, as part of an "Action Plan for Industrial Energy Saving Diagnosis (IESD)", facilitated the development of IESD services, and further enhanced the standards and quality of IESD services purposes. Unlike many other countries, however, in China the electricity, natural gas and heating prices for industry and commercial consumers are higher than those for households, providing an additional motivation for businesses to take energy-saving actions.

In China, energy prices are controlled by the government, and the Price Department at the NDRC sets the benchmark prices, while local DRCs decide their own local prices. The prices differ for different energy-user groups, including households, large industrial clients, ordinary industrial and commercial users, and agricultural users. Among them, the energy price for households is the lowest, while those for ordinary industrial and commercial users are the highest.

Despite repeated government efforts to reduce the prices for industry and commercial users, they remain higher than those for other user groups.

Public buildings

In October 2008, the State Council enacted an ***"Energy Conservation Bylaw for Public Institutions"*** setting out the various measures public institutions should adopt to save energy and improve energy efficiency.

The measures include using energy efficiency as a criterion in deciding public procurements of products and services, establishing quotas for energy consumption and annual targets for energy conservation, carrying out energy audits and energy management, collecting data and reporting energy use.

Public institutions' performances in respect of energy conservation will be evaluated on the basis of their total energy use in different years, per-capita energy use and per-floor.

The bylaw was amended in 2017, but the amendment is related more to changes in government approval procedures, not energy conservation requirements and area energy use. The government also regularly publishes a catalogue of energy efficiency products and services to support public procurement.

One barrier to energy conservation by public institutions was that public institutions used to fund their energy bills and fixed asset investments from different budget lines, making it impossible for them to engage ESCOs to undertake energy performance contracting. This barrier was removed in 2010, and local public institutions can now include their payments to ESCOs for EPCs as part of their energy expenses and pay them from the government budget.

The government is calling for the implementation of preferential tax policies to ESCOs and encouraging governments at all levels to enhance their support to EPCs.

Payments by government agencies and public institutions to ESCOs for EPCs are treated the same as energy expenses.

To encourage energy savings in public buildings, the Chinese government has issued detailed technical guidance on energy consumption monitoring, data collection and transmission, as well as metering equipment installation, the building operations of hospitals, colleges and universities, government office buildings and large public buildings.

9.4. Remaining Barriers to ESCO Market Development in China and Possible Solutions

General barriers to EPC development

One main barrier often mentioned to the deployment of EPCs is the lack of finance. Chinese ESCOs still mainly rely on their own equity funding as the main source, plus bank loans.

Existing data indicate that in 2017, ***65.2 percent of ESCO funding came from their own equity funds, 28.1 percent from bank loans.*** Many banks still find it risky and complicated to offer loans to EPC projects. A lack of finance delays project implementation and constrains the expansion of the ESCO market.

Other barriers are limited technical capacity and irregular market competition.

The Chinese ESCO market includes a large number of small ESCO companies that lack technical capacity and experience of doing projects. The fierce market competition sometimes leads to price wars and poor services, which damage clients' confidence in ESCO services.

Although China has established over two hundred standards for energy efficiency actions in different sectors, there remain some gaps in technical and commercial standards, as well as in rules for specific areas of EPC projects and implementation, for instance, in industries that are not energy intensive. This makes it difficult to implement EPCs in specific areas.

Another issue is the continuity of subsidies and the coordination of different incentive systems. The existing policy indicates that the subsidies for EPC projects will last until 2022, at which point the future of the policy will be decided.

Barriers to ESCO services in the residential building sector

Globally, there is little ESCO presence in the residential building sector. Apart from the usual issues of difficult coordination with residential buildings, ESCOs face some additional barriers to operating in the residential

buildings market in China.

Residential buildings in Chinese cities are mainly high-rise apartment blocks, most of which were built after the housing reform of the late 1990s.

Traditionally, central heating is only available in the north of the country and is considered a kind of social benefit provided by municipal governments.

Local governments are obliged to ensure that all households can achieve a minimum indoor temperature of 18°C during the heating season. The start and end dates of the heating season are fixed by the city.

For instance, in Beijing, the heating season runs from 15 November to 15 March of the following year. However, the central heating service can start early if the daily average temperature falls below 5°C for five consecutive days.

Local residents' heating bills depend on the size of their apartments and a fixed rate in RMB per square meter of floor area per heating season. Residents can neither adjust nor turn off the heating supply to their apartments. Often only around 80 percent of the heating charges can be collected.

The heating price system means that any energy cost savings from their building retrofitting goes to the heat supply company instead of the household. This system prevents ESCOs from taking on projects in China's residential building sector.

Despite the recent reform to introduce the metering of residential heating supplies, progress has so far been limited.

In summary, there are two key barriers to energy efficiency retrofitting based on EPC:

- the majority of households pay for heating based on the size of their apartments, not on their metered usage of heating;
- the low energy prices for households mean a longer payback period for investments in energy efficiency.

Moreover, the lack of properly enforced energy performance certification for buildings mean that even households with energy meters face the risk of being unable to recover their investment in energy efficiency retrofitting when they sell their apartments.

Barriers to EPCs in the transport sector

During the pilot stage of ESCO development under IFC support, there were two pilot EPC projects for the transport sector.

However, as the energy efficiency retrofitting of transport infrastructure tends to have a long payback period and low returns, and because the majority of China's transport infrastructure is relatively new, as in most other parts of the world transport EPCs are rare and have a low potential for further development.

Possible solutions to eliminate barriers

In the residential sector in the last two decades, the government has been promoting energy, especially the metering of heating. However, progress is mainly visible in new buildings.

Energy efficiency retrofitting in residential buildings needs effective enforcement of energy efficiency certification for buildings and large investments in heating pipe and meter retrofitting, as well as changes in social attitudes to heating, to the move from a public welfare service to market-based services and to energy prices, especially heating pricing reform for the residential sector.

The existence of ***a large number of small ESCOs with low capacities is a commercial phenomenon.*** This issue can be addressed through market competition, support policies for mergers and acquisitions, and further capacity-building, certification and accreditation.

The existing accreditation system for ESCOs is voluntary, and only a small number have been accredited. Further technical qualification and financial capacity, as well as business performance accreditation, can develop the market further.

Regarding the financing barriers, the government needs to create innovative ways to increase the role of ESCOs further, like allowing large and successful ESCOs to raise funding by listing on the stock market and issuing a green bond, as well as increasing government guarantees and the national revolving fund for EPC projects.

Although launching a national emissions trading system may to some extent fill the gap in financial incentives for EPCs, the prevailing uncertainty is a barrier to investments in energy efficiency projects.

The government needs to decide its subsidy policies as soon as possible to provide certainty for investments in EPC projects. It also needs to study the effects of its efforts to reduce energy prices for industries and commercial consumers on the profitability of energy efficiency projects and opportunities, as well as find ways to avoid them having negative impacts on energy efficiency actions.

10. Best Practices of ESCO Accreditation

10.1. ESCO Accreditation Process Requirement and Recommendations

The purpose of accreditation is to enhance the professionalism and quality of the services offered by ESCOs.

A reliable and transparent accreditation process increases confidence in the energy services sector and helps promote the growth of the industry.

To foster the development of a viable energy services market, any scheme should develop its ESCO accreditation process by establishing a set of criteria to serve as its basis.

Accreditation Requirements

The accreditation process should be made open to any company established or operating in a region that wishes to be accredited as an ESCO.

Applicants that can demonstrate a high level of full-service project development and implementation for energy-efficiency projects should be allowed to apply for and obtain accreditation. Below are some key features that all accreditation programs should include:

Business Criteria

- Applicants should be registered companies under national legislation;
- A minimum of two years of continuous operation;
- A positive review of all outstanding legal actions over a defined period;
- A statement of compliance with the accreditation organization's ethical guidelines;
- A demonstrated ability to acquire construction bonding of a certain capacity.

Financial Criteria

- A positive net working-capital ratio for the last two financial years;
- A positive net assets ratio for the last two financial years;
- An acceptable explanation by the applicant explaining any financial anomalies found by the accreditation body in the financial statements.

