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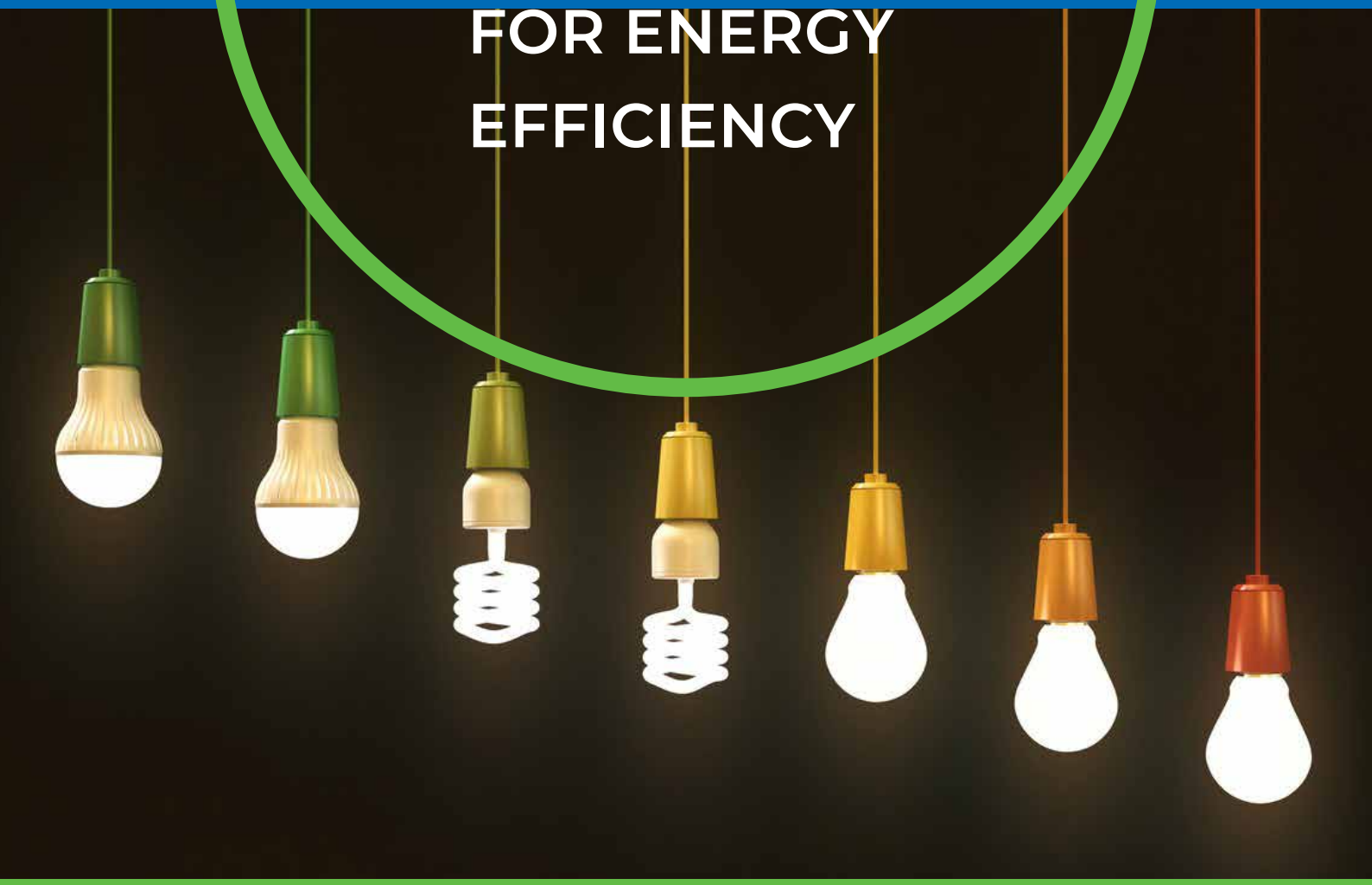
for UN Environment

# MANUAL OF FINANCING MECHANISMS AND BUSINESS MODELS FOR ENERGY EFFICIENCY



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# 1. EXECUTIVE SUMMARY

Energy efficiency is a highly-effective and economic way to reduce global greenhouse gas (GHG) emissions. According to the International Energy Agency (IEA), energy efficiency measures could result in 40% of the GHG emissions abatement required to achieve the goals set out in the Paris Agreement.[1] Energy efficiency also reduces air pollution, lowers spending on energy, enhances energy security, increases competitiveness and provides many other socio-economic, and environmental benefits.[1]

The potential for energy efficiency gains is growing with significant increases in global energy demand, particularly in developing economies. Yet global investment in energy efficiency slowed in 2017 – without new financing mechanisms for energy efficiency, it is likely investment will continue to stagnate.[1]

The aim of this manual is to provide an overview of innovative financing mechanisms, and business models from around the world that have spurred new investments in energy efficiency. The manual focuses on technologies covered by the United for Efficiency initiative – air conditioners, lighting, electric motor systems, refrigeration, and power distribution transformers. Together these products consume over half of the world's electricity.

There are many barriers inhibiting investments in energy efficiency currently, including high upfront costs, lack of access to finance, high perceived risk, lack of trust in new technologies, competing investment priorities, lack of knowledge and awareness, and split incentives. Many of these barriers can be overcome, at least in significant part, with well-designed financing mechanisms, incentives and business models, together with complementary measures such as policies, regulations, awareness raising activities and behaviour change initiatives.

There is no "one size fits all" approach for any market, country, or region. Different models may suit different market sectors, and different country and cultural contexts. In all cases, models need to be adapted to suit local conditions.

**Chapter 2** outlines the main barriers prohibiting investments in energy efficiency, and provides and overview of the key supporting measures and enablers.

The manual focuses on three energy end-use sectors: residential, commercial, and public.

**Chapter 3** provides an overview of innovative financing mechanisms and business models that aim to encourage investments in energy efficiency in the residential sector.

**Chapter 4** provides an overview of innovative financing mechanisms and business models that aim to encourage investments in energy efficiency in the commercial sector – this includes large commercial enterprises, as well as micro, small and medium enterprises and industry.

**Chapter 5** provides an overview of innovative financing mechanisms and business models that aim to encourage investments in energy efficiency in the public sector, including schools, universities, street lighting, hospitals, public administration offices, and other public buildings and services.

**Chapter 6** provides conclusions and recommendations and chapter 7 provides a list of useful resources.

A multi-faceted approach that includes policies, regulations, awareness raising activities and smart financing mechanisms guided by a national strategy can help ensure sustainable growth in energy efficiency investments over the longer-term.

# 2. INTRODUCTION

## 2.1 CONTEXT

Climate change is a pressing global challenge that is affecting every part of the planet. To strengthen the global response to climate change, countries adopted the Paris Agreement at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in 2015. In this agreement, all countries agreed to limit global temperature rise to well below 2 degrees Celsius, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.[2] Addressing the challenge of climate change, and achieving the goals set out in the Paris Agreement, will require a significant global effort.

Energy efficiency is a highly-effective and economic way to reduce global greenhouse gas (GHG) emissions and can make a significant contribution to combatting climate change. According to the International Energy Agency (IEA), energy efficiency measures could result in 40% of the GHG emissions abatement required to achieve the goals set out in the Paris Agreement.[1] Energy efficiency also reduces air pollution, lowers spending on energy, enhances energy security, improves competitiveness and provides many other benefits.[1]

However, investments in energy efficiency are not currently happening at the rate needed. Population growth and economic growth have outpaced energy efficiency gains over recent years, and this growth trend is set to continue. According to the IEA, by 2040 the world will be home to 20% more people, will contain 60% more building space and will have a Gross Domestic Product (GDP) that is double of what it currently is now. With this growth, global energy demand is expected to increase, and with it comes a huge need, and a huge opportunity for energy efficiency gains.[1]

Achieving these energy efficiency improvements will require a significant increase in global investments in energy efficiency, passing from USD 236 billion annual investments in 2017, to an average annual investment of USD 584 billion from 2018 to 2025, and USD 1,284 billion annually from 2026 to 2040. International development assistance alone will not be enough to meet these targets. Much of this finance will need to be mobilised locally, and from private sources.[1]

The aim of this manual is to provide an overview of innovative financing mechanisms, incentives, business models, and financial supporting mechanisms from around the world that have spurred new investments in energy efficiency. The manual focuses primarily on technologies covered by the United for Efficiency initiative – air conditioners, lighting, electric motor systems, refrigeration, and power distribution transformers. Together these products consume over half of the world's electricity.

The manual is split into three sections, describing mechanisms that can support uptake of energy efficiency measures for different end user groups – residential, commercial, and public sector end-users.

## 2.2 BARRIERS TO ENERGY EFFICIENCY

There are many barriers inhibiting investments in energy efficiency at the global, regional and national level. Many of these barriers can be overcome, at least in part, with well-designed financing mechanisms and business models, together with complementary measures such as policies, regulations, awareness raising activities and behaviour change initiatives.

Key barriers from the perspective of end users, including households, businesses and public authorities include:

- **The high upfront cost of energy efficient equipment.** High quality energy efficient equipment typically has a higher upfront capital cost. The cost savings that result from energy efficient equipment are generally realised over a number of years. This means that customers do not typically see the financial benefits of energy efficient equipment immediately, which can discourage investment. This is particularly important in countries which have a high cost of capital.
- **Lack of access to appropriate or affordable financing mechanisms.** For many end users, particularly in developing countries, lack of access to appropriate or affordable financing mechanisms is a key barrier. Globally, 1.7 billion adults do not have an account at a financial institution or through a mobile money provider, and hence can not necessarily be serviced with financing mechanism that are common in economies with high rates of financial inclusion.[3] End users who do have access to these financial services may still lack the collateral needed to access credit, or may be dissuaded from investing by unfavourable loan terms, such as high interest rates and or short-term tenors.
- **Highly-perceived risks or lack of trust in new technologies and promised energy savings.** Customers, especially in industry, can be risk averse towards new or unknown energy efficient technologies, and often perceive that there are hidden costs or that the equipment will not achieve the savings that were promised. Investment decisions are typically based on the client's risk and return perception. Energy efficiency is often perceived as relatively high risk. Even though the cost savings are promising, they are not seen as commensurate with the perceived level of risk.
- **Competing investment priorities.** Most end users have limited access to capital and many competing investment priorities. Investments in energy efficient equipment have to compete with other investment opportunities. Enterprises tend to prioritise investments in their core business where the risk and return of the investment is well understood, and energy efficiency often does not receive the appropriate attention from senior leadership. Governments tend to favour investments in things with shorter-term payback periods or higher visibility. Households may choose first to invest in shorter term day to day needs rather than future cost savings.
- **Lack of knowledge or awareness of energy efficiency and its benefits.** Many end users are not aware of the energy efficiency improvements they could make, the scale of the recurring savings to be made or of the multiple benefits of energy efficient technologies, such as better equipment performance, improved indoor and outdoor air quality, as well as energy bill savings potential.
- **Split incentives.** Split incentives can occur in rented buildings, when the entity responsible for paying energy bills, is not the same entity that is making the capital investment decisions. Building tenants, or building owners who do not pay the utility bills directly have less incentive to invest in equipment that saves energy, and a greater incentive to invest in equipment with a lower upfront cost.

The key barriers from the perspective of energy efficient technology providers (such as manufacturers, retailers, contractors, engineering firms or energy service companies) include competition with providers offering less efficient and lower quality products that have a lower upfront cost. High quality technology providers typically have to compete with these cheaper products, and often struggle to convince clients to invest more upfront capital in higher quality equipment and future cost savings.

The price of energy can also be a barrier for energy efficiency technology providers. Electricity or fuel prices are often subsidised, and do not include the cost of carbon or other externalities. This means energy efficiency investments, and energy savings are undervalued. Conversely, energy efficiency can however also offer a hedge against energy price increases.

From the perspective of technology providers, lack of policy, or policy enforcement is also a barrier. In places where regulations or enforcement are weak, technology providers find themselves competing with poor quality counterfeit products, which have a lower upfront cost and can also cause reputational damage.

From the perspective of financial institutions (FIs), the key barriers include FI's limited familiarity with, or technical capacity to assess energy efficiency projects. Many FIs, in particular local financial institutions (LFIs) have little experience with energy efficiency projects. In markets where capital is scarce, more traditional investments such as power plants and industrial expansion often receive investment priority. Moreover, limited familiarity with energy efficiency also means that FI's perceive high risk of non-performance of energy efficiency projects.[4]

Energy efficiency investments are also often small, with relatively high due diligence costs. They therefore do not always attract the interest of financial institutions, which are more often interested in larger investments. Some FI's do not consider energy savings as revenue stream, since the value of energy efficiency is in the energy that is not used, rather than in physical assets. This means that there is sometimes a lack of physical collateral to serve as security.

In recent years however, familiarity of FIs with energy efficiency projects, and growing awareness of the market opportunity, means that there has been growing interest from financial institutions in energy efficiency.[4]

## 2.3 SUPPORT MECHANISMS AND ENABLERS

Financing mechanisms and business models for energy efficiency can support, and be supported by other complementary mechanisms, such as policies, regulations, awareness raising activities and behaviour change initiatives. These mechanisms work alongside each other in a complementary manner. The key supporting mechanisms and enablers are described briefly below. The United Nations Environment Programme led United for Efficiency Initiative has many resources available related energy efficiency policies, labelling and awareness raising activities, these are referred to in chapter 7.

