Financing energy efficiency Project Bundles for municipalities

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MODULE 5

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Adequate financing solutions are key to deliver the multiple benefits from EE Project Bundles. This module focuses on how to address barriers to financing the EE Project Bundles developed in the previous modules. Like other investment projects, many municipal EE Project Bundles face the issue of high upfront costs, while the revenue from the investment, in the form of energy savings, occurs in small flows during the operation period.

The funding options include using the municipalities' own budget, grants from national or state level governments and international donors (including climate finance mechanisms), public-private partnerships or commercial sources, and off balance sheet finance. Except for a municipality's funding and grants, which can be used for social purposes, any other external funding will require a minimum rate of return from the project, and a low technical and financial risk. The minimum rate of return can vary from country to country, depending on the project type, the borrowers' creditworthiness, project risk levels and the maturity of the loans.

This section describes each type of financing source, including how they work, their advantages and disadvantages, and some concrete examples. It outlines some factors municipalities should consider when choosing between different funding options. It includes a section on long-term institutional and financial arrangement and actions needed to ensure continuous municipal EE project funding and implementation. Finally, it provides a list of existing tools that can support the decision-making on the financing of municipal EE Project Bundles.

5.1 Municipal energy efficiency Project Bundle financing – preconditions and options

5.1.1 Preconditions for successful financing

The economic returns of municipal EE Project Bundles come from the energy bill savings. To be able to attract external financing, especially from commercial sources, a Project Bundle needs to be economically viable, with a stable flow of revenue and profits during its life. Therefore, a few preconditions need to be met, including:

- *A municipality's payments for energy use need to be based on current consumption.* If billing is not consumption-based (as is the case with some district heating systems), energy savings from EE Project Bundles will not yield any cost savings and thereby make financing difficult or impossible.
- *Energy prices should reflect the real costs of energy*. Sometimes energy prices include subsidies and taxes. Heavily subsidized and low energy prices can reduce the profitability of municipal EE Project Bundles and make them less attractive to public facility owners and users, and financial institutions (Ravillard, et al., 2019)[50]. .
- *Stability of energy prices.* Energy price fluctuations directly affect revenue flow and project risks. High price instability, especially on price declines, can reduce investors' interest in EE Project Bundles. Price increases give EE projects more revenue and profits. Clear long-term government policies on future energy prices can reduce the risks of EE Project Bundles and motivate investment in them.
- *The municipal budgeting process must allow a municipality to retain the cost savings resulting from EE projects*. If the municipal budget is reduced when energy costs are lowered, the municipality is unable to repay the financing costs of the EE projects.

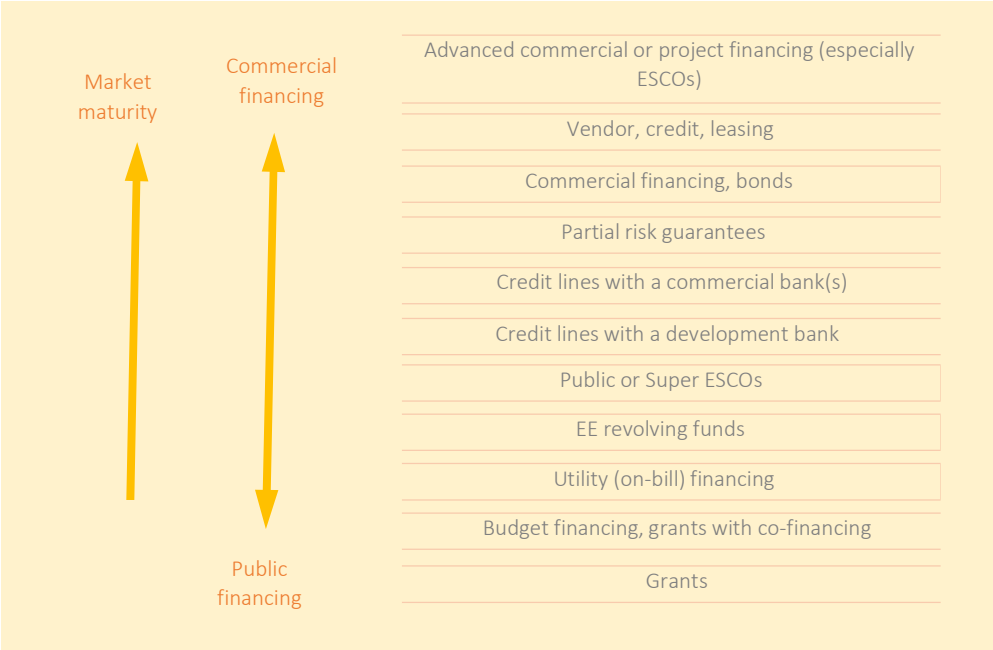
A municipality needs to have good baseline data on energy use and related service levels, such as hours and levels of indoor lighting, comfort levels for heating and cooling and adequate light levels for public lighting. Without such baseline information, it is challenging to measure the energy and cost savings from EE projects (see more on data analysis in "Module 3. Rapid assessment of energy efficiency projects for municipalities" and "Module 6. Assessing the performance and impacts of Project Bundles").