Technical Criteria

- A demonstration of staff competence through resumés and organizational charts;
- Project profiles that describe the project's energy efficiency measures, their construction and ultimate performance;
- A listing of all projects completed over a defined

duration;

- A demonstration of the fulfillment of a broad range of energy conservation measures;
- A safety program and documentation.

Alternate Accreditation Requirements

In some markets and countries, ESCOs may be just starting to provide services and therefore have only a limited ability to provide extensive project details as required by the accreditation process.

Furthermore, new market entrants may emerge that likewise have only a limited project portfolio.

Several countries have introduced a "provisional" accreditation process that allows ESCOs to seek accreditation on the basis of a reduced set of documentation.

Provisional accreditation is an acceptable process for developing markets and new market entrants, but it should only be offered for a short period of time, such as two to three years.

Furthermore, provisional accreditation should only be offered once, and only under special circumstances should provisional renewal be allowed. As the designation "provisional" is designed to allow a new market entrant to gain some project experience, it should only be renewed under special circumstances. As during the provisional period, success should be assessed with reference to the development of some projects that can be used for full accreditation.

In the provisional accreditation process, the areas to be relaxed should involve those items that a company with less longevity might experience, including:

- Number of years in operation;
- Projects available for reference;
- References from clients.

The role of an accreditation program is not to enable an ESCO to enter the market but to qualify those ESCOs that meet the accreditation requirements at a higher level of performance expectation. As such, it is important that even with provisional accreditation the ESCO can demonstrate the ability to fulfil the functions of an ESCO as outlined in Section.

It is also important to acknowledge the dynamics of the market where the accreditation program is being established.

If accreditation imposes legal or policy requirements on any company wishing to provide ESCO work, to facilitate new market entrants provisional accreditation should be more relaxed, as the ability to do any ESCO work is limited to accredited companies. It is vital that the accreditation program has a path allowing new markets and new market entrants to grow and prosper.

The Process of Accreditation

A dedicated ***ESCO Accreditation Board*** must be created and vested by a specific entity (government ministry, national energy efficiency agency, private-sector association) to manage the process and carry out the accreditation.

The Board often includes prominent professionals with various backgrounds and expertise to cover the different aspects of the ESCO business, for example:

- Government experts;
- Academics;
- Representative(s) of the accrediting body;
- Professionals from the financial sector;
- Professionals from the legal sector;
- Other experts as may deemed necessary.

The Board should meet, review and assess ESCO accreditation applications submitted by potential candidates.

The Board may convene and make decisions virtually by means of video conferences or audio calls. Applications will be evaluated against the stipulated criteria of the accreditation program.

It is recommended that the accreditation process be conducted at specific times during the year to allow the accreditation board to process applicants in groups, rather than continuously during the year.

Application Submission

When submitting an application for ESCO accreditation, the applicant will have to complete and submit a set of necessary documents and information, including at least the following:

- A completed application form;
- All the relevant information needed to prove that the company meets the requirements of the accreditation program;
- Payment of the application fee.

The completed application form and all accompanying documents should be sent, using a valid electronic signature, to the Board's designated e-mail address.

Issuing a Certificate

Upon successful accreditation, an Accreditation Certificate is issued. The accredited ESCO is then registered on a list of accredited companies posted on the accreditation body's website. The successful applicants will be expected to conduct their business in a professional and ethical manner according to the applicable national laws and regulations, otherwise accreditation may be withdrawn or suspended.

10.2. ESCO Accreditation Requirements in China

To be considered an ESCO by the Energy Management Company Association (EMCA), the association of ESCOs in China, a company needs to demonstrate compliance with the following criteria:

Business/Financial Requirements

- Registered capital exceeding CNY 5 million (approximately USD 750,000);
- At least one year of continuous operation;
- Accumulated investment in EPC projects of no less than CNY 1 million (approximately USD 150,000).

Technical Requirements

- Implementation of at least one EPC project;
- Competent technical professionals and personnel to implement EPC projects;
- Business core covering energy audits, diagnosis, design, retrofit and operation.

10.3. ESCO Accreditation Requirements in USA

ESCO's accreditation in the United States is managed ***by the National Association of Energy Service Companies (NAESCO)***. NAESCO maintains accreditation as an Energy Service Provider, an ESCO or an Energy Efficiency Contractor.

To become accredited, an applicant must:

- Be a member of NAESCO;
- Agree to NAESCO's ethical guidelines;
- Receive a recommendation from the accreditation committee;
- Be approved as accredited by the NAESCO Board of Directors.

The accreditation committee receives a file of information from the applicant, which forms the basis of evaluation of the applicant. The submission for ESP and ESCO applicants is through an online database known as eProject Builder, run ***by the Lawrence Berkeley National Laboratory (LBNL).***

Project data submitted by applicants is held in confidence by LBNL and the accreditation committee. The submission must include:

A business description, including the name of the legal entity for which accreditation is being sought, plus:

- CVs of reference project engineers and project managers;
- Financial-offer documentation – two reference projects;
- Measurement & Verification (M&V) narrative;
- M&V documentation – two reference projects;
- Commissioning/O&M documentation – two reference projects (including evidence of customer acceptance);
- Contracts executed for two reference projects;
- One full year of savings data for reference projects;
- At least ten reference projects;
- Audited financial statements;
- Signed NAESCO Ethical Guidelines document;
- Summary of legal action;
- Customer Reference Contact Form for reference projects;
- Submittal of all projects (list) in the last five years;
- Detailed company description.

10.4. ESCO Accreditation Requirements in Canada

Companies wishing to qualify under the Federal Buildings Initiative must meet the following criteria:

- Business/Financial Requirements ESCOs must possess the full financial capacity necessary for the provision of energy management services;
- Financial capacity must be demonstrated through recent financial performance, a high level of working capital, and/or proven access to multi-year sources of finance.

To meet these criteria, ESCOs must present the following documents to the certification commission:

- Audited financial statements, or if these are not available, unaudited financial statements for the past three fiscal years. If the ESCO has been in operation for less than three years, it must provide financial statements for the entire time period in question (including as a minimum: balance sheet; statement of retained earnings; income statement; and any notes to these statements);
- A signed certificate from the Chief Financial Officer (CFO) or an authorized signing officer of the company stipulating that the financial information provided is complete and accurate;
- A year-to-date financial statement for the current fiscal year with comparative in-house statements for the same period of the prior year;
- A parental guarantee signed by the parent company (if applicable and requested by the certification commission);
- Evidence of sufficient insurance coverage with respect to comprehensive general liability, errors and omissions.

Technical Requirements:

- Have implemented at least two energy-improvement projects, with completion dates within the last five years, using the EPC model;
- Provide details that clearly demonstrate experience in project management and the commissioning of energy improvements;
- Provide details of past experience of energy audits, energy analyses and feasibility studies, energy monitoring, energy-system maintenance and repair, and the training of building managers and operators;
- Demonstrate that it employs personnel with at least five years' experience in managing the design and implementation of energy improvements;
- Provide the names and qualifications of key personnel, supported by detailed resumés outlining relevant; project experience.
- ESCOs should also identify the employment status of each individual (e.g., partner; fulltime employee; part-time employee; etc.).

10.5. ESCO Accreditation Requirements in United Arab Emirates (Dubai)

The UAE has established an ESCO certification process consisting of two levels that is valid for three years. Companies that wish to be certified need to demonstrate the following qualifications:

Business/Financial Requirements for Full Certification:

- At least three years' operating experience;
- A minimum of six project references;
- Financial strength, based on an assessment of audited financial statements for last two years;
- A minimum of two years' operating experience in Dubai.

Technical Requirements for Full Certification

- Employment of at least two members of staff with engineering degrees, including one Certified Energy Procurement Professional (CEP) and one Certified Measurement and Verification Professional (CMVP);
- Energy audit equipment in place. Business/ Financial Requirements for Provisional Certification;
- Financial strength based on positive net assets, at least 25 percent equity finance and forecast solvency during the provisional certification period.

Technical Requirements for Provisional Certification

- Employment of at least one staff member with an engineering degree or CEP;
- Energy audit equipment in place.