- **Standards and regulations:** Standards and regulations, such as Minimum Energy Performance Standards (MEPS), energy conservation laws (voluntary or mandatory), building codes with energy performance standards, can successfully deter investments in less efficient technologies, and encourage investments in more efficient technologies. These mechanisms can help define which products can be sold, and those that should be blocked from the market. Standards and regulations are an important part of energy efficiency programmes.[5,6]

- **Supporting Policies:** Supporting policies such as labelling are necessary to ensure the smooth implementation of standards and regulations, and to increase public awareness and acceptance of energy efficiency and energy efficiency programmes. Reliable labelling systems are becoming common practice in many parts of the world. They impact the energy efficiency market directly by giving customers accurate and reliable information on the products' energy efficiency.[7]
- **Awareness raising, information, education and communications:** Raising awareness about the benefits and opportunities provided by energy efficiency is important to ensure buy in from all parties. Information, education and communications campaigns can inform end users, and provide them with the information needed to make changes in equipment or practices.[7]
- **Behaviour change programmes:** Behaviour change programmes, such as those that make use of energy efficiency ambassadors, or benchmark households or energy users against their peers, have also proven an effective way of changing energy consumption behaviours and product choices.[8]
- **Monitoring, verification and enforcement:** Effective implementation of energy efficiency standards and regulations also requires monitoring, verification and enforcement systems to ensure compliance.[5]
- **Disposal and waste management:** Replaced inefficient energy systems should not find a way back into the market as second-hand equipment. Effective systems should also be in place for the proper disposal, and recycling of equipment as well as the management of hazardous waste and of ozone depleting substances.[5,9]

Supportive policies and programmes can also be a key driver of energy efficiency investments, and an enabler of market-based mechanisms. However, policies and regulations alone are often not enough to stimulate industry investment in sustainable energy. Financing mechanisms, incentives and business models can support markets to move in the right direction, towards more efficient products, making ambitious policies easier to achieve.

Global, regional and national policy frameworks that support energy efficiency, or set efficiency or emissions reduction targets, can also encourage markets to move in a complementary direction, and encourage public and private investments in energy efficiency.[1] Integrating energy efficiency into national or regional energy and climate change strategies can help make energy efficiency a long-term investment priority. Since energy efficiency measures involve goods that are traded across borders, implementing standards, labels and testing requires regional coordination. Regional coordination can also increase the cost-effectiveness of capacity building and awareness raising and other measures.[4]

A multi-faceted approach that includes policies, regulations, awareness raising activities and smart financing mechanisms guided by a national strategy can help ensure sustainable growth in energy efficiency investments over the longer-term.

## 2.4 OVERVIEW OF TYPES OF FINANCING

Unlocking investments in energy efficiency requires a wide range of financial sources and solutions. There are different types and sources of financing that can be used for supporting energy end-users.

There are many ways to categorise financing types; the following table summarises these.

| FINANCING TYPES | |
|---|---|
| DEBT | Borrowers commit to pay to the lender the principal and interest (cost of funding) on an agreed schedule. Borrowers use assets as collateral as reassurance to the lender. Typical debt instruments include credit, mortgages, leasing. |
| EQUITY | Equity financing normally implies selling a stake in the company receiving the funding from investors, who expect to share the profits of the company and the investment stake appreciation. |
| GRANTS | Grants are non-repayable fund contributions (in cash or kind) bestowed by a grantor (often government, corporation, foundation or trust) for specified purposes to a recipient. Grants are usually conditional upon specific objectives on use or benefit, and might be require a proportional contribution by the recipient or other grantors. |
| RISK MITIGATION INSTRUMENTS | Financial instruments that are available in the market to mitigate the risks of investing in energy efficiency. The beneficiaries of risk mitigation instruments can be end-users, lenders, project developers, or the government. Insurance and credit guarantee instruments are the most common financial risk mitigation instruments. |

*1 Examples of national energy efficiency strategies include:*

- *Intended Nationally Determined Contributions (INDCs) under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC)*
- *Nationally Appropriate Mitigation Actions (NAMAs)*
- *Sustainable energy goals, such as energy system decarbonisation objectives, and energy savings or energy intensity reduction targets*
- *National Energy Efficiency Action Plans*

*Examples of regional energy efficiency policy coordination include:*

- *A Framework that harmonises national energy efficiency policies across a region*
- *Regional initiatives on Standards and Labelling*
- *Development and coordination of regional sustainable energy Competence Centres and Research, Development and Demonstration Centres*

There are many variations of these types of financing types applicable to energy efficiency; some of these are described below.

| TYPES | |
|---|---|
| Blended loans | Blended loans mix grants or subsidised loans with additional funds raised from other sources (e.g. capital markets). Blended loans might reduce borrower costs and increase the capacity of funds to take higher risks. Blended mechanisms are increasingly used by multilateral development banks (e.g. the World Bank, the Asian Development Bank, the African Development Bank, the Inter-American Development Bank), and bilateral financial institutions (e.g. Agence Française de Développement, or KfW Group). [10] |
| Green/climate Bonds | Bonds are loans made to large organisations from one or many investors for a specific period of time and at a particular interest rate. A green bond is a bond specifically earmarked to be used for climate and environmental projects. A bank may sell a green bond to raise money to finance energy efficiency projects.[11] |
| Convertible debt | A combination of debt and equity: loans are repaid or converted into company shares at a later date. |
| Securitisation | The process by which a company groups different financial assets/ debts to form a consolidated financial instrument sold to investors. In return, investors receive interest payments; e.g. an energy efficiency company can trade its future cash flow with investors.[10] |
| Crowd-financing | Is the practice of raising capital through the collective efforts of a large pool of individuals or peer-to-peer lending that can include individual investors, family, and friends typically through social media and crowd funding web platforms. Finance offered through crowd funding includes lending, equity, donations, and insurance, among others. |
| Aggregation | Aggregation refers to aggregating demand, such as communities joining up in cooperatives or pooling energy demand in a region and bulk-procuring services to deliver household energy efficiency systems, or aggregating a portfolio of projects (normally small enterprises or projects) with similar technologies or business models. Some of the benefits of aggregation include transaction cost reductions and limited risk exposure because aggregation distributes costs and diminishes the associated risks of a portfolio's execution; that is, risks are distributed if a project underperforms.[12,13] |
| Performance-based financing | Financing agreement in which a third-party (ESCO) provides funding to cover the upfront costs of high-efficiency equipment for a customer. The customer repays the energy efficiency investment from the energy savings generated by the project, so there is no need for customer upfront capital. Usually, the financing is off the customers' balance sheet. [10] |
| On-bill financing | A financing option that uses utility bills to collect periodic payments of the beneficiary customer to repay loans. |
| Owner equity | Owner provides their own capital. |

The above types of funding are provided by different financial sources, which can be international or national entities and include:

| SOURCE | |
|---|---|
| Banking institutions | These include commercial banks, credit unions or cooperative banks. These institutions accept deposits from the public and provide credit, and are highly regulated. |
| Institutional Investors | Investments made on behalf of its members (includes insurance companies, pension funds, hedge funds, endowments etc.). |
| National development banks (NDBs) | NDBs are financial entities established by a country's government that provide different types of financing for the purposes of economic development. |
| Bi/Multilateral development banks (MDB) | International financing institutions created by one (Bilateral) or more (Multilateral) countries for the purpose of encouraging economic development using loans, grants and technical assistance. Traditionally, most of the funding provided by Bi/MDBs is focused on sovereign-guaranteed loans (public debt backed by the government) and a small portion is directed to private lending. MDBs typically use national-based financial institutions to channel their funding. |
| Microfinance institutions (MFIs) | Financial institutions that provide small loans or financial services to low-income businesses or individuals. |
| Non-banking financial institutions (NBFIs) | NBFIs facilitate alternative financial services, such as risk pooling, money transmitting, and consumer credits. Examples of NBFIs include insurance firms, venture capitalists, currency exchanges, some MFIs, and pawn shops. NBFI's provide services that are not necessarily suited to banks, and generally specialise in sectors or groups.[14] |
| Private equity funds | Financial vehicles that pool capital to invest in projects or companies that can potentially provide an attractive rate of return. |
| ESCOs (Energy Service Companies) | ESCOs provide solutions for achieving energy savings. ESCO compensation can be linked (in part or in full) to the performance of the implemented solutions. In that context, an ESCO can manage projects, mobilise financial resources (not necessarily its own equity), offer turn-key services (either on its own or through collaboration with other market players) and assume performance risks. |
| Pension funds (mutual funds) | Fund that pools employees' pension contributions to invest in different type of assets to generate long-term benefits, which are paid at employee retirement. The role of pension funds in providing credit is very limited; they are mainly focused on public markets, i.e. bonds and listed equity. Their contribution is usually via specialist private markets, such as private equity and debt funds. |
| Insurance companies | A financial institution that provides mitigation instruments to protect individuals and businesses against the risks of financial losses in return for regular payments of premiums. |
| Guarantee institutions | A financial specialist that provides credit risk mitigation instruments to lenders.[15] |
| Crowd funding platforms | An entity authorised to provide online crowd-financial services. |
| Utility | An entity offering utility services (e.g. electricity, gas, water) to customers. |

The following table shows typical energy efficiency funding provided by sources listed above. Credit offerings are linked with the type of customers served and the source's risk appetite.

| SOURCE | DEBTS/ LOANS | EQUITY | GRANTS | GUARANTEES | INSURANCE | BLENDED LOANS | GREEN BONDS | CONVERTIBLE DEBT | SECURITISATION | CROWD-FINANCE | AGGREGATION | PERFORMANCE BASED FINANCING | ON-BILL FINANCING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Banking institutions | ● | | | | | | ● (2) | | | | | | |
| National development banks (NDBs) | ● (4) | ● | ● | ● | | ● | ● (2) | | ● | | ● | | |
| Bi/Multilateral development banks (MDB) | ● (1) | | ● (1) | ● (1) | | | ● (2) | | | | | | |
| Microfinance institutions | ● | | | | | | | | | | ● | | |
| Non-banking Financial Institutions | ● | ● | | | ● | | | ● | | | ● | | |
| Private equity funds | ● | ● | | | | | | ● | ● | | ● | ● | |
| ESCOs (Energy Savings Insurance) | ● | | | | | | | | ● | | ● | ● | |
| Pension funds (mutual funds) | ● (5) | | | | | | ● (3) | | | | | | |
| Insurance companies | | | | | ● | | | | | | | | |
| Guarantee institutions | | | | ● | | | | | | | | | |
| Crowd funding platforms | | | | | | | | | | ● | | | |
| On-bill financing and rebates (e.g. USA) | ● | | | | | | | | | | | | ● |

*(1) Mainly loans and financial services provided to governments or intermediaries (not directly to projects or private customers).*

*(2) Green bonds are used for raising funding from many investors that expect yields generated from green projects.*

*(3) Pension funds invest in green bonds expecting a yield that is coming from green projects or lending.*

*(4) Some NDBs act just as "second floor banks", meaning they do not lend directly, they use the banking institutions to disburse their funding.*

*(5) Not very common. Pension funds might invest in large-scale investments that are generating yields.*

# 3. FINANCING ENERGY EFFICIENCY IN THE RESIDENTIAL SECTOR

## 3.1 INTRODUCTION

This chapter provides an overview of financing mechanisms and business models designed to encourage investments in energy efficiency in the residential sector. The chapter briefly describes a board range of models, which are designed for different appliances and different household or country contexts – from high-income households in developed country contexts, to low income households in least developed countries. The list is not exhaustive, but provides an overview of the most promising and widely used models.

The following table shows common types of financing and sources of funding for residential energy efficiency. The sources are typically national, or sub national entities.

| SOURCE | TYPE |
|---|---|
| Banking institutions | Credit |
| | Leasing |
| Microfinance institutions | Credit |
| Utility | On-bill financing |

There are other financing instruments that indirectly benefit the residential sector. The following table summarises these instruments. The sources might be national or international entities.

| SOURCE | TYPE |
|---|---|
| National development banks (NDBs) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| Bi/Multilateral development banks (MDB) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| Pension funds (mutual funds) | Debt/loans |
| | Green bonds |
| Guarantee institution | Credit guarantees |

# 3.2 FINANCIAL MECHANISMS AND BUSINESS MODELS FOR THE RESIDENTIAL SECTOR

## a. Loans, green credit lines and revolving loan funds

### OVERVIEW OF THE MODELS

Households can finance energy efficiency improvements through direct loans from local financial institutions (LFIs).[2] Loans involve a customer accessing a sum of money from an LFI to finance energy efficiency upgrades or equipment. The loan is then repaid to the LFI with interest within an agreed period of time (loan tenor). The financial institution typically assesses the client's accounts or assets to determine their credit worthiness and takes an agreed asset pledge from the client as collateral until the loan is repaid. In some cases, the financial institution may assess the project cash flow and may take the equipment as collateral (project finance). In practice however, many households have limited access to finance, or prioritise other things such as education or other household improvements before energy efficiency.

Many LFIs have put in place specific green credit lines to attract investments in energy efficiency. Some LFIs have been able to access concessional financing from multilateral funds, and then offer loans to clients with concessional conditions such as below market interest rates or long-term tenors. For example, XacBank, a commercial bank in Mongolia, has a loan programme in place for household energy efficiency improvements, including low-income households, which offers concessional interest rates and longer term loan tenors through funding from the Green Climate Fund.[16] Financial institutions in Tajikistan have a credit line in place for climate change mitigation or adaptation projects for residential customers, with concessional conditions through funding from the European Bank for Reconstruction and Development, the Climate Investment Fund, UK Aid, and the EBRD Early Transition Countries Fund.[17] The Bank of Maldives has a specific green fund in place, which can be used by individuals to finance green projects including energy efficiency upgrades. The Bank of Maldives Green Fund is offered with concessional conditions, including lower equity contributions from clients and longer repayment periods. The Green Fund uses the Bank of Maldives' own resources.[18]

In some cases, special purpose revolving loans funds have been established where fit for purpose commercial mechanisms are not available or not considered appropriate. Revolving loans funds operate in principle in a similar manner to commercial loans, but are typically managed by a government-backed entity, a community group or an NGO, rather than by a financial institution such as a bank. Revolving loan funds start with a fixed pool of capital, which is lent to clients for specific projects, and then repaid to the fund. The replenished money can be re-lent to new clients.