[50] Ravillard, P., Carvajal, F., Soto, D.L., Montuenga, J.E.C., Antonio, K.M., Ji, Y., Hallack, M., 2019. Towards Greater Energy Efficiency in Latin America and the Caribbean: Progress and Policies. Inter-American Development Bank

5.1.2 Financing options for energy efficiency projects

Below is the full spectrum of international funding options for EE projects. As can be seen in Figure 5.1, higher market maturity means more access to commercial credit. Generally, the funding sources can be divided into four major types: 1) municipalities' own funding and budget, and grants from higher levels of government or international donors; 2) external credits, such as loans from banks and financial institutions and municipal bonds; 3) private investment in the form of public-private partnerships; 4) off-balance sheet options, i.e. EE retrofitting projects are financed by private investors, especially ESCOs or leasing companies – in such a situation municipalities keep paying the same energy bills for a certain period of time to the ESCOs or leasing companies. Private businesses and commercial banks fund municipal EE Project Bundles because of profit opportunities. Often a Project Bundle's financing is a combination of different funding sources. Apart from some minimum economic returns from the projects, private investors and commercial banks often require effective risk control measures, such as a certain proportion of funding from project owners, guarantees or collaterals. Like other infrastructure construction projects, municipal EE Project Bundles can also be funded through public-private partnerships.

Figure 5.1 Financing EE- A ladder of options



Source: Lukas, 2018 [51]

[51] Lukas, A., 2018. Financing Energy Efficiency, Part 1: Revolving Funds. Live Wire- A Knowledge Note Series for the Energy & Extractives Global Practice (2018/88). The World Bank Group

5.1.3 Factors influencing the availability of financing mechanisms in different municipalities

Municipalities in different countries and regions can face very different situations when it comes to the available options for funding municipal EE bundles, which can be influenced by multiple factors (see Figure 5.2).

Figure 5.2 Main factors influencing the availability of different financing models

Most of these factors are influenced by the size of a municipality, with large municipalities facing different challenges to smaller ones[52]. In terms of Project Bundles, the same type of EE actions, such as street lighting and water supply, can be big enough for one or more Project Bundles in a big municipality. Smaller municipalities, due to the smaller volume of EE potential among the same technology or the same type of public facilities, may have to either aggregate actions with greater diversity in the same bundle or be part of a bundle covering multiple municipalities.

5.2 Municipal budget funding and grants

The first situation is that municipalities have enough funding for implementing the EE Project Bundles, either through their own savings or budget funding, through grants from national or regional funding, or from international development agencies.

In such a situation, they can choose between hiring a general energy service provider company – which carries out the product procurement, installation and construction – or hiring several companies for different parts of the activity, such as detailed energy auditing and designing of the project, procurement, and installation. Hiring a general contractor can reduce the workload and technical expertise requirements from the municipalities. However, the overall contract payments may be higher and the municipality loses control of specific aspects of project implementation. During the EE project implementation, municipalities' procurement process must not be limited to selecting the least-cost supplier and allow for certain types of agreements such as Energy Saving Performance Contracts (ESPCs).

5.3 Off balance sheet funding solutions

If municipalities cannot obtain credit, they may need to consider financing models that do not accrue municipal debt and, therefore, do not count against their borrowing capacity (e.g. vendor finance or ESCO project financing).

As EE projects need energy audit and technical capacity, even when municipalities use their own funding or borrow money from banks to finance their EE projects, they normally still need to contract an external technical team to carry out the retrofitting. Such professional services can be provided by ESCOs or other technical companies. The fees can be paid in the form of a pre-negotiated fixed amount, with the ESCO guaranteeing a certain level of energy saving, or in the form of a certain share of the saving. In "Module 4. Business models for energy efficiency Project Bundling for municipalities", there are more details on the engagement of product suppliers, ESCOs, auditors, architects and other service providers in implementing municipal EE Project Bundles.

There are two preconditions for an energy performance contract to work. First, the statutes allow municipalities to retain their original budget for utility costs even though future utility bills will be reduced as a result of the installed energy and water

[52] Novikova, A., Stamo, I., Stelmakh, K., 2017. Guideline on Finding a Suitable Financing Model for Public Lighting Investment.

conservation measures[53]. Second, the public agencies and institutions are ready to share the energy, water consumption data.

5.3.1 ESCOs

ESCOs are energy service companies, which often provide both technical services and finance for EE projects. As ESCOs specialize in EE investments, they are in a better position of risk control, therefore can provide upfront investment for EE projects and recover the investment plus some profits through energy saving and energy cost reduction of the projects. For municipalities, the great advantage of using ESCOs to finance their EE Project Bundles is that there is no need to raise funds for their EE projects, while upon the end of the contract with the ESCOs, municipalities can enjoy continuous energy-saving benefits from the projects, better services for the users and increases in the public building or infrastructure's market value. Please refer to "Module 4. Business models for energy efficiency Project Bundling for municipalities" for further information on ESCOs.