Evaluation of companies that wish to be certified is based on the submission and review of documents proving that the applicant meets high standards in the following areas:

- Performance records for: audits; energy measurement; verification protocols; installation; project management; post-implementation reports; energy savings achieved;
- Safety policies and records;
- A detailed company profile;
- An acceptable legal and organizational structure;
- Financial solvency, a reputable sponsor, and/or established parent company organization;
- Reference letters from three or more clients.

10.6. ESCO Accreditation Requirements in Singapore

Certification is open to any company established in Singapore that wishes to be certified in the provision of energy-auditing services and the implementation of energy efficiency and conservation projects for buildings and facilities.

Certification varies according to the experience level of the ESCO and the systems expertise it possesses.

Certification criteria differ according to whether the company has been operating for less or more than three years.

There are two levels of certification according to:

- The number of years of experience the company possesses;
- The capacity to complete a Level 3 energy audit;
- The capacity to complete implementation of an energy efficiency project.

Business/Financial Requirements for Full Certification

- Industrial and workplace occupational safety policies and records;
- An acceptable legal and organizational structure;
- A range of additional service capabilities, e.g. facilities management;
- Reference letters from three or more clients.

Technical Requirements for Full Certification

- Completion of a minimum of nine Level III audits and three implementation projects in the previous three years;
- At least one Qualified Energy Services Specialist under full-time employment;
- Calibrated measuring equipment and instrumentation to carry out audits.

Business/Financial Requirements for Provisional Certification

- Industrial and workplace occupational safety policies and records;
- An acceptable legal and organizational structure;
- A range of additional service capabilities, e.g. facilities management;
- Reference letters from three or more clients.

Technical Requirements for Provisional Certification

- At least one Qualified Energy Services Specialist under full-time employment;
- Calibrated measuring equipment and instrumentation to carry out audits.

10.7. ESCO Accreditation Requirements in India

In order to create a sense of credibility among prospective clients that are likely to want the services of an ESCO, as well as among financial institutions, the Indian Bureau of Energy Efficiency has undertaken a process of rating ESCOs in terms of their success in implementing energy efficiency projects based on performance contracting, the availability of technical manpower, financial strength, etc.

The rating exercise was carried out ***by the Security and Exchange Board of India's*** accredited agencies, ***CRISIL*** and ***ICRA***. These two agencies developed an accreditation methodology which involved an assessment of the business risk (track record and market position), organizational arrangements and financial capacity of the organization and accrediting the ESCOs on a five-point scale.

The grading was designed to aid ESCOs in their ability to bid successfully for energy services projects and to arrange the finance for their implementation.

The parameters for assessment include a mixture of business/ financial and technical capability criteria:

- Years in the ESCO/energy management business;
- Number and nature of energy audits carried out to date;
- Number of different industries served;
- Order-book strength as measured by ratio of current order book to previous years' turnover;
- Number of energy management projects completed;
- Certification and quality systems in place;
- Technology tie-ups;
- Patents held by the company;
- R&D facilities;
- Constitution, ownership structure and parentage;
- Management evaluation and quality of organizational structure, internal control and systems;
- Employee strength in terms of numbers, qualification and experience;
- Number of certified energy auditors employed by the company;
- Annual turnover of the ESCO/energy management business;
- Profit margins of the ESCO business.

Overall financial strength as reflected by the capital structure and debt servicing.

11. An Analysis of the Current Situation of Energy Efficiency and ESCO Market in Ukraine

11.1. Key Trends of Energy Efficiency Market in Ukraine

In 2018-2021 total government-supported financing of energy efficiency projects in Ukraine exceeded 61.8 USD Million.

Although energy efficiency investments have declined since February 2022, total energy efficiency market in Ukraine values ***at 2.0-2.5 USD Billion*** per year and it is highly dependent on import of equipment.

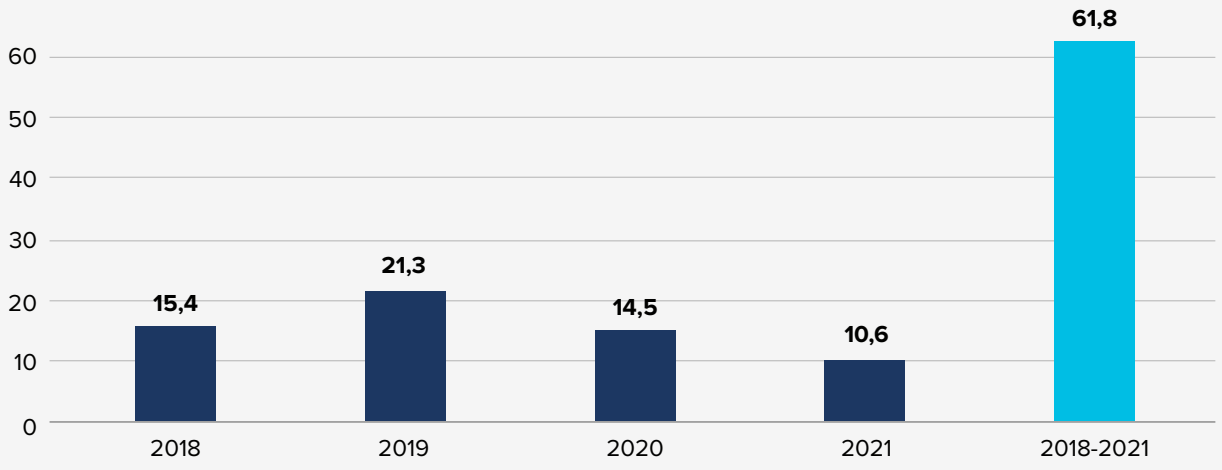

Figure 5. Government-Supported Expenditures in Energy Efficiency Projects in Ukraine in 2018-2021, Million USD

Source: SAEE

In January 2021-February 2022 average monthly import of energy efficient equipment to Ukraine varied from 85 to 161 USD million while since in February 2022 in dropped to 12-32 USD million per month. Thus, Ukraine ***has become critically vulnerable to supply of energy equipment since the beginning of war, and energy performance contracts*** can play an important role in supporting private energy efficiency investment in Ukraine and resilience of energy infrastructure of the country [6].

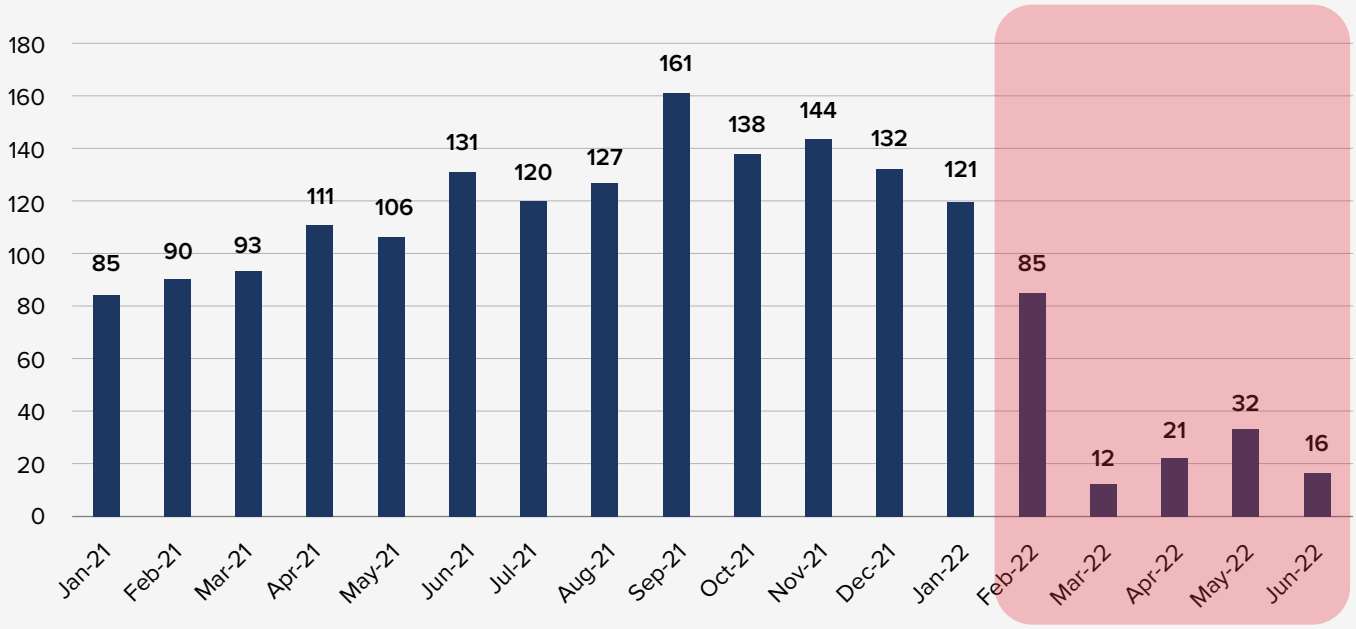

Figure 6. Monthly Import of Energy Efficiency Equipment to Ukraine in 2021-2022, Million USD

Source: www.trademap.org

11.2. Infrastructure and Public Buildings

The public sector in Ukraine is one of the high-priority market segments for ESCOs in Ukraine. There are ***more than 77 thousand public building*** in Ukraine which are one of the largest categories of energy consumers in the country.