### BENEFITS AND CHALLENGES

Loans and soft loans with credit enhancements can help householders overcome the upfront cost barrier associated with residential energy efficiency projects, and have proven successful at scaling up residential energy efficiency.[7] In some cases however, green credit lines are not enough to encourage investment, and complementary mechanisms (such as those mentioned below in Supporting mechanisms) are needed to support the mobilisation of the funds.

Some credit lines have high collateral requirements, making access for lower income households difficult. Loans and green credit lines are only useful in cases where residential clients have an active account with a financial institution; however, globally, 1.7 billion adults do not have an account at a financial institution or through a mobile money provider. Almost all of these unbanked adults live in the developing world.[3]

2 *These may be banking or non-banking financial institutions and also as financial intermediaries.*

There are several examples of successful energy efficiency revolving loan funds.[19] When the funds are well managed, they can encourage investments, as they are often offered at very low interest rates, with more flexible collateral requirements than commercial loans, hence allowing access to a broader range of customers. A drawback of revolving loan funds is that with limited capital, once the initial pool has been lent out, more lending cannot occur until the repayments are made, which takes place over many years. They also often have high administrative costs.[19]

Some community-managed revolving loan funds have faced serious challenges. Common challenges include lack of capacity of the group to manage the funds, poor repayment rates, and lack of transparency and accountability, which can lead to the misuse of funds. Community-managed revolving loan funds are often not housed in organisations that aim to become providers of financial services over the long-term, limiting the overall sustainability of the initiative.[20]

Offering energy efficiency loan programmes though commercial financial institutions can result in longer-term sustainability, as the institution is fit for purpose.[21]

Caution should be used when introducing debt financing with below market interest rates to avoid creating market distortions.[7]

## SUPPORT MECHANISMS

Households often have limited access to finance from commercial banks due to their limited collateral. **Guarantees,** such as loan loss reserves can support more clients to access loans by decreasing the risk of client default to lenders. For example, as part of the Residential Energy Efficiency Loan Assistance Program, the State of California in USA has in place a loan loss reserve which can be accessed by registered financial institutions to help customers access lower-cost financing for energy efficiency projects by reducing risk to participating lenders.[132]

In some cases, financial institutions are already lending for, but not tracking energy efficiency investments. Green tagging can help banks better understand and track energy efficiency loans.[22]

**Positive lists** can also help simplify banks' due diligence processes for green loans.

## ROLE OF DIFFERENT ACTORS

Credit lines are typically market-based. LFIs are the key partners.

Governments, multilateral financial institutions, and development agencies also play important roles in supporting financial institutions set up their internal processes for tracking and monitoring green loans by providing financing to LFIs at concessional rates, or by putting in place complementary mechanisms (such as those outlined above) to support green fund mobilisation and building capacity in environmental and social impact assessment.

Revolving loan funds can be administered by many different organisations including community groups, governments at the national, sub-national or municipal level, utilities, universities, financial institutions, or by not-for-profit organisations.[19] As mentioned above, revolving loan funds should be managed by a credible and fit for purpose organisation to avoid misuse of funds.

*Loans, green credit lines and revolving loan funds can also be used by the commercial and public sectors, and are also discussed in chapters 4 and 5.*

## b. Dealer financing

### OVERVIEW OF THE MODEL

Dealer financing is financial support from energy efficient technology providers to their residential customers. Through this credit-based model, customers acquire energy efficient products with no (or little) money down, and then pay later on a schedule agreed upon with the provider.

There are direct and indirect credit dealer financing models. Direct loans are more common – in this model providers use their capital to finance the energy efficient equipment purchased by customers. Credit tenor is normally between 30 and 180 days. A bank or third-party financial institution may purchase the credit or receivables portfolio. In the indirect loan model, the energy efficiency provider facilitates the loan application by collecting information from the customer and forwarding the application to a lender. The lender assesses the application and quotes the credit. It is very common to see agreements between a provider and a bank to allow the use of a credit card for payment with special credit conditions, such as six months of credit with no interest.[23]

*Dealer financing models are also applicable to the commercial sector, outlined in chapter 4.*

### BENEFITS AND CHALLENGES

Dealer financing is an important type of financing in many developing countries, especially where credit access is limited.

However, technology dealers do not always have the financial capacity to implement such models.

### SUPPORT MECHANISMS

Dealer credit models can be supported by credits or loans to the technology provider.

### ROLE OF DIFFERENT ACTORS

Dealer credit models are typically market-based. Technology suppliers are the key partners. They can be supported by LFIs.

## c. Microfinance

### OVERVIEW OF THE MODEL

Microfinance is the provision of financial services through small transactions (i.e. microcredits, micro savings, micro insurance, micro transfers, micro equity) to low-income households. Microfinance institutions (MFIs) serve sectors of the economy that the formal financial system usually considers unbankable due to high transaction costs, perceived risks, low margins, and lack of traditional collateral. The literature shows there is no single microfinance business model, but rather a number of models pursued by different types of institutions (i.e. NGOs, banks, non-bank financial institutions). Much of MFIs' external finance is donated equity capital or concessional loans at below-market interest rates (i.e. subsidies).[24]

Although the use of microfinance for energy efficiency is still limited worldwide, it has been successful in Central Asia (see the CLIMADAPT Tajikistan case study below). In this business model for energy efficiency, Multilateral Development Banks (MDBs) intermediate by making concessional loans or grants to local banks or intermediated finance facilities, which in turn on-lend to MFIs. The intermediating institution provides a large financial deposit to the on-lender MFIs to distribute in small green loans to eligible borrowers. The borrowers, who are eligible if they meet certain financial criteria, use the green loans to pay the upfront costs of energy efficiency systems such as energy efficient boilers or building insulation to pre-approved technology providers (see **positive lists**), while repaying the green loans in a stream of small, manageable payments over a realistic time period using peer-pressure in the short-run and institutional credit history in the long run to reduce the risk of nonperforming loans. Borrowers typically use the loans to pay 50% to 100% of the cost of the energy efficiency systems and, in some cases, bear the cost of repair and maintenance.

### BENEFITS AND CHALLENGES

The biggest benefit of this model is that it helps low-income and rural customers overcome the financial barriers to EE, since MFIs have unrivalled knowledge of, relationships with, and access to these customers.[25] Also, MFIs create customer awareness about the long-term financial returns of investing in energy efficiency systems; concessional microfinance allows small green loans to be offered at below market rates. MFIs are effective in promoting the uptake of financing for climate resilient technologies by leveraging the positive economic, social, and well-being impacts of these technologies and overcoming the high-perceived risks of and upfront costs to investment in EE. This model has proven to be very effective for small to very small investments and has helped achieve widespread primary energy savings and $CO_2$ emission reductions. MFIs are exposed to climate risks through their assets, operations, and supply chains; green loans have the potential to improve the climate resilience[26] and quality of MFIs' loan portfolios and create a new higher-return market segment.

The main challenges of this model is that borrowers sometimes feel deceived or uninterested in loan offerings due to MFIs' strict eligibility criteria, or perceived high interest rates charged[27]. Moreover, as the sources of funds are limited (typically limited to donor grants or concessional financing), especially for developing and offering new products and services such as loans for energy efficiency systems, MFIs may not be not self-sustaining. Finally, not only do MFIs have limited geographical coverage and depth of outreach across countries and regions, excluding segments of the population, but they also often lack technical capacity[28] to assess sound technology providers and cost-effective technologies, leading to missed opportunities for cost-effective primary energy savings and $CO_2$ emission reductions and unproductive investments.

## SUPPORT MECHANISMS

Microfinance can be supported by capitalising new **loan** funds, through credit enhancement for existing loans, such as loan **guarantees,** and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

Microfinance models require strong donor (e.g. IFIs, MDB) engagement and technical assistance to sustain the model beyond the initial capitalisation. Subsidies (grant money) are necessary to offer below market rates initially, but then competition among MFIs could self sustain green loan programs and lower interest rates for borrowers.

Government can also support the model by capitalising new intermediated finance facilities, and providing credit enhancement for existing MFIs green funds, such as loan guarantees.

Governments and development agencies can play important roles by providing technical support in setting up the model.

**CASE STUDY: CLIMATE RESILIENCE FINANCING FACILITY (CLIMADAPT) (TAJIKISTAN)**

The Climate Resilience Financing Facility (CLIMADAPT)[29] is a USD 10 million credit line programme to facilitate access to climate resilient technologies in Tajikistan. Partners in the EBRD programme include the government of Tajikistan, the Climate Investment Funds, and the United Kingdom. Concessional finance is disbursed through five local MFIs for on-lending to local households, farmers, and SMEs. Loans are provided in the local currency, protecting borrowers from foreign exchange risk. A positive list of pre-approved technologies and suppliers available was established to support local MFIs understanding of what constitutes a green loan, to increase MFIs' abilities to market them to potential borrowers, and to ease the due diligence process, which can otherwise be too burdensome for small loans.

Eligible residential homeowners can access loans from USD 500 to USD 300'000 to invest in energy efficiency systems and building insulation. As of 1 October 2018, the programme had loaned USD 9.8 million to support a total of 3424 projects. 62% of the programme portfolio is supporting energy efficiency projects, saving 55,864 MWh per year in primary energy.

## d. Positive Lists

### OVERVIEW OF THE MODEL

A positive list is an agreed upon list of sectors, sustainable technologies, or technology providers pre-approved for lending by financial institutions[30]. Technology and supplier exclusions can be identified by deduction under a positive list approach. Under a positive list, financing institutions give loans to borrowers and require that the loan proceeds are solely used for projects and investments that comply with the pre-approved list. They follow standard lending procedures in assessing credit and conduct due diligence in line with any positive list in place. Initiatives from the green finance industry such as the Green Loan Principles go one step further in suggesting a set of guidelines, market standards and a consistent methodology for use across financial institutions[31]. The framework intends to standardise environmentally friendly lending by clarifying principles on the use of funds, the process of evaluation and selection of green projects, the management of funds, and reporting.

### BENEFITS AND CHALLENGES

Positive lists allow flexibility to gradually open energy efficiency investments at the speed with which financial institutions are comfortable. They allow financial institutions to proceed with caution in delivering specific loans for energy efficiency investments, and promote the development and integrity of green-loan products. They offer greater clarity on the nature of energy efficiency projects being financed and the environmental outcomes they deliver, helping potential borrowers. However, the positive list approach discriminates against new products and services, which are not automatically protected under past commitments[32] as it only includes a partial list of energy efficient technologies and providers. Positive lists need to be updated regularly to include new energy efficient technologies and providers, which requires some resources and technical capacity from the financial institutions.

### SUPPORT MECHANISMS

The use of positive lists is generally combined with the offering of **green loans** through green funds, **revolving funds, microfinance,** or any other kind of financing mechanisms. The Green Loan Principles support the harmonization of **positive lists** across the green loan market.

### ROLE OF DIFFERENT ACTORS

Key actors include financing institutions, technology providers, business associations or MDBs who are the main sellers of the approach.

## e. Savings Groups

### OVERVIEW OF THE MODEL

The savings groups model is a market-based savings-led financing mechanism where self-selected individuals combine their savings and take small loans from those savings, with interest, and share the profits among themselves. They are owned, managed, operated and self-policed by members. Savings groups provide members the opportunity to save frequently in small amounts, access to credit on flexible terms, and some basic forms of insurance.

Typically, after up to two months of training and 9-12 months of supervision carried out by facilitating agencies, savings groups continue to operate independently in a self-policed and financially sustainable manner. Over the last 25 years, development organisations have trained about 750,000 Savings Groups, comprised of over 15 million members, across 73 countries. The average group had 5-30 low-income members, managing total assets of USD 1,200. This model represents an important safety net that supports low-income households in meeting their needs and improving their living conditions, including through sustainable energy investments.[33]

Savings groups can be a social fund, a sort of insurance that allows its members to borrow interest-free for qualifying goods. For instance, solar lamps, which are more healthy, secure and sustainable than kerosene lamps, qualified to be sold through such a scheme to the members of savings groups in Uganda[34]. It is particularly relevant for off-grid families in rural areas. Through savings groups, communities that share a common vision towards sustainable energy could pool their savings to invest in energy efficiency systems and re-invest their energy bill savings to fund further sustainable energy investments. As the savings groups become visible platforms, they could be used to offer other financial or non-financial services related to sustainable energy solutions, or to a larger development agenda. The model can also be used to alleviate energy poverty by increasing household access to small-scale clean energy solutions.[35]

### BENEFITS AND CHALLENGES

Savings groups are generally more structured, transparent and democratic than the informal financial services found in villages and informal housing communities in developing countries. They are simple and autonomous. They either complement services of regulated financing institutions or reach people who have been completely excluded from access to any financial services. Savings groups are popular, accessible, durable, and scalable. They provide good returns on member savings. They have high retention and survival rates. Savings groups focus on mobilising local capital to meet local needs and develop techniques that allow self-management at low cost. The model works better with urban low income, peri-urban middle income, peri-urban low income, and high-income rural members. There is a large amount of evidence on the positive impact of savings groups on member savings and access to credit.[36]

The biggest challenges for savings groups on an organisational level are to keep accurate records of individual loan balances (i.e. memorisation, passbooks, central ledgers or forms), and to keep the members' money safe. Some debate the economic legitimacy of a financial model that focuses on household cash management rather than enterprise growth. The fact that savings groups are presently unregulated and operate in isolation from national financial markets also causes concern. What is more, the small scale of the mechanism limits the capital base of the savings groups, while the small pool into which savings and loan interest income is deposited limits loan sizes. Another challenge of the model is its reliance on subsidies to pay the field officers of the facilitating agencies during the initial phases of savings groups' development. Finally, using savings groups to address the many challenges beyond finance bears the risk of overloading members with supply-driven activities instead of catering to their needs. There is mixed evidence that savings groups participation leads to an increase in assets and only a small amount of evidence that it leads to an increase in income and decrease in poverty.[36]

## SUPPORT MECHANISMS

Savings groups complement microfinance because MFIs and banks are highly effective in reaching the poor, mainly in urban areas. They perform best when supplying credit to small businesses. Although the formal financial sector is generally not willing to finance savings groups, MFIs and some banking institutions with clear development goals happen to provide some external funds to savings groups. MFIs are more suitable for larger, longer-term, lower-cost financing options.