5.3.2 On-bill financing

On-bill financing (OBF), also known as on-bill repayment, refers to a type of loan that can be used to invest in improving the EE of a building. The loan is paid back over time through additional charges on the building's utility bill. This mechanism encourages building occupants and owners to invest in EE measures, which can decrease energy consumption and utility bills[54]. OBF can help municipalities solve the upfront costs of EE retrofits, while the costs are repaid through an additional charge on their energy bills. The advantage of OBF is that customers do not need to fund the EE retrofitting costs. At the same time, due to long-term services and monopoly in the market, utility companies know the customers' performance in terms of energy bill payment and have both the past energy bill information and more leverage to avoid a default of payment by the borrowers. The disadvantage is that OBF also needs an initial public funding injection and most existing programmes try to keep bill neutrality and avoid an increase in the customers' energy bills. Utility companies, as ESCOs, tend to focus on lighting and energy using equipment with a large number of participants and a short payback period. OBF financing is popular in the US.

5.3.3 Vendors' credit

Another form of commercial credit is that offered by suppliers, which allows municipalities to pay for the products or equipment for EE Project Bundles in installments over an agreed duration. Such installment or credit sales can reduce the upfront fundraising needs by municipalities for their Project Bundles. Credit offered by vendors or suppliers is often quicker to get than loans.

5.3.4 Green leasing

Green leasing – also known as energy-aligned, energy-efficient or high-performance leasing – is the practice of realigning the financial incentives of sustainability or energy measures in lease documents. Realigning cost structures through a green lease allows both building owners and tenants to save money, conserve resources and ensure the efficient operation of buildings[55]. A green lease is mainly applied in commercial buildings. In most municipalities, the government agencies and public institutions use public buildings; in some cases, municipal governments and public institutions also rent buildings from a private company or the government body that manages public buildings. In such cases, green leasing can be a way to finance EE projects. One example is the city of Cleveland in the US, which uses green leasing to support city building EE improvement[56].

Green leasing can also be used to finance EE equipment for municipal street lighting, public buildings, water supply systems or other municipal EE Project Bundles.

5.4 Commercial credit and development credit

To access commercial credit for funding, a municipality needs to consider the following preconditions. In case these preconditions are not all met, the municipalities need to consider other funding options.

1) Local commercial banks or financial institutions (lenders) are interested and willing to finance municipal EE projects and have the funds and financial products for municipal EE financing.

2) A municipality needs to be considered creditworthy by commercial lenders, or they can get credit backing or a guarantee from the national or regional government.

3) In many countries, national governments impose borrowing limits on municipalities. A municipality needs to have sufficient borrowing capacity under such a limit to take on additional loans.

4) In addition to a good credit rating and sufficient borrowing capacity, a municipality may need to have collateral that is acceptable to commercial lenders.

[53] DBEDT, 2016. Hawaii State Guide to Energy Performance Contracting (EPC), 2016 Revision. Department of Business, Economic Development, and Tourism (DBEDT), Hawaii.
[54] Zhang, S., 2013. On-bill financing: encouraging energy efficiency. Center for Climate and Energy Solutions.
[55] Feierman, A., 2015. What's in a Green Lease? Measuring the Potential Impact of Green Leases in the US Office Sector. Institute for Market Transformation (IMT).
[56] IMT, 2019. Green Lease Leaders: Spurring Efficiency in Cleveland Businesses and City Buildings. Market Transformation (IMT).

Sometimes multilateral development banks or national development banks or funds also provide low-interest loans or special credit lines for EE projects. Development banks are funded by governments and target support for economic growth. Hence, they often offer loans at lower interest rates and longer maturity.

5.4.1 Getting a project to bankability

The definition of bankability is that the project is robust enough from a revenue and risk perspective to attract finance under the terms of an EPC contract[57]. Although financing is the last, and the key, step between project development and project implementation, bankability is an issue to a large degree determined in project opportunity identification through economic assessment and the selection of business models. The technical and economic assessment is expected to seek Project Bundles with relatively short payback periods, an internal return rate higher than the market interest rate, and low technical, economic and political risks. Such Project Bundles proposals are of high bankability. They are likely to attract the attention of banks and other financial institutions and raise the necessary funding.