The public sector accounts for about ***5-6 percent of total final energy consumption*** in the country, or about ***5 Mt of CO_2*** emissions per year.

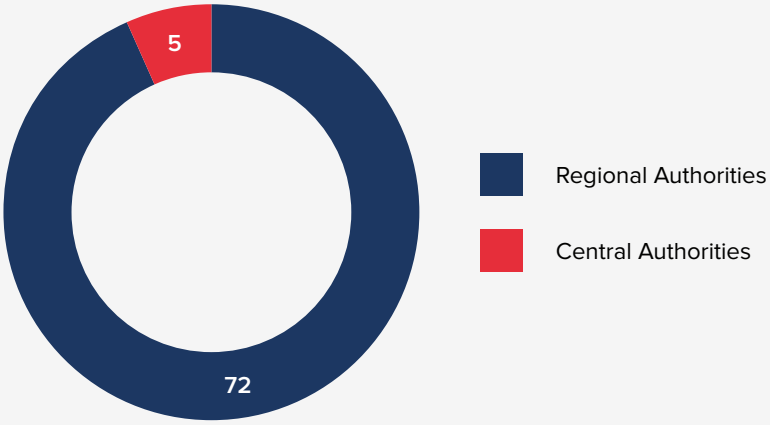

Figure 7. Total Number of Public Buildings in Ukraine, thousand buildings

Source: SAEE

The energy mix of the public sector in Ukraine is characterized by the predominant share of electricity and heat which account for ***71 percent of cumulative energy consumed.*** Primary fuels (coal, peat, natural gas, biofuels and waste account for 29 percent of the total energy consumption of public buildings in Ukraine.

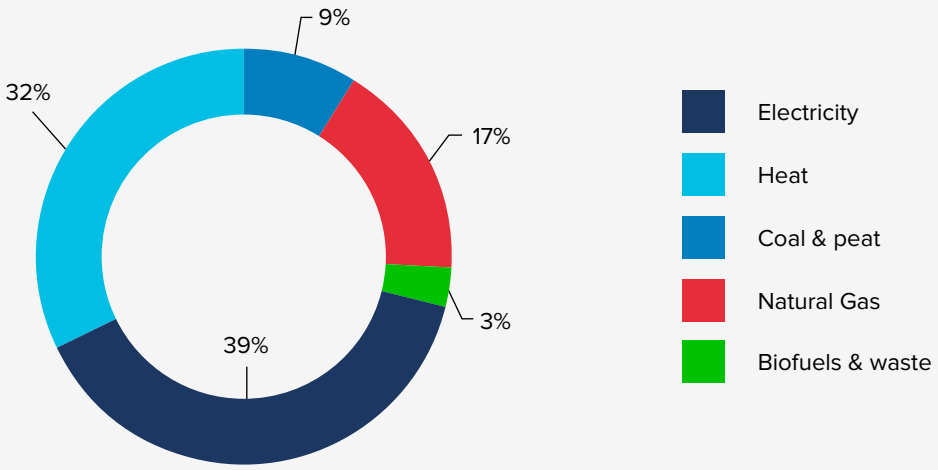

Figure 8. Structure of Final Energy Consumption of Public Buildings in Ukraine in 2020

Source: SAEE

Average specific energy consumption of public buildings in Ukraine is ***406.9 kWh/sq. m/year*** that is far beyond the energy efficiency benchmarks.

As a result of such a low average energy performance of public buildings in the country, a wide range of energy efficiency measures can be implemented in this sector targeting primarily improvements in the heating supply, thermal modernization, installation of energy efficient lighting fixtures.

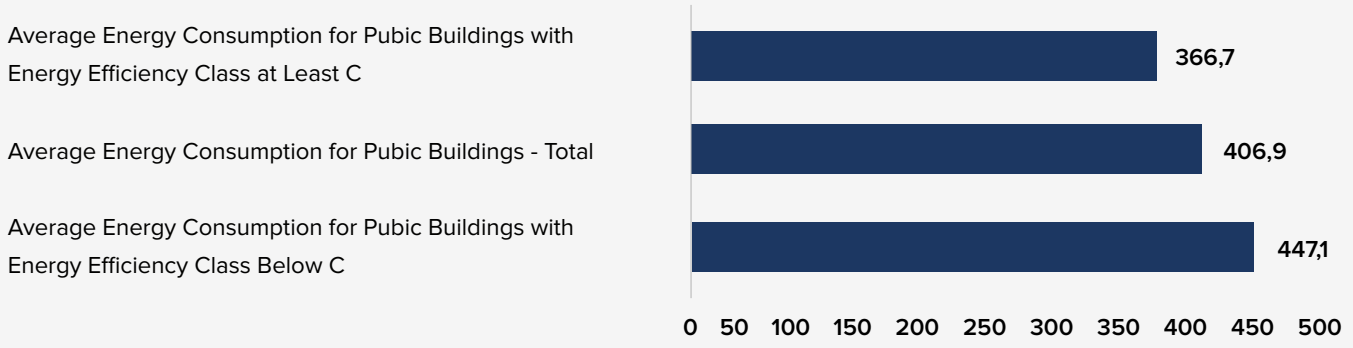

Figure 9. Specific Energy Consumption for Public Buildings in Ukraine, kWh/sq. m/year

Source: SAEE

The following Annexes to the report consolidate key figures of the state-owned properties in Ukraine as well as the current status of certification of energy performance of public buildings in the country.

- Annex 61: Government- and municipalities-owned property in Ukraine;
- Annex 62: Certificated of energy performance of public buildings in Ukraine.

11.3. Draft State Budget for 2023

Central public authorities in Ukraine are large consumers of energy. According to the ***Draft State Budget for 2023,*** total energy and utilities bill for this category of consumers is ***385.2 USD Million*** that results in at least ***40-50 percent inefficient expenditures*** due to high energy intensity of the building stock.

For example, provisional energy and utilities expenditures for assets belonging to the ***Ministry of Defense*** are estimated to 94.1 USD million in 2023, for public facilities owned by the ***Ministry of Environment and Natural Resources*** – 78.8 USD million, ***Ministry of Internal Affairs*** – 72.0 USD million [7].

The State budget of Ukraine in 2023 will suffer severe deficit due to escalation of security-related expenses and radical drop of income. As a result, the ***ability of the Government and municipalities to support sufficient level of investment in energy infrastructure and energy efficiency will be limited.***

The total number of the municipal buildings in Ukraine is 14 times higher than that of buildings of the central public authorities that means a very high potential for energy efficiency improvements in the public sector. It can also be noted that there is a very high level of differentiation of energy expenses of municipalities in Ukraine. Annual energy bills of Ukrainian municipalities vary ***from 200 to 700 Hryvnia per Capita (or from 100 to 300 Hryvnia per 1 sq. m of public building area)*** that results in a need to spend 3-8 percent of the total municipal budget for energy.

Annex 65 summarizes municipal expenditures for energy in Ukraine in 2020 [8].