## ROLE OF DIFFERENT ACTORS

Savings groups are promoted by numerous international and local NGOs, MFIs, and government agencies. Most savings groups' programmes are implemented by facilitating agencies such as NGOs, whose role is to bear the costs of group identification, training and supervision of the savings groups to carry out their transactions independently. These organisations promote savings groups and usually derive revenue from donor-funded programs through subsidies.

Savings groups may also be used for micro or household businesses.

## f. On-bill financing models

### OVERVIEW OF THE MODEL

On-bill financing is an innovative approach to financing energy efficiency that has proven to be effective for smaller investments and in increasing uptake of energy efficient equipment. The model enables energy utility customers to acquire energy efficient equipment, such as refrigerators and air conditioners, and to pay for the equipment over time through their monthly utility bills. In many cases, on-bill programmes are designed to deliver immediate overall cost savings from the very first day without the need for the customer to invest (bill neutrality). This means that the energy cost savings equal or exceed debt service, resulting in a lower total bill (debt repayment and electricity) after retrofit.[37,38]

Through on-bill financing, utility customers can purchase efficient equipment with their regular technology provider, who facilitates the credit request. There are several ways to structure on-bill financing models:

- In one approach, the utility incurs the capital cost of the energy efficiency upgrade, which is repaid through the utility. The utility thereby effectively takes on the role of a financing entity in addition to selling electricity.
- Another approach, sometimes referred to as "on-bill repayment", the upfront capital is provided by a third party, typically public or private financial institutions, rather than the utility. In exchange for a management fee, the utility acts as a repayment conduit, collecting the payments through the electricity bills for the original lenders.
- It is also possible to tie the cost recovery for an efficiency investment to the property's meter rather than the property owner, which means that tariffs remain in force regardless of a change in occupancy. These tariff-based on-bill models allow customers to make investments that may outlive their residency at the property, in which case the next owner can either repay the equipment in full or continue with monthly on-bill payments.[39,40,41]

### BENEFITS AND CHALLENGES

The biggest customer benefits of this model are the avoided upfront capital expenditure, and the ease of repayment. This can help motivate investments that may not otherwise happen. The model can also enable access to finance for customers who are not able to qualify for traditional financing options by broadening customer eligibility. Indeed, on-bill financing models tend to have low default rates. This is and because the loan has bill neutrality, as well as due to people's tendency to prioritise the payment of their utility bills and, where allowed, the utility's ability to shut off service in the event of non-payment.[38]

The increased energy efficiency on the demand side benefits utilities from the avoided cost and risks of additional building of power plants, new power lines, substations, and transformers. Energy efficiency can also reduce a utility's cost of complying with major national or international environmental rules. In some cases, the on-bill mechanism is a good opportunity for utilities to make inroads into financial services benefiting from their secured clients-base who are already making frequent payments for their utility services.

The main risks and challenges to establish an on-bill financing mechanism are:[42]

- Engaging the utility to support the transition towards energy efficiency and/or to serve as a financier.
- Evaluating credit risk of customers through their historical payments.
- Changing the utilities data and information management system to allow for on-bill repayment.
- Customer risk of power shut-off. This can be mitigated by enabling customers to obtain assistance with complaints, raise legitimate issues related to the loan and the project funded by the loan, and access a dispute-resolution process.
- Managing the contractor network who might misinform the clients.
- Repayment allocation (i.e., whether utility or lender is paid first) can be an issue when customers partially pay their bills.

## SUPPORT MECHANISMS

On-bill financing can be supported by capitalising new on-bill **loan** funds, through credit enhancement for existing on-bill funds, such as loan **guarantees,** and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

The success of the model depends mostly on the interest and engagement of the utility, which in many cases is in part or in whole, government owned. The government can support the model by capitalising new on-bill loan funds, providing credit enhancement for existing on-bill funds, such as loan guarantees.

Governments and development agencies can play important roles by providing technical support in setting up the model.

**CASE STUDY: CAMBIA TU VIEJO POR UNO NUEVO (MEXICO)**

The initiative "Cambia tu Viejo por uno Nuevo" (Translated: "Replace your old one (appliance) for a new one") in Mexico, coordinated by the Ministry of Energy, was implemented by the Trust for Saving Electricity (FIDE) in partnership with the National Development Bank (Nacional Financiera (NAFIN)) as part of the Programme for Substitution of Electro domestic Equipment (PSEE). Concessional funding was received from the World Bank and the Inter-American Development Bank to finance energy efficient refrigerators and air conditioning systems to residential clients through electricity bills. Through this program 1,700,000 residential refrigerators and 200,000 air conditioners were replaced over 5 years.[43,44] By the end of 2011, the programme resulted in greenhouse gas emissions reductions of 550,000 $tCO_2e$/year and annual electricity savings of 823 GWh.[45]

*On-bill financing is also outlined in chapter 5, given that is also applicable to the public sector.*

## g. Bulk Procurement

### OVERVIEW OF THE MODEL

Innovative, high-efficiency and high-quality products often face barriers to market entry, from price to lack of product recognition. Market transformation tools like bulk procurement help bring these products to market at an accelerated pace.[46]

Bulk procurement is a no-subsidy, demand-driven mechanism that provides economies of scale enabling manufacturers to bring down their prices through successive rounds of efficient and transparent bidding to create a large and sustainable market for energy efficient products.

Government authorities or the private sector issue tenders with a set of qualifying criteria to buy large numbers of energy efficient products, while manufacturers compete on price bids. In each round, multiple bidders are selected and all of them are asked to match the price of the lowest bidder. The volume of the bid is then allocated to all the manufacturers who agree to match the lowest price in the bid. Aggressive bidding by manufacturers and the exclusion of regular dealers and retailers tend to drive down the price of procured energy efficient products like LED light bulbs.

Bulk procurement is sometimes carried out along with maintenance services under an annual maintenance contract. Distribution agencies are contracted to distribute the energy efficient products that have been procured at a lower price to end-users, who are allowed to buy fixed amounts of units based on the payment options they elect (i.e. upfront payment, monthly instalments). The benefits of lower bulk procurement prices are passed on to end-users. Improved manufacturing and competition lowers retail market prices for the targeted energy efficient products.

Programmes using bulk procurement does not require subsidies, but schemes are often coupled with a product awareness campaign and innovative marketing initiatives to raise awareness among end-users who would have not acquired energy efficient products otherwise.[47]

### BENEFITS AND CHALLENGES

There are many examples in the literature of effective bulk programmes carried out in developed and developing economies for energy efficient products.[46]

One benefit is that repeated tenders of bulk procurement increases and improves domestic manufacturing capacity and fosters competition. Buying directly on a mass scale reduces risk for manufacturers. Bulk demand is also a strong economic incentive for manufacturers to invest more in local assembly lines and lower their costs. As the model allows manufacturers to deal with one procurement agency or entity, they can bypass distributors and retailers, and save transportation costs.

By aggregating the demand for a certain product on a national scale, bulk procurement has the potential to transform markets. Most importantly, bulk procurement supports the implementation of efficiency standards, and helps create sustainability in a market, passing on resulting savings to end-users.

However, the potential for product cost reduction through bulk procurement depends on the volume of tenders and the number of suppliers in an energy efficient product market. If both are small, the potential will be limited. Also, market disturbances in the retail market could occur and be challenging if withdrawal plans from bulk procurement are not well-prepared.

## SUPPORT MECHANISMS

Possible support mechanisms include:

- **On-bill financing** models to reduce the upfront cost of energy efficiency systems for low income end-users with high discount rates.
- **Credit guarantees** and concessional loans to help scaling up successful bulk procurement programmes.
- **Financial incentives** like consumers' rebates or tax credits to reduce the cost burden of high-efficiency and high-quality products.
- Labelling and voluntary standards to increase product quality and efficiency.

## ROLE OF DIFFERENT ACTORS

Equally important are the implementing entities buying large quantities of energy efficient products (i.e. government authorities, utilities, private businesses) and the manufacturers responding to the demand by ramping up their production and lowering product price. Multilateral Development Banks (MDBs) or aid agencies play also an important role as well by providing technical assistance and financial instruments to inform the design and scale-up the programmes.

**CASE STUDY: UNNAT JYOTI BY AFFORDABLE LEDS FOR ALL (UJALA) (INDIA)**

Unnat Jyoti by Affordable LEDs for All (UJALA) is one of the world's largest LED bulb programmes for households. It is being implemented across India by Energy Efficiency Services Ltd. (EESL), a public sector company. EESL procured the LED lights in bulk leading to an 80% price reduction over several years. The bulk procurement was completed over successive rounds of competitive bidding. The programme increased the share of LEDs in India from less than 1% to around 15% in one year. After three years of operation, more than 230 million LED bulbs were sold to Indian households.

These bulbs are saving more than 30 TWh of electricity annually, which is about 13% of India's residential electricity consumption in 2015–16.[47] EESL will use the model to sell energy efficient ceiling fans, ACs, and other energy efficiency appliances in the residential sector. With the support of the World Bank, EESL is implementing the Street Lighting National Program (SLNP), which will replace 13.4 million conventional street lights with LEDs in the public sector in India. EESL is poised to scale up its support for energy efficiency markets such as municipal services and public buildings, an electric vehicles program, as well as a smart meter program. EESL also plans to implement the UJALA model in other countries like the United Kingdom, Canada, Nepal, and Bangladesh.[48]

*Bulk procurement is also outlined in chapter 5, given that is also applicable to the public sector.*


## h. District service models: "servitisation"

### OVERVIEW OF THE MODEL

The standard business model for delivering energy services such as lighting, cooling, heating, mechanical power, compressed air, involves the manufacture, sale, use, and disposal of equipment. Higher production volumes support more sales and profit. As a result, manufacturers lack a strong incentive to voluntarily minimize product energy and resource use. Alternative business models are possible, and can promote much more energy and resource efficient technologies.

The district service model is based on the servitisation concept – transforming a traditionally product-focused business model into a service-focused one. It is a promising tool for further climate change mitigation. Although interest in service-based competitive strategies is not new – it is broadly applied in sectors such as software and photocopying services – the concept is still new in the energy efficiency sector. Servitisation involves end customers paying for the service they receive, rather than the physical product or infrastructure that delivers the service. The technology provider installs and maintains the equipment and recovers costs through periodic customer payments. These payments are fixed-cost-per-unit for the service delivered (for example, dollars per cubic meter of compressed air, per tonne of refrigeration, or hours of lighting), and are based on actual usage. The payment is not dependent on the savings (as with an **ESCO model**) but agreed in advance as a function of actual usage. This makes it easier and more transparent for the client. District service involves a larger infrastructure serving several customers with cooling, heating and/or compressed air. Residential buildings and apartments can benefit from district service models. Globally, district cooling systems are used to a much lesser extent than their equivalents for heating. *49,50,51,52*

## BENEFITS AND CHALLENGES

District service models benefit customers through lower energy and maintenance costs, the absence of upfront capital investments, industry-leading equipment, and transparent and predictable pricing structures. District service converts client capital expenses into operational expenses, freeing-up capital for other investment priorities. The model also reduces perceived energy efficient technology risks by clients, as they are not required to invest in the technologies directly, and are not exposed to equipment failure.

District service models give technology providers a strong incentive to increase profits by reducing their products' operating costs through innovation and effective maintenance, helping overcome 'split incentives' between manufacturers and users. In addition, district service models typically require a circular economy or whole lifecycle approach to asset management, maximising the value of equipment and benefits provided by the asset throughout its operating lifetime, including at end-of-life (e.g. for re-use/ re-sale, parts harvesting, etc.).

The main risks and challenges of establishing district service model mechanisms are:

- The upfront cost of a district service infrastructure is significant, since it can include the construction of plants, a large piping network and customer substations for example.
- Regulatory barriers might need to be addressed individually in some countries to design contracts aligned with the national legislation. For example, selling heat or cold might be considered like selling energy and thereby require the service provider to be a regulated utility.
- District service models require a broad portfolio of clients to compensate for demand uncertainty.
- It is necessary to coordinate with building developers to ensure that district service systems are in line with building design.[53]

## SUPPORT MECHANISMS

District service models can be supported by financial tools to recapitalise the service providers and risk mitigation mechanisms to compensate for the demand uncertainty.

## ROLE OF DIFFERENT ACTORS

Governments can support the development of district cooling for example by allowing the private sector to sell heat and cold without being a regulated utility, or by supporting local utilities to partner with heating and cooling service providers. Encouraging real estate developers to connect to the district cooling service can help to reduce demand uncertainty.

Governments and financial institutions can support the capitalisation of the service providers with energy funds or through mechanisms such as sale and leaseback.

*District service models and servitisation are also outlined in chapter 4 and 5, given that they are also applicable to the commercial and the public sectors.*


## i. Mortgage Financing

### OVERVIEW OF THE MODEL

Energy efficient mortgages (EEM), also known as green mortgages, enable a householder who is buying, selling, refinancing, or refurbishing a home to benefit from energy efficiency financing. EEMs are loan products that allow borrowers to reduce their utility bills by financing the cost of integrating energy efficiency features into a new home, or into refinancing an existing home.