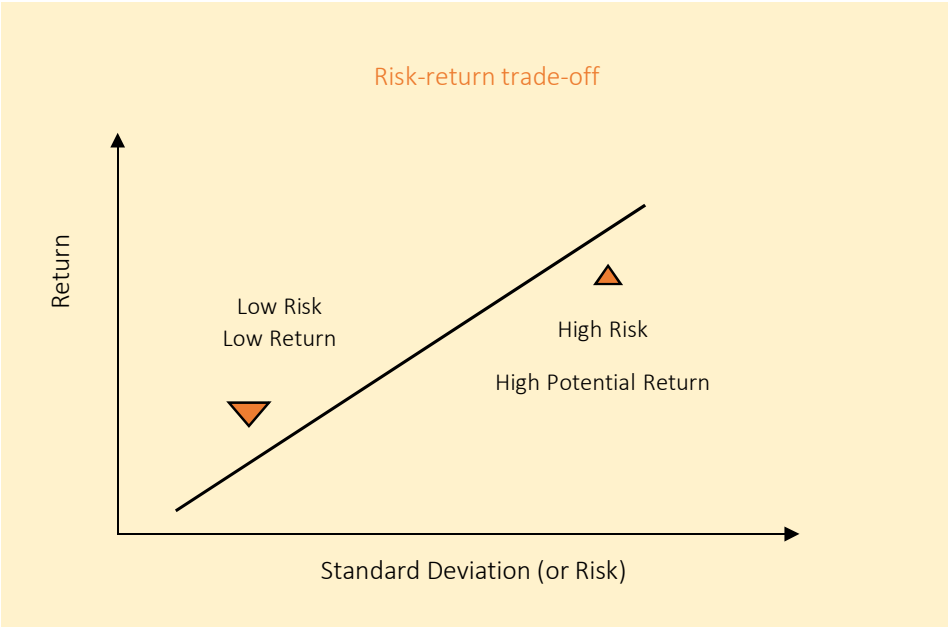
5.4.2. Risk management

As EE improvements are intangible, many EE projects are perceived as complex and granular. In turn, projects struggle with an unfavourable ratio between perceived project revenue and transaction cost. Project Bundling can address the issue of small scale and high transaction costs; they cannot address the problem of perceived financial risks, and sometimes bundling itself appears linked to many difficulties and elevated complexity.

EE projects are "brain-driven", i.e. a considerable share of the project value does not relate to the value of the invested assets, but rather on the know-how behind the optimal application of the assets. The cash flow of EE projects comes from cost savings instead of product sales; the risks are more closely linked to the operation and use of public facilities and occupants' behaviours. Hence, they are often considered higher-risk.

Higher risk is associated with a greater probability of higher return, and lower risk with a greater probability of smaller return. This is called the risk-return trade-off. This means that projects with higher risks often have to offer higher returns to attract external financing (see Figure 5.3).

Figure 5.3 Illustration of the risk-return trade-off



[57] Milne, C., 2019. Bankability Assessment of the new EPC, Deliverable D4.5.

From the perspective of financial institutions, two elements are of utmost relevance in assessing the economic returns and risks of EE projects. Commercial loans can be offered based on the municipalities' own creditworthiness or the EE bundle's bankability. In risk assessment, banks and financial institutions consider the risks related to the project's successful implementation, delivery of the expected energy savings, realization of the expected energy cost-saving and timely repayment of the loans and interests[58]. Table 5.1 and Table 5.2 are the risks of EE projects. Non-quantifiable risks are those that cannot be directly reflected in the project's economic feasibility assessment, while quantifiable risks directly affect the results of economic feasibility assessment.

Table 5.1 Non-quantifiable EE retrofit risks

Risk factor	Risk Type	Description
Product Lifetime	Technology	The uncertain lifespan of installed products; depreciation and sustainable performance; future product replacements.
EE Product Failures	Technology	Failures of products throughout their installation lifetime.
Facility data limitations	Technology	Lack of data to assess facility performance/consumption accuracy.
Technology mismatch	Technology	Installations of sub-optimal products due to lack of technological know-how or the unavailability of resources.
Maintenance control	Technology	The inability of providers to monitor the maintenance of the installed upgrade project and regulate actions for optimal use.
Unproven Technologies/Products	Technology	Lack of information and track record of product performance life cycles.
Negative Utility	Technology	Product maintenance requirements might be very time-consuming and therefore have a higher associated non-monetary cost.
Extreme weather conditions	Physical	Floods, changes in weather.
Product Use	Behavioural	Assumptions on typical use might not be accurate as users might use the retrofitted product sub- optimally.
Rebound Effect	Behavioural	Greater incentive to consume more energy and be less sparing with consumption behaviour given the notion of saving measure instalments.

Source: Stevens et al., 2017 [59]

Table 5.2 Quantifiable EE retrofit risks

Risk factor	Risk Type	Description
Inaccurate Assumptions	Valuation Risk	Inaccurate methods and assumptions to model savings from upgrade projects.
Whole life energy considerations	Valuation Risk	Consideration of time (whole life of energy savings/product lifespan etc. to model investment returns).
Vacancy	Occupancy Risk	Assumed versus the actual vacancy rate, which increases risk over longer periods. Occupancy is not guaranteed to remain stable over long periods.
Fuel Cost/ Energy Price Fluctuation	Energy Price	Unforeseen changes in the cost of fuel within countries.
Tariff Structures	Valuation Risk	Unforeseen changes in the assumed tariff structures, for example from fixed tariff to time-based tariffs.
Required Return	Valuation Risk	EE upgrades producing less than the expected return.
Accuracy of consumption baselines	Valuation Risk	Inadequate estimated volumetric consumption baseline for modelling guaranteed savings.
Interest Rate Fluctuation	Valuation Risk	Unforeseen changes in the interest rate incorporated within the valuation.