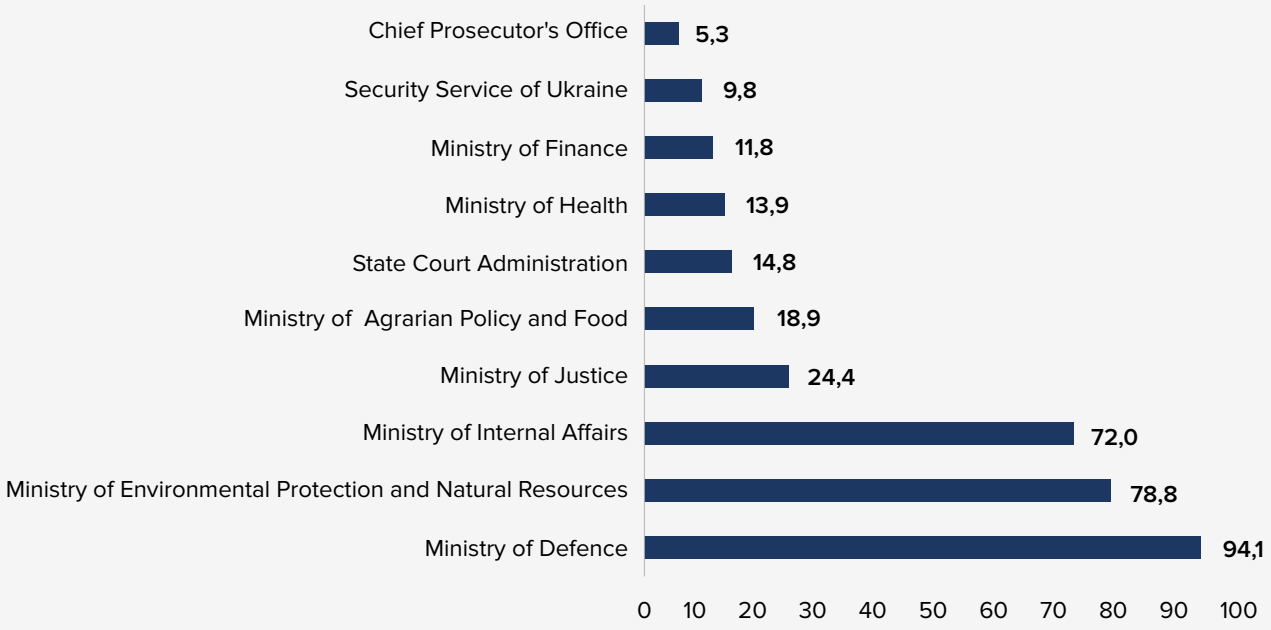

Figure 10. Energy and Utilities Expenditures of Public Buildings of Central Authorities in Ukraine (According to the Draft Budget for 2023), USD Million

Source: Ministry of Finance

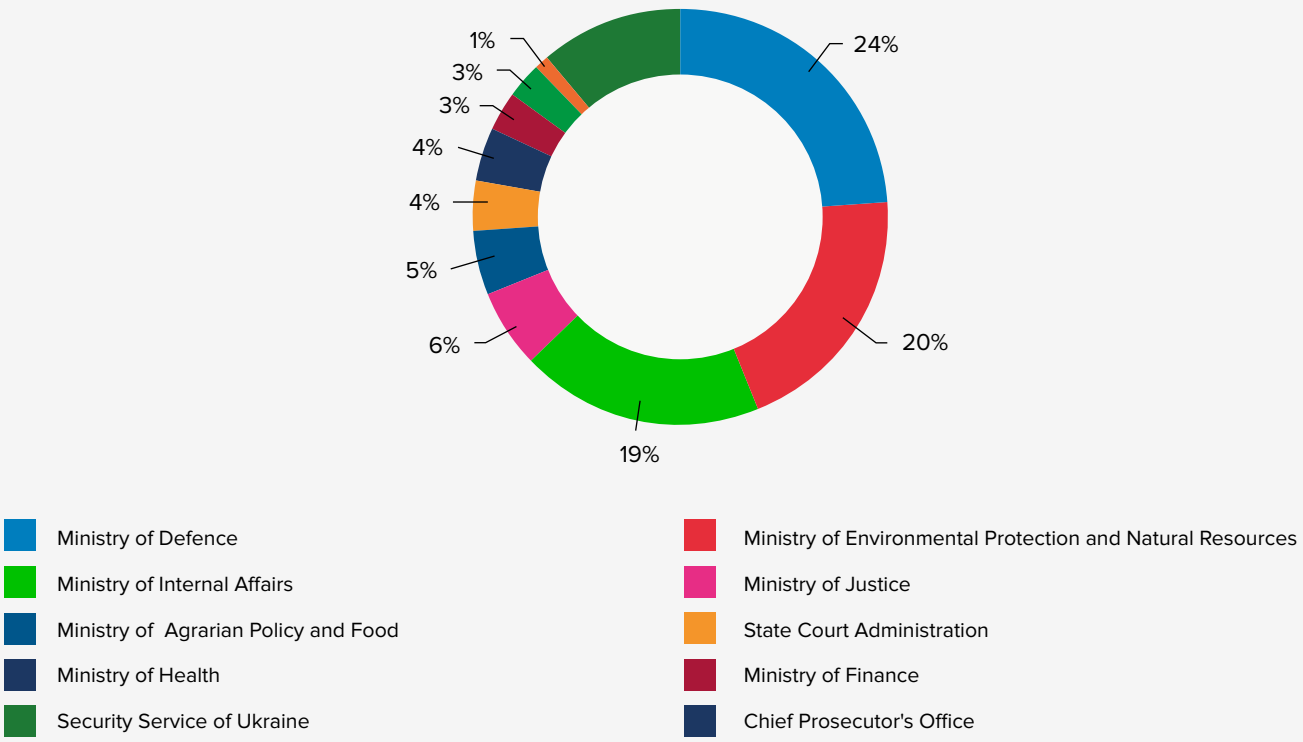

Figure 11. Structure of Energy and Utilities Expenditures of Public Buildings of Central Authorities in Ukraine (According to the Draft Budget for 2023)

Source: Ministry of Finance

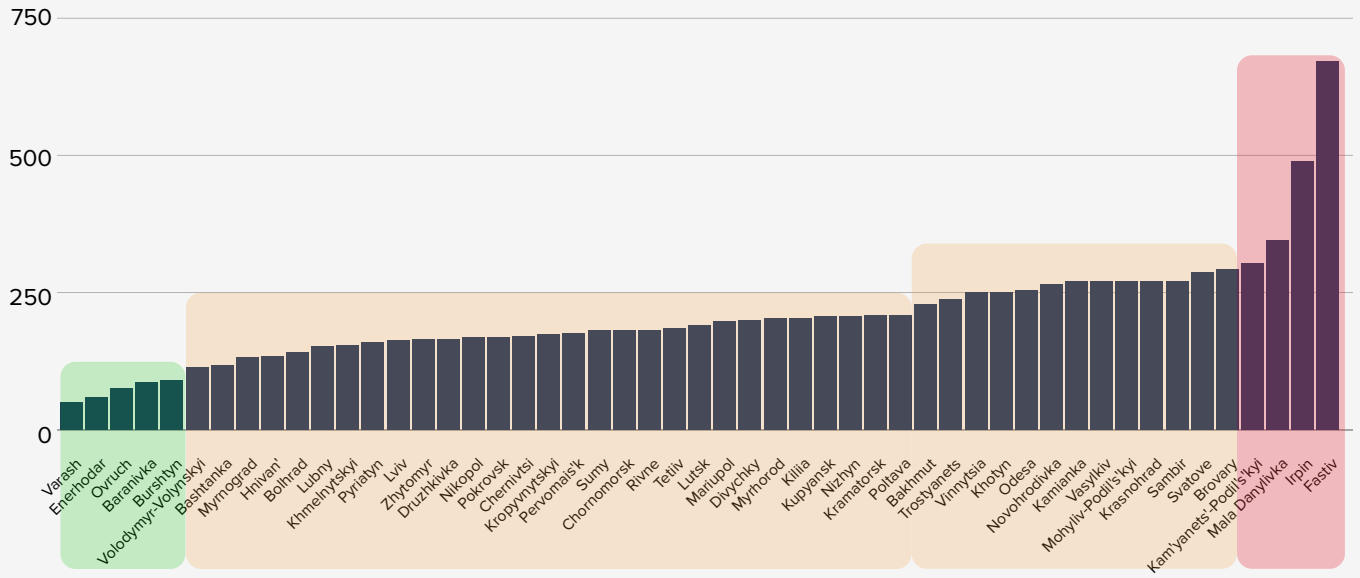

Figure 12. Energy Expenditures of Municipalities in Ukraine in 2020, Hryvnia per 1 sq. m of Public Building Area