Through mortgage financing, someone purchases or refinances a home that is either already energy efficient or that will become energy efficient after upgrades. To be eligible for an EEM, the lender and the borrower request an inspection and an assessment from a certified energy auditor. As an output, the energy rater usually provides a report including:

- Energy performance of the building.
- Detailed ratings of the energy efficiency features of the building, such as insulation levels, heating and cooling systems, solar orientation, air leakage, or window efficiency, etc.
- Estimate of annual energy use and costs of the existing building.
- Forward looking recommendations for energy improvements, including costs estimations, potential annual savings calculation, and payback time.

The auditor's report documents the home's existing energy efficiency level and/or includes recommendations for cost-effective refurbishments that could improve efficiency. If upgrades are required, the lender needs to see that the value of potential energy savings is greater than the borrowing costs to implement efficiency upgrades. The lender can recognise these savings and add the cost of the upgrades to the mortgage. If the home is already deemed energy efficient, the lender can relax the debt-to-income qualifying ratio for the borrower.[55]

**CASE STUDY:** **ENERGY-EFFICIENT CONSTRUCTION AND REFURBISHMENT (GERMANY)**

KfW, Germany's national development bank, partners with commercial banks to make financing attractive and affordable for purchasing energy efficient homes, building energy efficient homes and making efficiency upgrades to existing homes.

By 2017 the impact of ten years of this support included[3]:

- Funding provided for over four million housing units
- The 'KfW House Efficiency Scale' established as standard throughout the industry
- Triggering investments of over EUR 260 billion in building efficiency measures
- Securing an average of 320,000 jobs per year in the building industry and regional trades.
- Helping to reduce carbon emissions by almost 9 million tonnes per year

**How does it work?**

The German Energy Savings Ordinance (EnEV) defines minimum energy efficiency standards, based on primary energy use and heat loss calculations, which all new buildings must comply with. KfW labels its House Efficiency standard based on these minimum national regulatory standards, setting these as the baseline on an energy consumption scale of 100, and KfW lines of credit flow through German banks to homeowners providing attractive interest rates on lending as well as grants. The KfW mortgage products are available for new buildings and energy efficiency improvements for existing buildings. The less energy that the home uses, the more attractive the lending rates and the higher the KfW grant component is for the homeowner.

KfW Loans for New Buildings:

More efficient buildings → Less efficient buildings

| KFW 40 PLUS | KFW 40 | KFW 55 | BASELINE KFW 100 STANDARD |
|---|---|---|---|
| 60% more efficient than KfW 100<br>needs only 40% of energy a 100 KfW<br>efficient house needs technique and creates renewable own energy | 60% more efficient than KfW 100<br>needs 40% of the energy a 100 KfW efficient house needs | 45% more efficient that KfW 100<br>needs 55% of the 100 KfW efficient house | Baseline "label' representing the minimum EE requirements based on the German Energy Savings ordinance.<br>(100 does not mean 100% efficient or highest efficiency) |
| Most attractive loan and grant conditions (higher energy efficiency homes) | | Least attractive loan and grant conditions (less energy efficiency homes) | |

More attractive conditions ← Less attractive conditions

3 *https://www.kfw.de and https://www.bmwi-energiewende.de (Accessed: 12th March 2019)*

## BENEFITS AND CHALLENGES

This model reduces the need for governmental energy subsidies and unlocks additional finance for renovation from the private sector, bringing banks or mortgage lenders into the campaign for energy efficient buildings. Among other benefits, EEM is an affordable way to implement energy efficiency home upgrades that may be otherwise too costly for households, and save money over the long run[56]. The literature also shows that energy efficiency lowers mortgage risks; the odds of default for households in energy efficiency rated houses are 32% lower and the odds of prepayment are 28% lower. Furthermore, the greater the efficiency of an energy efficiency rated home, the lower the risk of default.[57]

From the point of view of the client, mortgage financing uptake is vulnerable to: a lack of demand for housing; overestimation of the energy efficiency savings by the certified energy auditors; lower than expected performance of energy efficient equipment and installations delivering less energy savings, and; to falling energy prices. Also, the literature shows there are still some supply-side and demand-side barriers to overcome for a greater EEM uptake in the future. Lenders often perceive high costs of participating in EEM programmes, while borrowers are unlikely to prioritise EEM. Indeed, borrowing households see EEM as unattractive due to a general lack of awareness of the EEM model, and of information about the relationship between energy efficiency and risks.[57] They also perceive the home energy assessment process as gruelling, and are more aware of the availability of other financing options on the market.[58]

## SUPPORT MECHANISMS

Support mechanisms include home-improvement loans for making energy-efficiency upgrades in existing homes, and **financial incentives** such as tax credits or rebates for energy efficiency purchases and improvements to offset the cost of energy efficiency improvements and renewable energy technologies in homes.

## ROLE OF DIFFERENT ACTORS

Under EEM, banks or mortgage lenders play an important role in raising awareness of the benefits of EEM and in offering preferential terms to home buyers, e.g. lower interest rates and increased loan amounts, if borrowers demonstrate the property meets certain environmental standards. Governments play an equally important role in drafting the right policies and technical certifications to offer a standardised framework for the energy efficiency assessment of a home under EEM. They can also provide risk mitigation mechanisms such as credit **guarantees.**

## j. On-tax financing model - Property Assessed Clean Energy (PACE)

### OVERVIEW OF THE MODEL

The Property Assessed Clean Energy (PACE) financing model is an on-tax financing mechanism for investment in building energy efficiency (EE) and distributed renewable energy (RE) installations. PACE enables homeowner access to energy efficiency and renewable energy financing from third-party investors, with repayment through property taxes. The model allows long-term financing, and because it is associated with a property, repayment can be transferred to a new owner upon sale. Energy efficiency and renewable energy upgrades can also increase the market value of a property.

PACE was first launched in California in 2008 and has spread throughout the USA[60]. A funding programme modelled on PACE, Environmental Upgrade Agreements, also exists in Australia.[1] The PACE model is being developed in Europe (EuroPACE), including a pilot in Spain, with the support of the European Commission's Horizon 2020 research and innovation programme.[61]

### BENEFITS AND CHALLENGES

The model requires working with local municipalities and assessing a tax collection structure's compatibility with PACE. PACE overcomes the barrier of access to long-term energy efficiency and renewable energy financing, especially for lower-income families, since funding is offered at lower interest rates than standard bank loans.[1] PACE also reduces energy poverty, improves thermal comfort, and lowers utility bills for homeowners and occupants.

On-tax financing has the most potential in countries where tax collection is well-structured and transparent, since private investors are more likely to trust repayment will occur within such an environment. PACE supports governments in achieving policy goals (e.g., emission reductions, energy savings, renewable energy targets), while creating new jobs without increasing public debt. Implementing PACE includes educating energy service professionals so they are aware they can offer larger projects because, with PACE, their clients will have better access to capital. The model can also be extended to energy efficiency upgrade investments in the commercial sector.

### SUPPORT MECHANISMS

On-tax financing models can be a source of asset-backed green bonds through the aggregation of similar PACE projects (e.g., securitisation). Energy efficiency projects can also be supported by energy efficiency insurance options, and be combined with other utility, sector, regional, and state **incentive** programs.

### ROLE OF DIFFERENT ACTORS

The PACE model is a market-based approach with potentially strong support from local governments. Key partners include private investors, technology providers, and energy savings service providers (renovators, builders), who are the main sellers of the model.

## k. Remittance based payment models

### OVERVIEW OF THE MODEL

Remittances[4] are a significant and growing source of financial inflows for developing countries.[62] BASE and partners developed a business model that enables migrant workers living and working abroad to direct part of their remittance payments towards small scale sustainable energy solutions for their families at home. The model builds on existing finance channels to develop a self-sustaining, market-based business model for sustainable energy products.

As at 2017, official remittances flows to low and middle income countries reached a total of USD 466 billion globally, and were more than three times the size of official development assistance.[62] While remittances undoubtedly contribute to higher living standards for some receivers, in many cases, remittances are not used for longer-term productive purposes. [63,64] For example, an ADB report cites examples claiming that often "remittances are used to finance excessive consumption and not to increase productive capacity of the home country".[63]

BASE and partners developed a model that enables migrant workers living and working abroad, to channel part of the remittance money that is traditionally spent on the consumption of energy (e.g. kerosene, coal, firewood, electricity) towards investment in sustainable energy products (e.g. solar panels, solar home lighting systems, improved stoves, thermal insulation). The model was successful piloted in Haiti, with migrant workers living and working in USA,[65] and in Bolivia, with migrant workers living and working in Spain.[66]

### BENEFITS AND CHALLENGES

The model involves working with local money transfer organisations (MTOs) to set up a business model that enables the MTO to sell sustainable energy products to migrant workers living and working aboard, that can then be collected by their families at home. The model puts part of the investment decision making power in the hands of the migrant workers, who often have a strong interest in seeing remittance monies spent on investments with a longer-term tangible benefit for their families at home. The model helps overcome the upfront cost barrier to sustainable energy investments and empowers migrant workers to contribute to sustainable development in their home countries. These models could be extended to energy efficient household products, such as air conditioners and refrigerators.

The remittance-based model has the most potential in countries where remittances are a significant share of GDP, and where remittance workers are concentrated in one or two location abroad, in order to concentrate efforts in developing and promoting the model.

### SUPPORT MECHANISMS

In cases where large investments are foreseen, remittance based models can be complemented with **microfinance** loans, or **savings groups** models.

### ROLE OF DIFFERENT ACTORS

The remittance model takes a market-based approach. Key partners include money transfer organisations in both the remittance sender and receiver country, and potentially microfinance institutions.

Governments and development agencies can play an important role in setting up the model.

*4 In this context, remittances refer to personal monetary transfers that a migrant worker makes from abroad to his/her relatives or community in their country of origin.[133]*

## I. Financial incentives (e.g. rebate or subsidy programmes)

### OVERVIEW OF THE MODEL

The aim of financial incentives is to lower the upfront cost of energy efficient (EE) technologies, and guide businesses (see **financing incentives in the commercial sector**) and consumers towards energy efficiency choices. Financial incentives vary in amount and form across programmes. Governments or utilities offer incentives to: promote the adoption of energy efficient appliances and systems identified through voluntary or mandatory energy efficiency labelling; support manufacturers and resellers to meet stricter compulsory energy efficiency standards; to boost energy efficiency investments in the residential sector, or to meeting energy savings obligations (in the case of utilities). The most common types of financial incentives are:

- **Rebates:** the buyer purchases an appliance or system that satisfies specific use and efficiency requirements, and later receives a rebate. To be eligible for a rebate, the buyer must comply with certain terms and conditions. A rebate can take multiple forms (e.g. utility cash rebate, instant rebate, mail-in rebate, etc.). It is the most common type of incentive and a cost-effective way for utilities to reduce electricity demand.[67] Rebate programs typically also include marketing to raise customer awareness of EE.
- **Tax credits:** an amount of money that taxpayers can subtract from taxes upon the purchase of pre-approved energy efficiency appliances, or investment and installation of an energy efficiency system. Tax credits are granted to individuals or businesses (see **financing incentives in the commercial sector**). For instance, homeowners who make qualifying energy efficiency improvements to their existing homes (e.g. better insulation, windows, heating and cooling systems, solar heaters, geothermal heat pumps, etc.) can subtract a percentage of the upgrade costs up to a certain credit limit fixed by the government. Electric vehicles are also eligible for tax credits in some countries.
- **Subsidies:** measures that keep prices below market level or reduce costs for purchasing energy efficient appliances or systems. For instance, public funds used to co-finance the costs of energy efficiency investment measures in the residential housing sector. In this case, the subsidy level provides only the necessary leverage for individual potential beneficiaries to invest.[68]
- **Value-added tax (VAT):** a tax on consumer spending. Governments can lower VAT rates for efficient appliances or systems to stimulate energy efficiency imports and thus lower prices for consumers.

### BENEFITS AND CHALLENGES

Incentives are proven, highly effective tools for increasing market adoption of energy efficient technologies.[69] They are attractive to consumers and can be highly economical from a public finance point of view.

The biggest challenge is ensuring financial incentives enable market changes that are self-sustaining, and that continue after the incentive programme ends.[70] For government programs, another challenge is ensuring public money for incentives is used in an efficient, socially and responsible manner.

### SUPPORT MECHANISMS

Incentives could be financed through carbon credits or government loan **guarantee** schemes. Moreover, as financing incentives are short-term solutions, they must be strongly linked with and complemented by long-term policies and regulations, as well as labelling and energy efficiency performance standards, and consumer awareness programmes. All are important supporting policy tools to change the perception and purchasing habits of customers in the long-run.[70]

## ROLE OF DIFFERENT ACTORS

Government agencies provide short-term financial incentives to stimulate the market for energy efficiency technologies, in addition of drafting and enforcing the supporting policies, standards and labelling.

Beneficiaries (i.e. households, homeowners) respond to the incentives by purchasing or investing in eligible and discounted energy efficient equipment. To complement financing incentives, donors and Multilateral Development Banks (MDBs) can provide capacity building through technical training, outreach and mobilisation activities.

The private sector plays a key role in ensuring the dissemination and adoption of the energy efficiency standards through local industries and businesses. Local and international appliance retailers develop marketing plans to raise customer awareness of the cost-effectiveness and multiple benefits (e.g., health benefits) of energy efficiency technologies.