Source: Stevens et al., 2017

[58] IEA, 2014. Energy Efficiency Financial Institutions Group 2017, Bleyl et al. 2017
[59] Stevens, D., Brounen, D., de Coo, W., Adan, H., Fuerst, F., 2017. Risks and Uncertainties Associated with Residential Energy Efficiency Investments. Conference Paper.

If some risks with high occurrence probability and high impacts on the project's economic performance are identified, the project owners need to plan effective risk management measures. The risks for commercial banks can also be reduced through collateral or guarantees for the loans.

Apart from directly borrowing money from commercial banks, big municipalities may be able to issue bonds and use the funding raised to finance their EE Project Bundles, which is another form of loans (called debt securities) that investors provide to issuing municipalities.

When the funding is loans or credits from international sources, especially in foreign currency, country risks are an important factor affecting a municipalities' access to international finance. Country risk is a broader concept that encompasses both the potentially adverse effects of a country's political environment and its economic and financial environment. Like other risks, it can also be managed with guarantees and insurance.

5.5 Mechanisms for financing and implementation of energy efficiency Project Bundles

5.5.1 Using Public-private partnership (PPP) to leverage private investment

The public sector can develop policy and regulatory instruments to overcome the barriers and facilitate the scaling-up of investments in EE projects, but project development and commercial financing are necessary to sustain the scaling up of EE investments. PPPs are mechanisms that use public policies, regulations or financing to leverage private-sector financing for EE projects. The IEA identified three top PPP approaches for EE finance. These are dedicated credit lines, risk-sharing facilities and energy-saving performance contracts[60].

These PPP approaches are not only relevant for mobilizing private finance for EE projects from all sectors, including the municipal public sector. Other practices of funding municipal EE projects include establishing dedicated credit lines targeted at public sector EE (as indicated in Table 5.3 above), so that the municipal EE projects can access low-interest loans from the credit lines, to overcome the funding barriers and realize the various social, economic and environmental benefits that the EE actions can bring about. Dedicated credit lines can streamline the procedures and building capacity of a team that is able to evaluate municipal EE project proposals.

Another solution is offering risk guarantees, either directly by the municipal government or by development banks. These can help reduce the risks of municipal EE projects and help attract loans from commercial banks. In this sense, risk-sharing allows the actors involved in the bundle to make their investments safer. Climate and multilateral funds offer risk guarantees and help build capacities to diminish the present barriers. There are also examples of insurance products for energy performance contracts, but they are more available for developed countries.

Table 5.3 PPP mechanisms in the IEA EE policy pathway

Type of PPP	Brief description	PPP features			
		Agreement between public and private entities	Allocation of risk between partners	Mobilization of private sector financing	Payment to private sector for providing services
Dedicated credit lines	Mechanism under which governments or donors provide low-interest loans to LFIs to encourage them to offer sub-loans to implementers of EE projects	Loan agreement between partners	Project financing risk shared between partners	Private partner generally provides co-financing	Local financial institutions earn fee by on-lending funds at higher interest
Risk-sharing facilities	Mechanism where governments or multilateral banks offer guaranteed product to absorb some EE project risks and encourage involvement of LFIs in EE financing by reducing their risk	Guarantee Facility Agreement (GFA)	Public partner absorbs some financial risk	Risk reduction mobilizes additional private-sector financing	LFI earns interest on additional loans mobilised
Energy-saving performance contracts (ESPCs)	ESCO enters into term agreement with public agency to provide services, with payments contingent on demonstrated performance	Energy Services Agreement (ESA)	Performance risk generally borne by ESCO	ESCOs mobilize private-sector financing	Performance-based payment to ESCO

Source: IEA, 2011

[60] IEA, 2011. Joint Public-Private Approaches for Energy Efficiency Finance- Policies to scale-up private sector investment. The IEA Policy Pathway series.

5.5.2 Institutional capacity-building – Public Super-ESCO and Revolving Fund

EE Project Bundle coordination and financing requires technical expertise and trust between the technical team carrying out the retrofitting, maintenance, and operation, and the users of the municipal facilities in such aspects as data access and collection. To maintain continuous EE improvement, ensure resource availability and accumulate expertise and experience in project development and risk control, one effective solution is creating specific funding mechanisms, such as a Super ESCO, revolving fund, development credit line or risk guarantee.

Super ESCOs are governmental entities created to serve the public sector, develop the capacity of private ESCOs and facilitate project financing[61].