Source: Association of Energy Efficient Municipalities

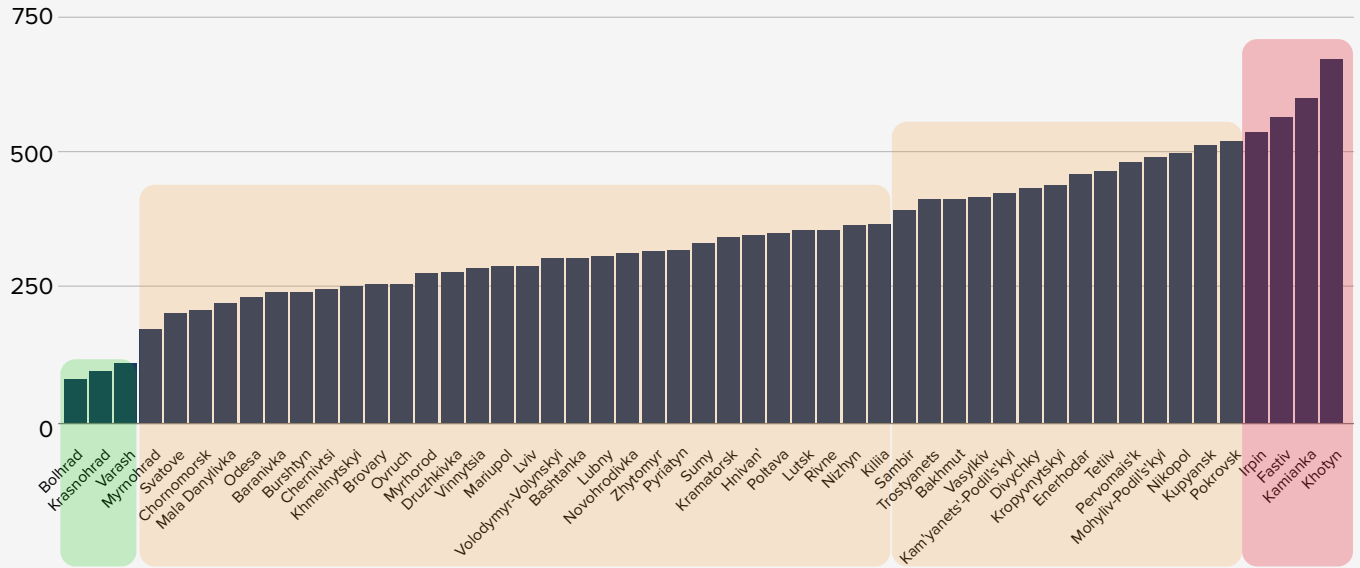

Figure 13. Energy Expenditures of Municipalities in Ukraine in 2020, Hryvnia per Capita

Source: Association of Energy Efficient Municipalities

The Annexes below provide a summary of the current state of public finance in Ukraine according to the data from the Ministry of Finance.

- Annex 63: Municipal loans in Ukraine in 2021;
- Annex 64: Municipal guarantees in Ukraine in 2021;
- Annex 69: Draft state budget expenditures for energy in 2023.

11.4. Key Indicators of ESCO Market in Ukraine

Energy performance contract market in Ukraine is under development.

According to SAEE, ***594 EPC contracts*** have been signed in 2019-2021 with ***total contract value 46.9 USD Million.***

EPC market in Ukraine is formed by ***41 ESCO companies***, TOP-5 market players account for approximately 68 percent of the total cumulative contract value.

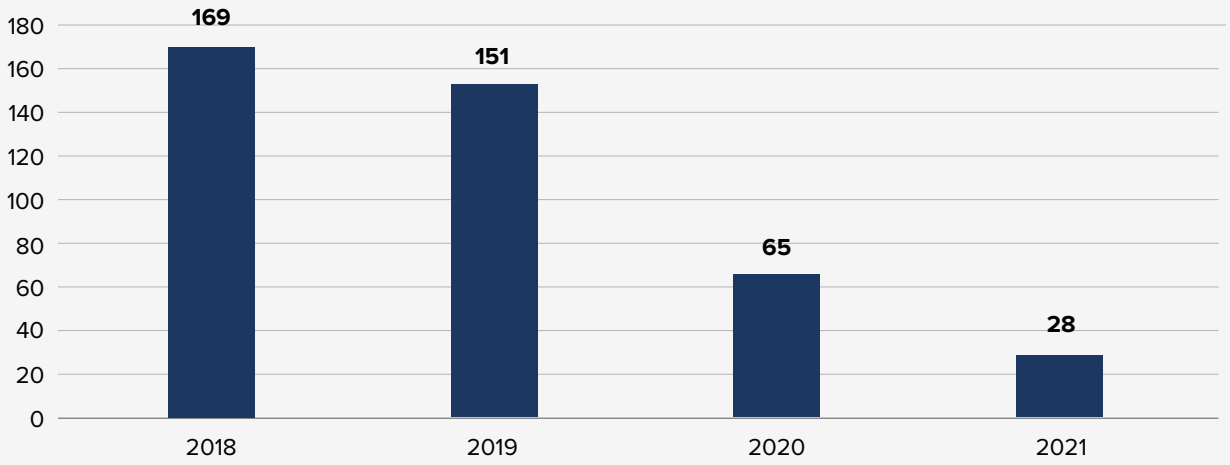

Figure 14. Number of EPC Contracts in Public Buildings in Ukraine in 2018-2021

Source: SAEE

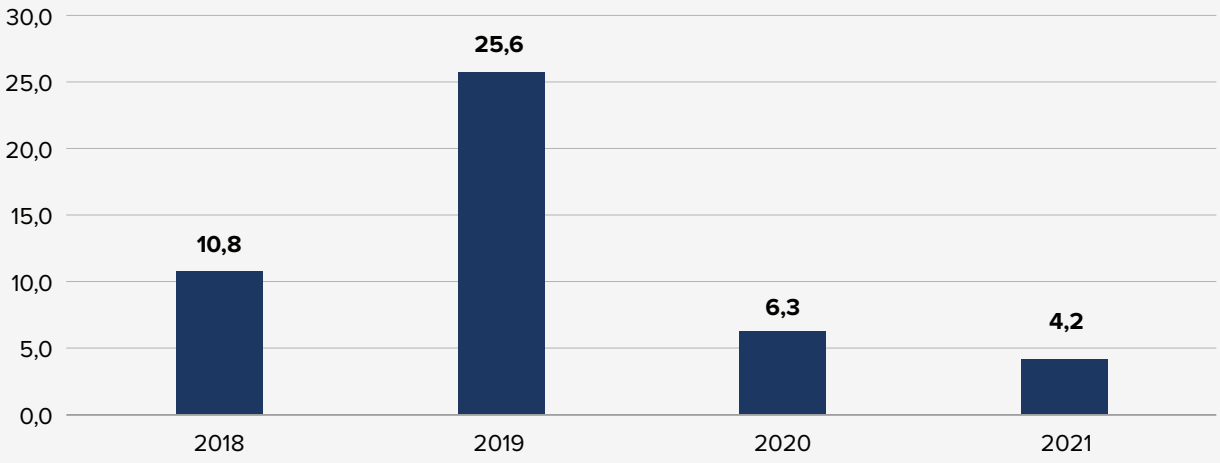

Figure 15. Total Value of EPC Contracts in Public Buildings in Ukraine in 2018-2021, USD Million

Source: SAEE

Average EPC contract value in 2018-2021 varied from ***64 to 170 USD thousand*** reaching the maximum values in 2019.

Typical EPC contracts imply modernization of heating system of the buildings with installation of individual heating plants, heat consumption regulators, replacement of lighting fixtures.