*Financial incentives are also outlined in chapter 4, given that they are also applicable to the commercial sector.*

**CASE STUDY: GHANA REFRIGERATOR REBATE, TURN-IN AND REPLACEMENT PROGRAMME**

The Government of Ghana implemented a "rebate, turn-in, and replacement" refrigerator bounty programme in 2012. The scheme encouraged consumers to exchange their old refrigerators for new efficient ones, available at a discounted price through a rebate. A budget of USD 1.6M was assigned, equivalent to a rebate of USD 32 per appliance to be exchanged through retailers. The scheme aimed to reduce carbon emissions and other ozone depleting substances related to energy. The programme was supported by UNDP and the Global Environment Facility (GEF).[69] Upon completion of the programme, the market share of imported new refrigerators was over 80%, while 32,257 old refrigerators were replaced and transported to recycling facilities for disposal. Also, the average energy demand of refrigerators in households dropped from approx. 1,140kWh/year to approx. 740kWh/year, and the average annual national energy demand was reduced by 450 GWh/year, resulting in emissions reductions of 3,700 kton $CO_2$ equivalent.[71]

## m. Guarantees

### OVERVIEW OF THE MODEL

Guarantees (e.g. partial-risk loan guarantees, payment guarantees) are instruments that can help expand loan financing for commercially viable energy efficiency investments in the residential sector. Financial institutions (e.g. commercial banks, leasing companies) that are unfamiliar with energy efficiency projects and their risk mitigation options tend to perceive repayment risks as high. Guarantees are designed to reduce financial institutions' perceived risks in the short-run and improve their technical and financial confidence in specific energy efficiency projects or project developer models in the long-run, by covering part of the loan repayment risk.[72]

Usually, international financial institutions (IFIs), governments or utilities provide guarantees to financial institutions through public energy efficiency investment programmes, backed by IFIs or government resources. Guarantee issuers enter into guarantee agreements with participating financial institutions that initiate the relevant transactions with borrowers (e.g. project developers, households, residential building owners) seeking commercial loans. These agreements lay out the eligibility criteria and guarantee support (e.g. % of loan amount, first loss coverage, remaining default coverage, maximum tenure, etc.) for a loan portfolio. In return, guarantee issuers ask for small fees (i.e. processing fee, guarantee fee).[73] In the meantime, borrowers submit detailed project documents to the financial institutions from which they seek commercial loans. Financial institutions often loan funds to project developers, but repayment comes from individual households or residential building owners. Even with loan guarantee programmes in place, borrowers should still satisfy commercially viable loan conditions (e.g. providing collaterals as security).[74] If claims are made under guarantees, guarantee issuers are forced to repay the amount of those claims to the guarantee beneficiaries.[48]

### BENEFITS AND CHALLENGES

Guarantees help raise financing for energy efficiency investments in commercial markets at more favourable terms for borrowers. They give commercial banks incentives to lend because they partially compensate financial institutions for losses.[75] The use of loan guarantee programmes, backed with public funds, helps cover perceived high initial business risks, thus mitigating information asymmetry.[76] Experience has shown loan guarantees are especially useful where the banking system functions well and the fundamental conditions allowing energy efficiency lending to flourish are already in place (i.e. greater market maturity).[74] In some cases, loan guarantee programmes are not appropriate because the main barriers for commercially viable energy efficiency lending are not perceived high repayment risks, but rather other structural issues such as a lack of efficient processes to meet technical assessment requirements or the level of market maturity.[75]

### SUPPORT MECHANISMS

Guarantees support commercial **loan** financing schemes. These programmes operate either within the commercial banking system or as specialised development agencies or **revolving funds. Positive lists** can assist financial institutions in meeting technical assessment requirements for energy efficiency projects, while **financial incentives** can offer supporting credit enhancement measures (e.g. interest-rate buy downs, loan loss reserves).

### ROLE OF DIFFERENT ACTORS

Project developers often design energy efficiency projects, sign project implementation agreements with clients (e.g. residential building owners, households, etc.), and apply for loans to financial institutions on behalf of individual households or residential building owners. Financial institutions evaluate credit applications, conduct due diligence, assess borrower risk and the commercial viability of energy efficiency projects, and seek portfolio guarantees. Local financial institutions (LFIs) or government authorities set up and manage guarantee programmes, review guarantee applications, provide technical and financial evaluation of the projects, and sign guarantee agreements.

*Guarantees are also outlined in chapters 4 and 5, given that they are also applicable to the commercial and public sectors.*

# 4. FINANCING ENERGY EFFICIENCY IN THE COMMERCIAL SECTOR

## 4.1 INTRODUCTION

This chapter provides an overview of financing mechanisms, incentives and business models designed to encourage investments in energy efficiency in the commercial sector. The commercial sector is broad in scope – from micro enterprises to large commercial enterprises. The models that will be most effective for each segment may vary. The chapter describes briefly a board range of models, which are designed for different appliances and different business sizes or country contexts. The list is not exhaustive, but provides an overview of the most promising and widely used models.

The following table shows common types of financing and funding sources for commercial sector energy efficiency. The sources are typically national entities. There might be international sources if the investment amount justifies the transaction costs.

| SOURCE | TYPE |
|---|---|
| Banking institutions | Credit |
| | Leasing |
| Private equity Funds | Credit |
| | Equity |
| | Convertible debt |
| ESCOs (Energy Service Companies) | Performance-based financing |
| Insurance | Risk mitigation instruments |
| Guarantee institution | Credit guarantees |
| Crowd funding platforms | Crowd-finance |
| On-bill financing and rebates (e.g. USA) | On-bill financing and rebates (e.g. USA) |

There are other financing instruments that indirectly benefit enterprises. The following table summarises these instruments. The sources of financing are typically national or international entities.

| SOURCE | TYPE |
|---|---|
| National development banks (NDBs) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| Bi/Multilateral development banks (MDB) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| Pension funds (mutual funds) | Debt/loans |
| | Green bonds |
| Guarantee institution | Credit guarantees |

# 4.2 FINANCING MECHANISMS AND BUSINESS MODELS FOR THE COMMERCIAL SECTOR

## a. Loans and green credit lines

### OVERVIEW OF THE MODEL

Enterprises commonly finance their activities through direct commercial loans from local financial institutions (LFIs). In principle, energy efficiency improvement projects could be financed through direct loans without additional interventions. In practice, many enterprises (in particular SMEs) have limited access to finance, and typically prioritise core business activities over energy efficiency improvements.

In many cases, LFIs, including commercial banks and national development banks, have put in place credit lines for energy efficiency projects. These loans are sometimes offered with favourable or concessional conditions, such as below market interest rates or long-term tenors. For example, BANDESAL, a development bank in El Salvador, has a program aimed to promote energy efficiency through dedicated credit lines offered on preferential terms with the support of bilateral funds from KfW; BNDES, a national development bank in Brazil, offers special credit lines for energy efficiency[134]; Numerous other banks worldwide have dedicated green credit lines. Numerous new Green Climate Fund programmes also involve multilateral development banks on-leading concessional finance to local financial institutions for green projects. See for example the EIB GEEREF NeXt project.[135]

Loans and soft loans with credit enhancements have proven successful at scaling-up commercial energy efficiency projects, including smaller[5] projects.[7] In some cases, green credit lines alone are not enough to encourage investment, and complementary mechanisms (such as those mentioned below) are needed.

6 *In this context "smaller projects" refers to investments that may be undertaken by micro, small to medium-sized enterprises (SMEs). In many cases, SME's have been a difficult market sector to address.*[112]

## BENEFITS AND CHALLENGES

Green credit lines can be a useful way for enterprises to overcome upfront cost barriers to energy efficiency.

Mobilising funds is the key challenge related to green credit lines. In many cases enterprises have limited investment capacity and will continue prioritising investments considered core to their businesses.

In some cases, credit lines have high interest rates, are only available with short-term tenors, or have high collateral requirements,[6] making access for SMEs difficult.

Caution should be used when introducing debt financing with below market interest rates to avoid creating market distortions.[7] Offering energy efficiency loan programmes through local commercial banks can support the programme to become fully market-based, and result in longer-term sustainability.[21]

## SUPPORT MECHANISMS

SMEs often have limited access to finance from commercial banks due to their limited collateral. Credit **guarantee** funds can support enterprises by covering their collateral requirement.

Insurance mechanisms can help de-risk investments, encourage enterprises to invest and hence, support the mobilisation of funds.

In some cases, financial institutions are already lending for, but not tracking energy efficiency investments. Green tagging can help banks better understand and track energy efficiency loans.[22]

**Positive lists** can also help simplify banks' due diligence processes for green loans.

## ROLE OF DIFFERENT ACTORS

Credit lines are typically market-based. LFIs are the key partners.

Governments, multilateral financial institutions, and development agencies also play important roles in supporting financial institutions set up their internal processes for tracking and monitoring green loans by providing concessional loans to LFIs to on-lend at concessional rates, or by putting in place complementary mechanisms (such as those outlined above) to support the mobilisation of green funds.

6 *Lending decisions by banks are typically based on the value of the clients collateral (balance sheet financing) rather than on expected project-based cash flow of the energy efficiency upgrade (project financing).*[136]

**CASE STUDY: MICRO SMALL AND MEDIUM-SIZED ENTERPRISE GREEN CREDIT LINE (MONGOLIA)**

XacBank, a local commercial bank in Mongolia, has a credit line in place for Micro Small and Medium-sized Enterprise (MSME) energy efficiency loans. XacBank is expecting to mobilise around USD 60 million over 5 years for energy efficiency projects in the MSME sector. Concessional financing from the Green Climate Fund and the Global Climate Partnership Fund enables XacBank to offer loans at below market rates, with longer-term loan tenors, making the loans attractive.[77]

XacBank is also considering developing an **Energy Savings Insurance (ESI) model** to support fund disbursement. A credit **guarantee fund** is also in place in Mongolia, which can help SMEs acquire the collateral they need to access loans.

*Loans and green credit can also be used by the residential and public sectors, and are also discussed in chapters 3 and 5.*

## b. Revolving loan funds

### OVERVIEW OF THE MODEL

Revolving loans funds work similarly to commercial loans. Special purpose revolving loan funds are sometimes established where fit for purpose commercial mechanisms are not available to a specific market sector (such as micro, small or medium sized enterprises), or are not considered appropriate.

Revolving loan funds start with a fixed pool of capital, which is lent to clients for projects that fit a specific purpose, and then repaid, often with a small amount of interest, to the fund. The replenished money can be re-lent to new clients.[19] Revolving loan funds are typically managed by a government entity, a university, a community group, a not-for-profit organisation, or in some cases are administered by a commercial financial institution such as a bank.[19]

There are several examples of successful energy efficiency revolving loan funds for the commercial sector. For example, in Turkey, Thailand and several states in the USA.[78–80] Turkey, Thailand and several states in the USA have commercial sector focussed energy efficiency revolving loans funds. The Thai Revolving loan fund is described below as a case study. The Revolving Loan Fund in Turkey was made available to selected enterprises for energy efficient and ozone friendly cooling appliances.[78] In the USA, the State of Maine has a fund available to small commercial and not for profit enterprises. The fund is administered by the Maine Public Utility. The State of Maryland had a Commercial and Industrial Efficiency loan fund (EmPOWER), which was made available to locally owned or managed enterprises. Several other US states have similar programmes.[80] In Australia, a similar arrangement has been put in place through a public fund, called the Clean Energy Finance Corporation, in collaboration with the Commonwealth Bank of Australia. It takes a private sector approach, but allows business to take loans that cover 100% of the cost of the equipment, and to use the equipment as collateral.[112] There is also an example of a publicly backed and managed energy efficiency loan programme in Argentina.[112] All these programmes focus on underserved or hard-to-reach sectors such as local micro, small to medium-sized enterprises (MSMEs). When the funds are well managed, they can be a useful way of encouraging commercial sector investments in energy efficient equipment.

### BENEFITS AND CHALLENGES

The key immediate benefit of revolving loan funds is that they are often offered at low interest rates and with more flexible collateral requirements than commercial loans. This allows lender access to a broader range of customers, including MSMEs, which in some cases struggle to access commercial loans.

A drawback of revolving loan funds is that they require an initial pool of capital, which is often limited or can be difficult to source. For many revolving loan funds, the initial capital is sourced through a grant or very low interest loan from public entities, such as government funds or multilateral development funds. For example, the Revolving Loan Fund in Turkey was made available through a grant from the Multilateral Fund (MLF) for the Implementation of the Montreal Protocol.[78] In the US State of Maine, the initial pool of capital was made available by the US Department of Energy. In the State of Maryland, the initial capital was made available by the State of Maryland Strategic Energy Investment Fund, and the American Recovery and Reinvestment Act of 2009.[80] These sources are often limited, and once the initial pool has been lent out, more lending cannot occur until the repayments are made, which takes place over many years. Revolving loan funds also often have high administrative costs, meaning that they become expensive to manage in the cases that a specific body is set up to manage the fund.[19]

One key drawback of revolving loan funds, is that they are often not housed in organisations that aim to become providers of financial services over the long-term, limiting the overall sustainability of the initiative.[20] Offering energy efficiency loan programmes though commercial financial institutions can result in longer-term sustainability, as the institution is fit for purpose with existing due diligence, repayment collection procedures, and the intention to continue to offer financial services over the long term.[21] Revolving loan funds set up to target specific underserved or hard-to-reach sectors can demonstrate the energy efficiency market potential of these sectors, and may encourage market-based lending over the long-term.[19]

Community-managed revolving loans funds have faced many challenges, including limited capacity of the community group to manage the fund, poor repayment rates, and lack of transparency and accountability, which can lead to the misuse of funds.[20,81]

Caution should be used when introducing debt financing with below market interest rates to avoid creating market distortions.[7]

## SUPPORT MECHANISMS

Loan loss reserves (such as payment **guarantees**) or credit enhancements can support revolving loan funds.