With government backing in terms of funding, credit and market demand, public ESCOs can be dominant in the local ESCO market and become super ESCOs. Public ESCOs can be an effective solution for combining technical expertise and public funding to overcome the technical and financial barriers to municipality EE Project Bundles. In recent years, Super ESCOs have been established in India, Saudi Arabia, Armenia, the US, Belgium and the UAE. Typically, the government capitalizes a Super ESCO with sufficient funds to undertake public sector EE projects and to leverage private sector/ commercial financing. The Super ESCO then has a dual role of supporting the capacity development and project development activities of existing private sector ESCOs and helping to create new ESCOs[62].

Revolving Fund. Another approach is setting up a revolving fund to support public sector EE improvement. The government provides the starting capital to the Revolving Fund (RF), which then provides investments in municipal EE projects and recovers its investment through energy saving. In this way, a pipeline of municipal EE projects can be developed, funded and implemented.

Box 5.1. Example of Super ESCO – EESL India[63]

Energy Service Limited (EESL) is a joint venture of four National Public Sector Enterprises – NTPC Limited, PFC, REC and POWERGRID – and was set up under the Indian Ministry of Power in 2009. It is the largest super ESCO in the world. It has distributed 360 million LED bulbs and implemented India's Affordable LEDs for All (UJALA) programme, by distributing LED bulbs, and the Street Lighting National Programme (SLNP), by retrofitting streetlights with LEDs. Today, UJALA is the world's largest domestic lighting project and SLNP is the world's largest streetlight replacement programme.

Under the Buildings Energy Efficiency Programme (BEEP), EESL has completed projects in 10,344 buildings including railway stations and airports. Other areas it has been active include replacing inefficient water pumps with efficient ones, promoting electric cars and public procurement of air conditioners.

EESL is the world's largest energy service company (ESCO) that is driving numerous initiatives considered potential game-changers in building a conducive ecosystem for energy-efficient technologies across geographies. EESL implements EE retrofit projects under the Pay-As-You-Save (PAYS) ESCO. EESL has taken its market transformation business model to the UK, Middle East, South Asia and South-East Asia.

EESL's success in driving public energy efficiency implementation in India has attracted international support. In 2019, the Asian Development Bank (ADB) approved a loan of USD 250 million as part of an assistance package to EESL to expand energy efficiency investments in India.

[61] IEA, 2019. Energy Service Companies (ESCOs)- At the heart of innovative financing models for efficiency.
[62] Sarkar, A., Moin, S., 2018. Transforming Energy Efficiency Markets in Developing Countries: The Emerging Possibilities of Super ESCOs. The World Bank Group. Available at: http://documents.worldbank.org/curated/en/536121536259648570/pdf/129781-BRI-PUBLIC-VC-ADD-SERIES-6-9-2018-12-9-31-LWLJfinalOKR.pdf
[63] ADB, 2019. ADB Provides $250 Million to Expand Energy Efficiency Investments in India. News Release, 27 November 2019. Available at: https://pib.gov.in/newsite/PrintRelease.aspx?relid=199549; https://www.adb.org/news/adb-provides-250-million-expand-energy-efficiency-investments-india

Box 5.2. The City of Pittsburgh's Green Initiatives Trust Fund[64]

The City of Pittsburgh's Green Initiatives Trust Fund provides a continuous and secure source of funding from energy-saving measures, which is used to finance future energy-efficiency projects within the city, such as energy audits, aggregated energy purchases, renewable energy generation, efficiency upgrades at city-owned facilities and other green initiatives in the Pittsburgh Climate Action Plan. The city focuses on projects with a payback period of less than half of the operational life expectancy of the equipment or measure. The fund has helped energy projects to be evaluated and approved more quickly through the decision-making bodies of the municipality. Established in 2008, the fund was initially seeded with USD 100,000 and topped up with savings from aggregated energy purchases and energy savings each year. From 2008 to 2012, the fund financed solar thermal installations, a solar photovoltaic installation, installation of 4,000 LED streetlights, and retrofits to various city facilities, including the City-County building, totalling USD 2.45 million.

Box 5.3. Best practice example of revolving fund – Canada's Green Municipal Fund (GMF)[65] [66]

The GMF started in 2000 and was created by the Canadian federal government to provide upfront multi-year funding. GMF is a revolving fund administered by the Federation of Canadian Municipalities (FCM). The GMF supports grants, loans and loan guarantees to encourage investment in EE and other environmental municipal projects. By 2016, the fund has received CAD 675 million of funding from the federal government. GMF can provide grant and low-interest loans. Grants of up to 50 per cent of eligible costs are available for plans, studies and field tests, to a maximum of CAD 175,000. Low-interest loans of up to 80 per cent of eligible costs are available for capital projects, to a maximum of CAD 5 million or CAD 10 million for high-ranking projects, typically combined with a grant amount for 15 per cent of the loan, to a maximum of CAD 750,000 or CAD 1.5 million for high-ranking projects.

5.5.3. Education and capacity-building

Three conditions need to be met for EE investment and transactions to take place: marketing and technical assessment, financing and incentives for all market participants[67]. To speed up municipal EE project implementation at scale, it is important to build the capacity of market players, including qualified energy managers and auditors, professionals for data collection and project design, retrofitting, equipment replacement and repair and maintenance.