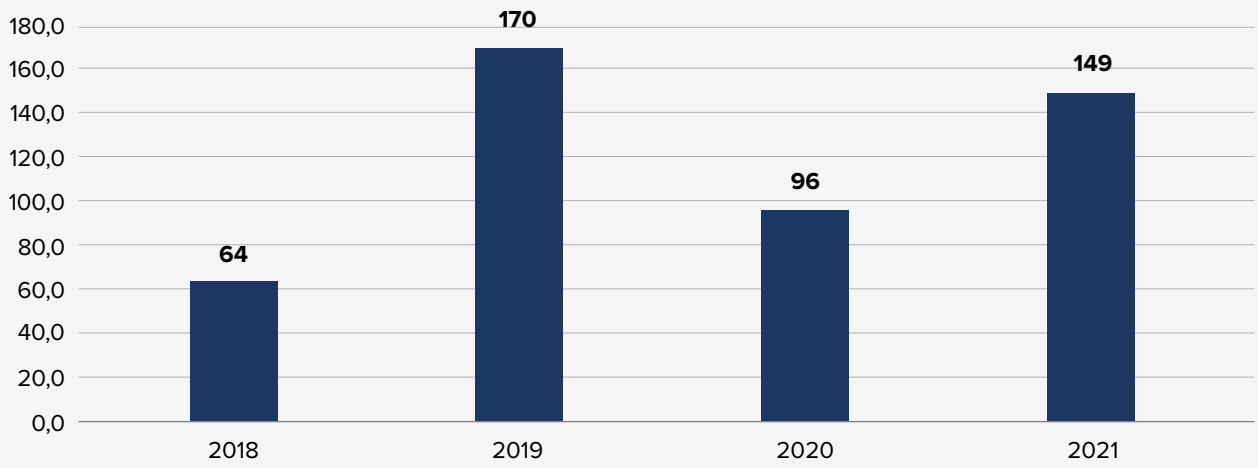

Figure 16. Average Value of EPC Contracts in Public Buildings in Ukraine in 2018-2021, USD thousand

Source: SAEE

Current portfolio of thermal modernization EPC contracts is limited by high payback periods, high interest rates for loans provided by Ukrainian banks as well as inefficient procurement procedures.

The Annexes below provide a summary of the current status and historic tendencies of ESCO market in Ukraine since 2016.

- Annex 57: ESCO contracts in Ukraine in 2018-2022;
- Annex 58: ESCOs in Ukraine and their key indicators (as per 21.07.2020);
- Annex 59: Monitoring of ESCO contracts in Ukraine in 2016-2018;
- Annex 60: Candidate objects for EPC contracts in Ukraine.

Current penetration rate of energy performance contracts in the public sector in Ukraine is low.

According to the data from the Association of Energy Efficient Municipalities of Ukraine, only 0.01 percent of the public buildings in the country were subject to new EPC contract in 2021.

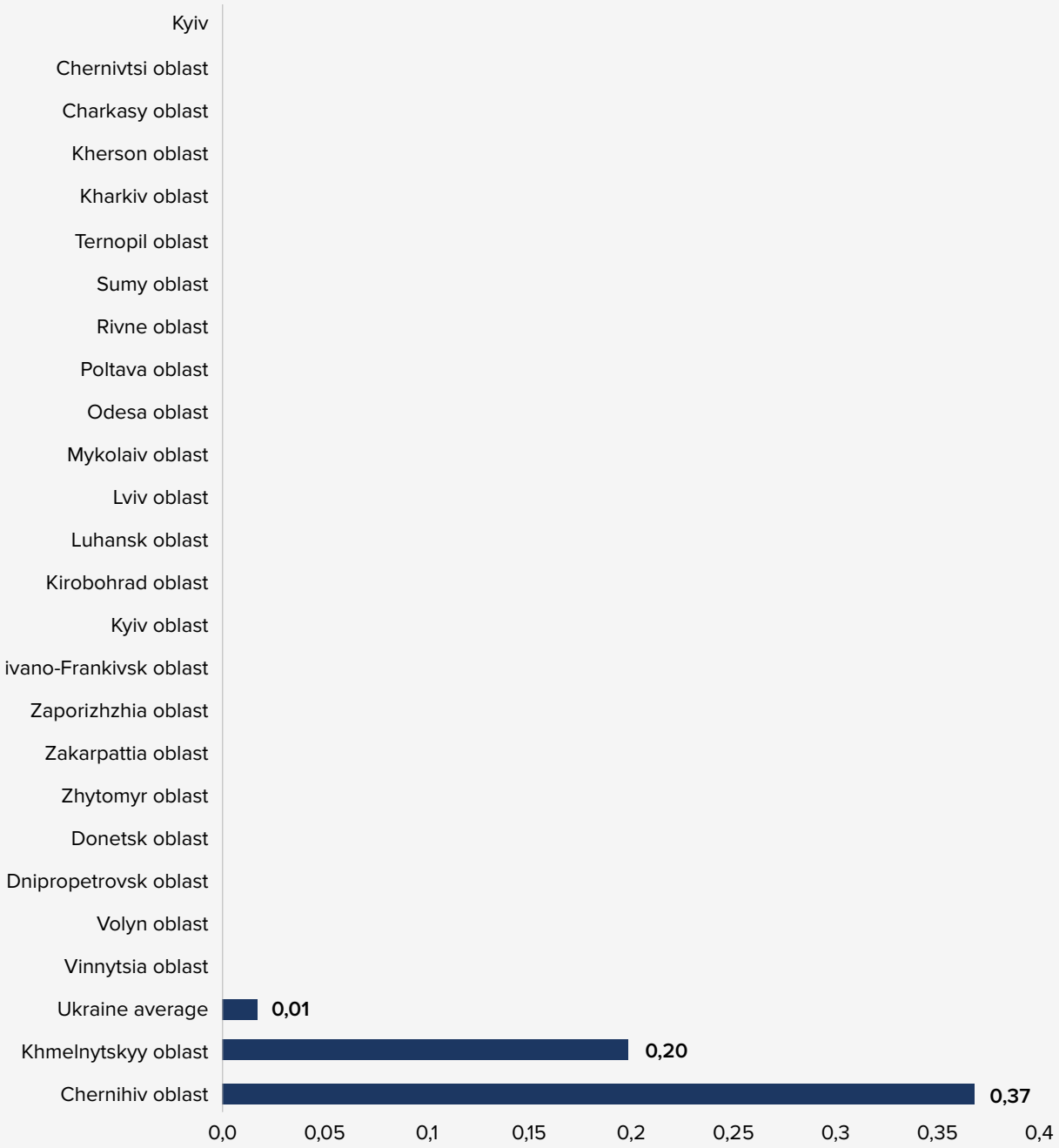

Figure 17. Share of Public Buildings Signed EPC Contracts in Ukraine in 2021, %

Source: Association of Energy Efficient Municipalities of Ukraine

12. Perspective Project Interventions to Promote ESCO Market in Ukraine

The key intervention areas from the project to support development ESCO market in Ukraine in 2022-2023 are mentioned in the Figures below.