## ROLE OF DIFFERENT ACTORS

Revolving loan funds can be administered by many different organisations including community groups, governments at national, sub-national or municipal level, utilities, universities, financial institutions or by not for profit organisations.[19]

*Revolving loan funds can also be used to finance energy efficiency improvements in the residential sector and the public sector, and are also discussed in chapters 3 and 5.*

**CASE STUDY: THAILAND ENERGY EFFICIENCY REVOLVING FUND**

The Thailand Energy Efficiency Revolving Fund was established by the Royal Thai Government to facilitate commercial loans for industry and building energy efficiency and renewable energy projects, and to stimulate financial sector involvement in these projects. The funds are lent to participating local commercial banks, with an interest rate of 0.05%. The banks are able to on-lend the funds to clients at a maximum interest rate of 4%, which is well below the market rates.[82] Phase I of the EERF was launched in 2003 as a three-year programme and was renewed for two additional three-year terms. By April 2010, the EERF had financed 335 energy efficiency projects and 112 renewable energy projects. The total investment in these projects was USD 453 million, and the estimated annual energy cost savings were USD 154 million, with an average payback of three years.[79]

## c. Dealer or trade financing

### OVERVIEW OF THE MODEL

Dealer financing or trade financing is financial support from energy efficient technology providers to their commercial customers. Through this credit-based model, customers acquire energy efficient products with little or no money down, and then pay later on a schedule agreed upon with the provider.

There are direct and indirect credit dealer financing models. Direct loans are more common – in this model providers use their capital to finance the energy efficient equipment purchased by customers. Credit tenor is normally between 30 and 180 days. A bank or third-party financial institution may purchase the credit or receivables portfolio. In the indirect loan model, the energy efficiency provider facilitates the loan application by collecting information from the customer and forwarding the application to a lender. The lender assesses the application and quotes the credit. It is very common to see agreements between a provider and a bank to allow the use of a credit card for payment with special credit conditions, such as six months of credit with no interest.

Under dealer financing, some technology providers offer credit support to retail distributors, which help them to access customers and markets that they are not able to reach. For example, a high-efficiency electric motor provider might agree with some installation companies or specialised contractors to extend to them a short-time credit on their purchases to facilitate the deal between the installation company and their customer. This gives some time for the installation company to acquire the equipment and install it before receiving the full payment from their customers.[23]

### BENEFITS AND CHALLENGES

Dealers financing is an important type of financing in many developing countries, especially where credit access is limited.

However, technology dealers do not always have the financial capacity to implement such models.

### SUPPORT MECHANISMS

Dealer credit models can be supported by credits or loans to the technology provider.

### ROLE OF DIFFERENT ACTORS

Dealer credit models are typically market-based. Technology suppliers are the key partners. They can be supported by local financial institutions (LFIs).

*Dealer financing models are also applicable to the residential sector, outlined in chapter 3.*

## d. Leasing

### OVERVIEW OF THE MODEL

A lease is an arrangement in which one party (the lessor) conveys the use of an asset (a parcel of land, building, service, or an air conditioning system) to another party (the lessee) for a specified period of time in exchange for periodical payments. There are two basic forms of leasing: operating leasing and finance leasing. The differences between the two involve: who owns the leased asset; what accounting and tax treatment apply; who bears the expenses and running costs; whether the contract includes a purchase option, and; the lease term length. Leases can be offered directly by the technology supplier (vendor lease), by a financial institution, or by a third-party such as a leasing company.

An operating lease is similar to an equipment rental: the ownership as well as all associated risks and rewards remain with the lessor, the asset is returned by the lessee after the lease term, the asset never appears on the lessee's balance sheet, and the lease payments are treated as operating expenses. A finance lease is similar to a loan, in which the equipment itself serves as a collateral for the lender: the lessor maintains ownership of the asset while the lessee enjoys the use of the asset for the duration of the lease agreement, usually accompanied by an option to buy the asset at the end of the contract or before the contract ends. The lessee bears all costs and risks associated with the use of the leased asset, and the asset appears on the lessee's balance sheet because the lease is recorded by the lessor as a sale and by the lessee as a purchase. Commercial customers (e.g. hotels, offices) and industrial customers (e.g. manufacturing, agriculture) can both benefit from operating or finance lease arrangements. *83,84*

### BENEFITS AND CHALLENGES

Leasing arrangements benefit customers through the absence of upfront capital investments, the possibility to use the equipment itself (instead of another asset or property) as collateral, the lack of restrictive covenants, industry-leading equipment without the risk of obsolescence, flexible arrangements in which the equipment might be returned or purchased during the contract period, and a transparent and predictable pricing structure.

Operating leases convert client capital expenses into operational expenses, affording the client tax benefits and other advantages such as off-balance-sheet financing. In the case of retrofits, the lease rentals are largely paid through energy savings resulting in negligible impact on the profit and loss statements. Both forms of leasing free-up capital for other investment priorities. In addition, default rates within the leasing activity are low because the asset is crucial to an enterprise's core business activities.*85,86,87*

The main risks and challenges to establishing leasing mechanisms are:

- Regulatory barriers, such as whether leasing can be carried on without a license by the central bank.
- The legal and tax environment can be less attractive for financial institutions to offer leasing instead of loans.
- Resource constraints: leasing investment involves significant capital outlay for the lessor, which is a challenge for vendor leases.
- Risk of obsolescence for the lessor in case of short contracts and rapidly-evolving technology.
- The lessor faces the risk of delay in rental payments or payment default, which can be reduced by evaluating customer credit risk, with mechanisms such as payment guarantees, and with equipment reallocation procedures.
- Equipment reallocation procedures can face legal challenges when the equipment is installed on the client's property and should be considered when designing the leasing contract.

## SUPPORT MECHANISMS

Leasing models can be supported by risk mitigation mechanisms such as payment guarantees to reduce the risk of default from the end-client, by carefully analysing the credit risk of the clients, and by validating the technology with positive lists. With vendor leases, financial tools to recapitalise technology such as sale and leaseback or the securitisation of cash flows can decrease resource constraints of the lessor.

## ROLE OF DIFFERENT ACTORS

Government regulators can support leasing by simplifying leasing operations in local regulations, by creating a favourable legal and tax environment, and by authorising, enabling or offering risk mitigation mechanisms such as payment guarantees.

The private sector must be actively involved because technology providers need to rethink the way they operate their businesses, and in some cases take part of the credit risk. Financial institutions can offer leasing directly or support the capitalisation of technology providers through mechanisms such as sale and leaseback. Utilities can also play an important role, such as in utility-led leasing programmes.[88]

*Leasing is also applicable to the public sector, outlined in chapter 5.*

## e. Pay-per-service models: Equipment-as-a-Service and district service models

### OVERVIEW OF THE MODEL

The standard business model for delivering energy services such as lighting, cooling, heating, mechanical power, compressed air, involves the manufacture, sale, use, and disposal of equipment. Higher production volumes support more sales and more profit. As a result, manufacturers lack a strong incentive to voluntarily minimize the energy and resource use of the equipment they sell. Alternative business models are possible and can promote much more energy and resource efficient technologies.

Pay-per-service (PPS) models are based on the servitisation concept - transforming a traditionally product-focused business model into a service-focused one. Although interest in service-based competitive strategies is not new and broadly applied in sectors such as software and photocopying services, the concept is still fairly new territory in the energy efficiency sector. Servitisation involves end customers paying for the service they receive, rather than the physical product or infrastructure that delivers the service. The technology provider installs and maintains the equipment and recovers costs through periodic customer payments. These payments are fixed-cost-per-unit for the service delivered (for example, dollars per cubic meter of compressed air, per tonne of refrigeration, or hours of lighting), and are based on actual usage. The payment is not dependent on the savings (as with shared savings energy performance contracts) but agreed in advance as a function of actual usage. This makes it easier and more transparent for the client. The equipment can either be installed directly on the customer's property (Equipment-as-a-Service), or in the case of services such as cooling, heating and compressed air, a larger infrastructure can be installed in a separate location to serve several customers with the same facility (district service). Commercial customers (e.g. hotels, offices) and industrial customers (e.g. manufacturing, agriculture) can both benefit from pay-per-service models.

### BENEFITS AND CHALLENGES

PPS models benefit customers through lower energy and maintenance costs, the absence of upfront capital investments, industry-leading equipment, and a transparent and predictable pricing structure. The model effectively turns a capital expense into an operational expense for clients, freeing up capital for other investment priorities. The model also reduces the perceived technology risk for the clients, as they are not required to invest in the technologies directly, and are not exposed to equipment failure.

PPS gives technology providers a stronger incentive to increase their own profits by reducing their products' operating costs through innovation, helping overcome 'split incentives' between manufacturers and users.

PPS can also increase the likelihood that the equipment is effectively serviced and maintained, lowering the risk of unplanned breakdowns and creeping inefficiency. In addition, PPS business models typically require a circular economy whole lifecycle approach to asset management, maximising the value of equipment and benefits provided by the asset throughout its operating lifetime, including at end-of-life (e.g. for re-use/ re-sale, parts harvesting, etc.).

The main risks and challenges to establish PPS mechanisms are:

- Regulatory barriers might need to be addressed individually in some countries to design contracts aligned with the national legislation (e.g. local regulation doesn't permit leasing or service contracts).
- Technology providers face the risk of payment default, which can be reduced by evaluation of the credit risk of customers, with mechanisms such as payment guarantees and equipment reallocation procedures.
- Equipment reallocation procedures can face legal challenges when the equipment is installed on the client's property and should be considered when designing the PPS contract.

Current efforts in the area of PPS models aim to scale up investments in energy efficiency through the use and promotion of the Equipment-as-a-Service business model. For example, K-CEP and BASE are currently leading the "Cooling as a Service Initiative" through which tools will be developed to sell air conditioning as a service, and demonstration projects will be implemented[7]. The Rocky Mountain Institute published a report in 2017 about the potential of Lumens as a Service to capture the multibillion-dollar LED market opportunity.[89]

## SUPPORT MECHANISMS

PPS models can be supported by financial tools to recapitalise technology providers such as sale and leaseback or the securitisation of cash flows, by risk mitigation mechanisms such as payment **guarantees** to reduce the risk of default from the end-client, and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

PPS models need strong engagement from the private sector, since the technology providers need to rethink the way they operate their business and take part of the credit risk.

Governments can support by simplifying leasing or service contracts in the local regulations, and by authorising, enabling or offering risk mitigation mechanisms such as payment guarantees. Financial institutions can support the capitalisation of technology providers through mechanisms such as sale and leaseback.

**CASE STUDY: DISTRICT COOLING (SINGAPORE) AND COMPRESSED-AIR-AS-A-SERVICE (GERMANY)**

District cooling is an innovative urban utility service involving the centralised production of chilled water that is piped to commercial buildings for air-conditioning. Singapore has one of the worlds largest district cooling systems in place.

In the case of Singapore District Cooling, chilled water is produced by production plants and distributed by water pipes contained within the common services tunnels.

Using a district cooling facility - as opposed to having to build and install their own plant rooms and cooling towers - helps make businesses in the area about 30 per cent more energy-efficient.[90]

Using the Internet of Things to Provide Air-as-a-Service, the German company Kaeser began putting sensors on its equipment and monitoring the usage and condition of the machines to sell compressed air as a service through a predictive maintenance program. The company sells air by the cubic meter through compressors that it owns and maintains.[91]

7 *caas-initiative.org*

*District service models and servitisation are also outlined in chapter 3 and 5, given that they are also applicable to the residential and the public sectors*

## f. Energy performance contacts - shared and guaranteed savings models (ESCOs)

### OVERVIEW OF THE MODEL

Energy Performance Contracts (EPCs) enable funding of energy efficiency upgrades from energy cost reductions. Under an EPC arrangement, an external organisation, typically called an Energy Service Company (ESCO) implements an energy efficiency project, and uses the stream of income from the cost savings to repay the project costs. The ESCO only receives full payment if the project delivers predicted energy savings; this transfers project technical, financial and operational risks from the client to the service provider.

There are two major contracting models defining the relationships and risk allocations among the ESCO, customer and lender: the shared savings model and the guaranteed savings model. In shared savings models, the ESCO invests in the project. The cost savings resulting from the energy upgrade are quantified, and for the duration of the contract a pre-determined share of this amount will be used to remunerate the ESCO. The ESCO thus takes over both the performance and the customer credit risk, and acquires financing. In guaranteed savings models, the ESCO guarantees a certain level of energy savings by covering, in case of underperformance, the monetary value of the difference between predicated and actual energy bill savings based on a specified utility rate. This shields the customer from any performance risk. The customer is directly financed by a financial institution, repays the loan and assumes the investment repayment risk. Cash-poor, yet creditworthy commercial customers are good potential clients for EPCs. The feasibility of EPC projects depends on the predictability of energy use, the level in energy efficiency, the price of energy, the size of the investment, the complexity of the project, and the legal, financial and regulatory rules. *92,93,94,95,96*

### BENEFITS AND CHALLENGES

ESCO models benefit customers by:

- Reducing or eliminating the performance risk and need for internal technical expertise.
- Incentivising the ESCO to provide state-of-the-art products and services and to optimise its operation to achieve high energy savings.
- In the case of the shared savings model, the customer does not have to invest and the project is financed off balance sheet.

The main risks and challenges to establish EPC arrangements for shared savings contracts are:

- Possible payment default of the customer after installation.
- Uncertainty of baseline measurement and unexpected increase in installation costs. In some cases ex-post monitoring could be challenging.
- Leverage problems for ESCOs who can become too indebted.
- An adversarial relationship between the ESCO and customer can be created because higher than expected measured savings translate into higher payments to the ESCO. New approaches attempt to overcome this. *97,98*

The guaranteed savings concept is also exposed to uncertainties in the baseline measurement, and can be difficult to implement in developing markets because it requires customers to assume investment repayment risk. The **Energy Savings Insurance model** normally covers the investor risk, which can include providing additional risk mitigation as part of a shared-savings performance contract scheme and facilitate adoption in developing countries. *99,100*

## SUPPORT MECHANISMS

Shared-savings EPC models can be supported by financial tools to recapitalise the ESCOs such as sale and leaseback or the securitisation of cash flows, by risk mitigation mechanisms such as payment **guarantees** to reduce the risk of default from the end-client, and by **positive lists.**

Guaranteed-savings EPC models can be supported by standardised contracts, independent validation entities, additional insurances to cover the customer in case of non-compliance by the ESCO, credit **guarantees** to support the client to assume the investment repayment risk, tax arrangements and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

Governments can support the adoption of EPC models by lifting institutional barriers and mobilising necessary capital needs.[101] Governments can simplify local regulations for ESCOs to offer customer financing and by authorising, enabling or offering risk mitigation mechanisms such as payment guarantees for these entities.