Energy audits play an important role in investment decision-making for municipal EE Project Bundles. They offer insights into how the energy is used, and solutions for EE improvement, their costs and payback periods. Two types of energy audit are involved in different stages of the project identification and decision-making: preliminary and detailed. A preliminary energy audit involves an analysis of utility billing information, building equipment and operating data and sometimes a visit to the building or facilities in order to identify EE measures and energy-saving opportunities. The detailed audit consists of a site walkover to identify the energy profile of a building or facility by completing surveys, and analysis of energy conservation measures and energy-saving opportunities. An investment-grade detailed audit involves analysis of capital-intensive improvements and required rigorous engineering analysis. They can sometimes take several months to complete and deliver. They normally require more dedicated input from on-site staff and are usually the outcome of less detailed energy audit recommendations.

[64] ICLEI Canada, 2018. On the money: Financing tools for local climate action. Partners for Climate Protection. Available at: https://fcm.ca/sites/default/files/documents/resources/guide/financing-tools-local-climate-action-pcp.pdf
[65] Government of Canada, 2018.Up-front Multi-year funding – Green Municipal Fund. Available at: https://www.nrcan.gc.ca/plans-performance-reports/dpr/2017-2018/21503
[66] The G20 Energy Efficiency Finance Task Group, 2017. G20 Energy Efficiency Investment Toolkit.
[67] World Bank, 2008. Fi<nancing energy efficiency : lessons from Brazil, China, India, and beyond

Evaluating the energy saving from municipal EE Project Bundles involves comparing EE performance before and after the retrofitting measures, which can be influenced by multiple factors beyond the control of ESCO companies, such as activities or behaviour change of the users, energy price changes or even weather fluctuations. Hence it is important to systematically collect data to establish EE benchmarks and clear rules on risk and benefit sharing in energy performance contracts, to avoid contract disputes and keep all participants in EE projects motivated through continuous engagement.

5.6. Designing the right financing solutions for each municipal Project Bundle

Municipalities sometimes face some restrictions in using municipal funding for municipal EE Project Bundles, due to an inadequate revenue base, restrictions on their revenue-raising and borrowing powers, and restrictions on municipal funding use. Municipalities may also find it difficult to access financial credit due to the requirements for collateral and recourse, the difficulty of assessing the creditworthiness of different public institutions and EE retrofitting projects lack of hard cash flows.

Based on their observations from hundreds of municipalities, the World Bank concluded that the main financing options for cities retrofitting municipal buildings are:

- their own budget funds,
- public finance provided by national or regional governments,
- finance provided by international organizations, such as the World Bank or Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ),
- dedicated EE funds,
- commercial financing from banks and private investors, including by issuing local government bonds.

Cities need to conduct or commission analyses to determine the financial vehicles available to them, and the suitability of these options. Large municipalities face different sets of challenges to smaller municipalities and will often need different solutions. The suitability of different financing mechanisms depends, among other factors, on:

- the municipality's creditworthiness,
- The predictability of revenues,
- Local legal and regulatory frameworks,
- Implementation capacity.

Different types of municipal EE Project Bundling vary in technology complexity and financial returns. Table 5.4 offers a simple assessment of the characteristics and financing options of three types of municipal EE projects: public building retrofits, public lighting, and municipal utilities.

- Public building retrofits. This includes installing insulation, efficient windows,

Box 5.4. Financing of Municipal EE projects - the US practices[68]

In the US, municipalities, universities, schools and hospitals are known together as the 'MUSH' market. In the United States, MUSH EE projects mainly rely on self-funding – the total energy cost saving should at least be able to cover the overall costs of implementing the project. Financial institutions engage directly with the end-user to provide the loans, while the ESCOs are responsible for designing the EE retrofitting projects, installing the equipment and providing the ongoing operation and maintenance services, and taking the performance risks. Private-sector FI engagement in the energy services business is predominantly driven by federal, state or local regulations, which set out the way energy services are financed, including the allocation of risk.

[68] Wilson Sonsini Goodrich & Rosati, 2012., Innovations and opportunities in Energy Efficiency finance. MAY 2012, Second Edition. Prepared by Kim, C., O'Connor, R., Bodden, K., Hochman, S., Liang, W., Pauker, S., Zimmermann, S.

efficient boilers and chillers, and energy management systems.

- Public lighting. This includes replacing mercury vapour and high-pressure sodium lamps with LED lamps, and installing lighting controls. Municipal utilities. This includes reducing losses in district heating and water supply systems, installing efficient pumps and optimizing systems. Depending on the existing conditions of the equipment, paybacks for the replacement of energy-using equipment are often shorter than system-wide renovation. For example, in India, the payment period of replacing inefficient chillers and pumps with efficient ones is usually less than three years or max five years.