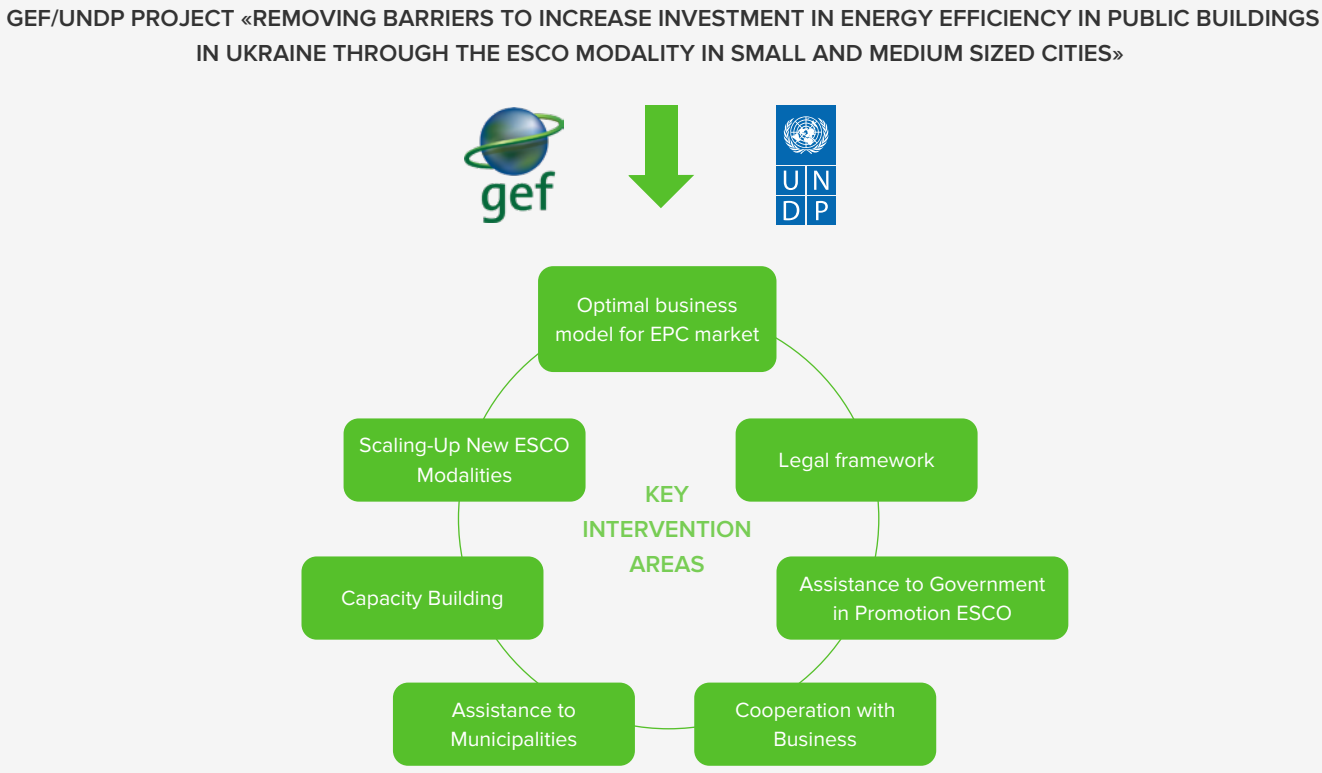

Figure 18. Project Interventions to Eliminate Barriers to ESCO Market in Ukraine

Source: Project Data

Current Situation **Vision — 2030**

Market Transformations

- ✓ The public Sector in Ukraine has ***very high potential*** for energy efficiency improvements ***(up to 1,02 Mtoe per year)*** and GHG emission reduction ***(up to 3,2 Mt CO2-eq. per year)***
- ✓ ***The minimal investments*** in improvement of energy efficiency of the public buildings - ***2 USD Billion***
- ✓ ***Total investments*** required to improve energy efficiency in the public sector according to the current energy performance standards - ***10-14 USD Billion*** within next 15-20 years
- ✓ Sustainable growth of ESCO market in the public sector to ***reach 100 USD Million by 2030***
- ✓ ***Balanced sources of funding*** energy efficiency projects in the public sector ***(state funds and programs, loans from IFI, energy performance contracts, grant financing, green bonds, commercial credits)***
- ✓ Mature ESCO market structure ***(Super-ESCO, small-and medium-sized private ESCOs, municipal ESCOs)***
- ✓ Effective ESCO market supporting instruments ***(risk-sharing facility, guarantee fund)***

Figure 19. Middle-Term Goals for ESCO Market in Ukraine Aligned with Country's Decarbonization Goals

Source: Project Data

The recommended actions to support ESCO market development in the country should focus on:

- ***Support in adoption of relevant policies and regulations;***
- ***Assistance to authorities in institutional development of ESCO market in Ukraine;***
- ***Development of recommendations for design of sustainable ESCO financing infrastructure;***
- ***Strengthening technical capacity of ESCO market participants;***
- ***Implementation of informational and awareness campaigns supporting ESCO market development in the country.***

A special attention will be given to establishment of cooperation with such IFIs as World Bank, EBRD, EIB to contribute to design a new large-scale project aimed at support ESCO market development in the forms of Super ESCO, guarantee fund, risk-sharing facility to scale-up results achieved by the GEF/UNDP Project.

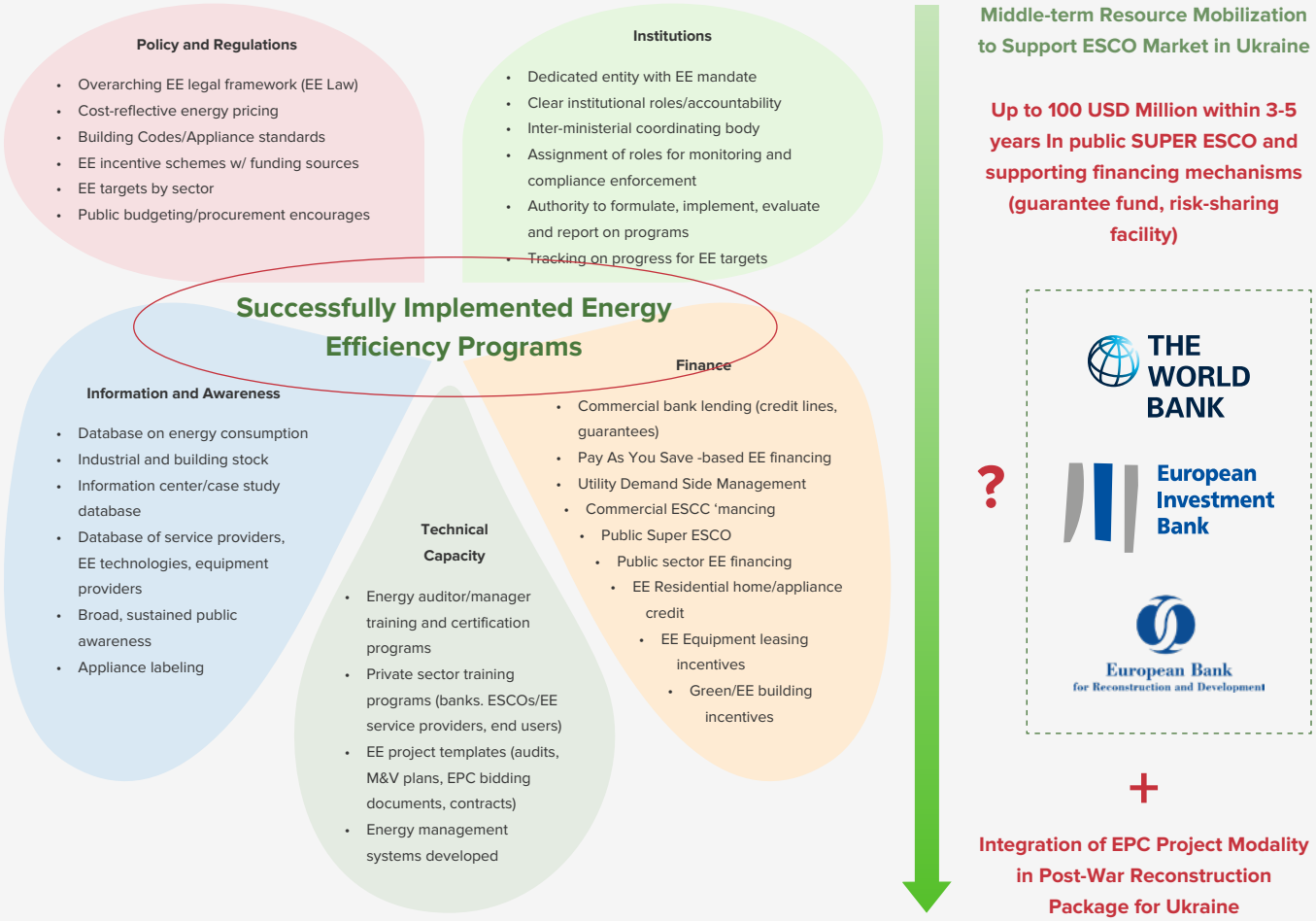

Figure 20. A Roadmap to Support Effective ESCO Market Operation in Ukraine

Source: Project Data

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