Generally speaking, three basic types of delivery mechanism for EE investment projects have been popular in recent years: (i) loan financing schemes and partial loan guarantee schemes; (ii) ESCOs; and (iii) utility demand-side management programmes.

Table 5.4 Illustrative Municipal EE Projects and Related Financing Options

		Project Characteristics Potential				Potential Financing Options for Municipalities
Type of Measure	Examples	Technical Complexity	Investment Needs	Paybacks	Weak Credit, Limited Borrowing Capacity	Strong Credit, Ample Borrowing Capacity
Building Retrofit	Insulation, Efficient Chillers/ Boilers, EMS	Medium	Medium to High	Long	Budget Financing, EE Funds	Budget Financing, EE Funds, Public Support, Commercial Financing
Public Lighting	LED Lamps, Lighting Controls	Low to Medium	Medium to High	Medium		
Utilities	Loss Reduction, Efficient Pumps, System Optimization	Medium to High	Medium to High	Long		

Source: ESMAP, 2014[69] (Note: Indicative Payback Periods: Short (<3 years), Medium (3-6 years), Long (>6 years)

EE measures can be limited to the energy-using equipment and appliances, or cover comprehensive building or system renovation. EE measures that only involve the replacement of inefficient lighting, appliances and equipment with efficient ones can be implemented using budgetary resources and through public procurement. However, when municipal EE Project Bundles cover the comprehensive retrofitting of buildings, street lighting systems or utilities, the enormous investment needed, and longer payback periods, may make it necessary to seek external financing. This is where multilateral development banks, climate funds and development programmes have huge potential, since project financing mechanisms still need capacity-building for later secure operation in developing markets.

Both financiers and end-users must decide to what extent technical assessment work should be outsourced (Table 5.5).

[69] ESMAP, 2014. Financing Municipal Energy Efficiency Projects- Energy Efficient Cities, MAYORAL GUIDANCE NOTE #2

Table 5.5 Decision tree for municipal EE project financing

Situation		Issues/ challenges	Action	Financing mechanism
Does the municipality have sufficient resources to fund the project itself?	Yes	Allocation of funds from the budget	Prepare grant application	General budget financing
Are grants available from donors? (No)	Yes	Grants may not finance entire project	Prepare grant application	Partial budget financing and partial grant
Are funds available from national government? (No)	Yes	Funds may only provide partial financing	Apply for national funds	Budget capture
Is there an EE fund? (No)	Yes	Eligibility criteria for the EE fund	Apply to the EE fund	EE fund
Are commercial banks willing to offer dedicated credit lines and/or risk-sharing programmes? (No)	Yes	Creditworthiness, collaterals, and borrowing capacity of the municipality	Review eligibility for these mechanisms	Dedicated credit lines or risk guarantee programmes
Is the municipality creditworthy and has borrowing capacity?	Yes	Criteria used by commercial banks to assess creditworthiness	Access credit lines or risk-sharing programmes	Dedicated credit lines or risk guarantee programmes
No options available for financing				
Are there active ESCOs in the local market? (No)	Yes	Developing EPC	Negotiate EPC with ESCOs	Commercial financing with ESCOs
Are leasing or vendor financing programmes available? (No)	Yes	Eligibility criteria and terms of financing programmes	Negotiate leasing or vendor financing agreement	Leasing or vendor finance
Does the municipality have the capacity to issue municipal bonds? (No)	Yes	The market for such bonds, transaction costs	Develop municipal bond programme	Municipal bonds

Source: ESMAP, 2014.

EE measures for efficient indoor lighting and appliances, due to their low cost and short paybacks, may be implemented by municipalities using budgetary resources and through public procurement. However, often such efficient indoor lighting and appliance measures are combined with building retrofit options in a single project. Such bundling may reduce transaction costs and facilitate the implementation of some of the longer payback building envelope and equipment options. However, it may require external financing due to the larger investment needs.

5.7. Conclusions

Municipalities have multiple options to finance their EE Project Bundles. They can use their budget fund and grants from governments at higher levels and international donors, get loans from development banks, as well as resort to innovative off-balance sheet financing mechanisms such as ESCOs, in-bill financing, vendor credit and green leasing. To be able to get commercial loans and private investment, the Project Bundles' risks need to be low while their financial returns need to be above similar projects. Bundling can create EE projects with financing needs above the thresholds of financial institutions and overcome the barrier of high transaction costs for financial institutions. Through Project Bundling, municipal governments can build up their institutional capacity for EE project identification, development and implementation, hence reducing the risks for financial intuitions and private investors. Each municipality has its own specific situation in terms of financing options, and EE Project Bundles can be different in terms of profitability, risk and financing needs. Each municipality needs to evaluate its own Project Bundles and tailor the financing solutions accordingly.

5.8. Further reading

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been developed as part of the project titled "QualitEE – Quality Certification Frameworks for the EE Services" supported by the EU's Horizon 2020 programme. https://qualitee.eu/wp-content/uploads/QualitEE_3.3_Financial_Guidelines_V2.0_190115.pdf

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