In guaranteed savings models, financial institutions can support the capitalisation of the service providers with loans or through mechanisms such as sale and leaseback. Governments can mitigate the risk in lending to smaller and medium enterprises. To facilitate large-scale implementation of energy efficiency projects, some governments have established and capitalised “Super ESCOs” to implement projects in public facilities, to support capacity building and project development activities of existing private ESCOs, and to provide private ESCOs and their customers with financing. [102]

*Energy performance contracts and the ESCO model are also outlined in chapter 5, given that they are also applicable to the public sector.*

## g. Crowd funding for the commercial sector

### OVERVIEW OF THE MODEL

Crowd funding is the mobilisation of funding for projects from a large number of investors using internet-based platforms and online processes. Crowd funding takes different forms (i.e. donations, rewards, crowd-lending or debt, equity, royalties) that can be split into two general categories: community crowd funding and financial return crowd funding.[103] The size of the investment of an individual investor can range from very small (e.g. could be as low as EUR 50) to large. Typically businesses can fundraise between USD 1,000 and USD 1 million. Crowd funding uses a large range of modalities and business models.[104]

Crowd funding for energy efficiency (CF4EE) can be used when there is a lack of affordable financing or high upfront costs for implementing or scaling up cost-effective energy efficiency measures. Commercial buildings are a prime target for energy efficiency. A typical CF4EE process follows these steps[105]:

- A project developer or Energy Service Company (ESCO) enters into a contract with crowd funding platforms (CFPs) defining the fees, terms, and conditions.
- The energy efficiency project is listed on the website of the CFPs and the fundraising campaign kick starts with time-real project funding progress to potential investors.
- Potential investors pledge amounts online and enter into individual investment agreements after security and financial clearance.
- Crowd-lending investors provide a loan to the project developer, expecting both interest payments and principal return later on, or offer to acquire a share in the project developer in return for dividends and/or an increase of its share value in the future.
- The project developer can then mobilise the funding to finance the upfront costs of the energy efficiency project development for commercial building owners (e.g. hotels, businesses, industries).
- Commercial building owners pay back the project developer through a financing mechanism. For instance, building owners could install energy efficiency measures under shared savings contracts with ESCOs.

### BENEFITS AND CHALLENGES

Debt crowd funding can be financially viable for energy efficiency investments in the commercial sector without relying on governments subsidies. ESCOs are attracted to work with owners of large buildings, as they offer scale and easier negotiations with only a single decision maker. However, many building owners do not prioritise energy efficiency and do not want to invest their own capital. Further, despite being profitable projects, ESCOs find it difficult to raise the necessary debt finance from traditional financial institutions, who are not comfortable with the ESCO business model of energy savings as the income stream used to pay debt. Therefore, banks may ask for collateral that ESCOs cannot always provide.

Crowd funding helps overcome these barriers by removing the involvement of financial institutions and by financing the upfront costs of energy efficiency investment for the commercial building owners. Crowd investors can even expect generous interest payments, while building owners will cut their utility bills and reduce $CO_2$ emissions without investing their own resources. In addition, crowd funding can lead to better awareness and support for energy efficiency projects, and offer market outreach and validation for new energy efficiency technologies.[106] Crowd funding offers the following additional benefits over existing financial instruments:

- Taps into new funding sources, such as small investors with risk appetite for venture capital and small impact investors.
- Empowers responsible investors seeking greater control over their investments.
- Encourages investors to increase their risk tolerance by offering greater diversification and smaller amounts per investor.
- Increases the speed of decision and transaction processing through standardised online processes.

Using the crowd funding approach to finance energy efficiency projects has been found to be financially viable (i.e. attractive Internal Rates of Return (IRRs)). However, returns can become very low once crowd funding and project developer costs, which can equal 10% to 20% of the funds raised, are factored in[105].

## OTHER CHALLENGES WITH THE MODEL ARE:

- Legal uncertainty because regulations are missing or are inappropriately adopted from existing pre-crowd funding legislation.
- Missing institutional capacity, including competent crowd funding platforms (CFP) and support services, such as online-payment to ensure high quality projects and efficient online processes.
- Possible competition from donations or government subsidies, rendering crowd funding too costly by comparison.
- Foreign exchange risk in cross-border crowd funding, which neither crowd investors nor project owners want to bear.

Finally, experience shows that CFPs dedicated to energy efficiency have grown slower than those dedicated to renewable energy (RE)[106]. This is due to the nature of energy efficiency projects that are less visible and attractive to small investors and the availability of and competition with concessional funding for EE.

## SUPPORT MECHANISMS

Both **lease** purchase models and **shared savings contracts** are good supporting mechanisms for crowd funding. There is also a need for a clear regulatory framework to support crowd funding. **Guarantees** can support crowd funding by reducing investment and lender risks through a first loss guarantee facility comforting investors that dividend and interest payments would be paid, even if a project is defaulted.

## ROLE OF DIFFERENT ACTORS

CFPs and small investors mobilise funding, enabling project developers (e.g. ESCOs) to afford the high upfront costs of energy efficiency investments, which in return unlocks energy savings that are shared with commercial building owners (e.g. hotels, businesses).

Utilities are indirect beneficiaries of those savings.

Aid agencies or donors can help governments develop appropriate regulation and offer capacity building to CFPs and regulators.

Professional financial institutions, institutional investors, venture capital and angel investors have enabled CFPs to tackle more complex and larger projects

*Crowd funding is also outlined in chapter 5, given that it is also applicable to the public sector.*

## h. White certificates

### OVERVIEW OF THE MODEL

The white certificates model is a market-based instrument implemented and regulated by government policymakers to stimulate investments in energy efficiency. This instrument is a certification of an amount of energy savings achieved relative to a base-line. White certificates can be traded, generating additional revenue for making the energy efficiency investment more attractive. They are also known as energy savings certificates or energy efficiency credits or white tags, which are all tradable energy savings certificates.[59] This model is usually introduced in combination with mandatory energy savings obligations for either utilities or targeted energy-intensive sectors in a country, region or state.

White certificates have been implemented in Europe (Italy - since 2005,[59] France, UK among others), Australia, and in the USA.[59] One of the larger White Certificates programs is the Perform, Achieve and Trade (PAT) scheme in India, which sets mandatory energy intensity improvement targets for designated consumers in energy-intensive sectors and allows them to generate and trade energy saving certificates (ESCerts) among themselves.[59]

### BENEFITS AND CHALLENGES

The implementation of a white certificates market is typically the result of a public sector initiative. It therefore requires political will and the design of specific regulations, as well as a committed authority to issue and regulate white certificates. Once implemented, white certificates have the advantage of creating a new market for energy efficiency investments. In Europe, it has stimulated the development of new business models such as ESCOs.[59] End-users benefit from white certificates since the certificates generated from the energy savings can be traded, therefore presenting an additional source of income, resulting in a reduction of the payback of energy efficiency investments, making them more affordable.

Challenges associated with the implementation of white certificates include the great effort and resources from the public sector to set up the scheme and create and enforce regulations. White certificate schemes may also be limited for specific types and sizes of energy efficiency projects, and therefore may not be accessible to all end-users (e.g., homeowners).

### SUPPORT MECHANISMS

Other energy efficiency incentive programmes can support white certificate schemes, for example emission reduction trading schemes. White certificates are also compatible with **green loans,** credit **guarantees** and **ESCO models.**

### ROLE OF DIFFERENT ACTORS

The public sector plays the main role in developing and implementing white certificate schemes. Such a model directly impacts utilities and targeted energy-intensive sectors, which are required to achieve certain energy savings targets. ESCOs can pursue energy savings projects that generate tradable certificates to make those projects financially more attractive.

## i. Financial incentives (e.g. rebate or subsidy programmes)

### OVERVIEW OF THE MODEL

Financial incentives lower the upfront cost of energy efficiency, a major barrier to energy efficiency in the commercial sector. Financial incentives vary in amount and form and are most commonly offered by government (tax-payer funded) or by an energy utility (rate-payer funded) subject to energy savings obligations. The most common types of commercial financial incentives are rebates and subsidies:

- **Rebate programmes** (i.e. prescriptive, custom): commercial customers purchase new, energy efficient equipment or a system that satisfies program efficiency requirements. After purchasing and installing the equipment, the customer submits an incentive application, and later receives a rebate. Alternatively, instead of a per unit rebate, the incentive can be based on predicted energy savings (e.g. kWh saved per year), which programme technical experts verify through industry standard methods, such as engineering calculations (in pay-for-performance models, incentives are calculated based on actual savings). For such "custom" projects, customers provide details of the planned improvements and equipment utilization. They know the rebate amount before purchasing the equipment and will receive the rebate after installing it. Many utilities in the U.S. and Canada offer prescriptive and custom rebates to business customers as part of energy savings obligation schemes.[107] Rebates are the most common type of incentive and a cost-effective way for utilities to reduce electricity demand.[67]
- **Subsidy programmes** offer funding to reduce the costs of financing energy efficiency upgrades for businesses. For instance, direct monetary subsides allow qualifying businesses to secure fixed-rate financing through credit enhancements in the form of loan loss reserves and/or interest rate buydowns. Eligible businesses must comply with the programme requirements and policies, and follow a detailed application process (i.e. project information and review, loan application, energy assessment) before being approved.[107] Subsidy programmes can also be public funds used to co-finance the costs of energy efficiency investments in the commercial housing sector. Subsidy levels should provide only the necessary leverage for individual potential beneficiaries to invest.[68]

### BENEFITS AND CHALLENGES

Prescriptive rebates are easy to implement and understand for commercial customers. Larger, complex, or process-specific projects need custom rebate approaches, and are more applicable to industry.[107]

The biggest challenge is ensuring financial incentives enable market changes that are self-sustaining and continue after the incentive programme ends.[70] For government programs, another challenge is ensuring public money for incentives is used in an efficient, socially and responsible manner.

### SUPPORT MECHANISMS

Governments can also offer tax incentives as supporting mechanisms to boost energy-related projects. These incentives commonly take the form of either sales tax exemptions, which allow commercial buyers to be exempt from paying taxes on energy efficiency goods, or tax credits which allow a company to deduct a fixed amount or a percentage of an energy efficiency purchase price, up to a maximum amount from its annual taxes.[108]

However, financing or tax incentives must be strongly linked with and complemented by long-term policies and regulations, as well as energy efficiency labelling and performance standards in order to achieve long-term market transformation.

### ROLE OF DIFFERENT ACTORS

Government agencies and utilities play a central role by providing short-term financial incentives to stimulate the market for energy efficient technologies in the commercial sector. Government also creates and enforces supporting energy efficiency policies, including standards and labelling, which are necessary for long-run market transformation. Businesses respond to incentives by investing in discounted energy efficiency products and services, saving energy, operating costs (through lower utility bills), and increasing competitiveness.

*Financial incentives are also outlined in chapter 3, given that they are also applicable to the residential sector.*

## j. Guarantees and insurance

### OVERVIEW OF THE MODEL

Guarantees such as credit guarantees and partial-risk guarantees, are instruments that can help expand loan financing for commercially viable energy efficiency investments in the commercial sector. Financial institutions such as commercial banks and leasing companies who are unfamiliar with energy efficiency projects and their risk mitigation options, or reluctant to lend due to small project sizes and relatively high transaction costs, tend to perceive repayment and credit risks as high. Guarantees are designed to reduce financial institutions' perceived risks in the short-run and improve their technical and financial confidence in specific energy efficiency projects or project developer models (e.g. ESCOs models) in the long-run by entirely or in part covering loan repayment risk.[72] Credit guarantees may cover the loss from a loan default regardless of the cause of the loss, covering all risks, while partial-risk guarantees may only cover losses due to particular causes, covering against specific risks. Guarantees generally cover less than 100% of the loss from default to preserve the incentives for financial institutions to conduct due diligence and assess borrower credit risk.[109]

Normally, international financial institutions (IFIs) or governments provide guarantees (e.g. individual and portfolio partial guarantees for loans) to financial institutions through public energy efficiency investment programmes, sometimes combined with credit enhancement measures and financial incentives (e.g. grants), and backed by IFIs or government resources. Guarantee issuers enter into guarantee agreements with participating financial institutions who take the lead in finding energy efficiency projects, designing their credit facilities and reviewing project proposals from project developers (e.g. ESCOs, commercial building owners, SMEs). These agreements lay out the eligibility criteria and guarantee support (e.g. % of loan amount, first loss coverage, remaining default coverage, maximum tenure, etc.) for a loan portfolio. In return, guarantee issuers ask for small fees (i.e. processing fee, guarantee fee).[73]

In the meantime, borrowers submit detailed project documents to the financial institutions for commercial loans. Then, financial institutions provide loans to project developers. Even with loan guarantee programmes in place, borrowers should still satisfy loan conditions that are commercially viable (e.g. providing collateral as security).[74] If claims are made under guarantees, guarantee issuers are forced to repay the amount of those claims to the guarantee beneficiaries.[48]

Insurance, another risk mitigation instrument, can be applied to energy efficiency investments and projects as well. There are different types of insurance products related to energy efficiency: those that cover technological and performance risks, and those that cover credit and contractual obligations (surety type of insurance). Technological and performance risk insurance types exist in USA and European markets, but their use has been limited. This type of insurance covers the risk of an efficient unit or project not performing as predicted. It can have different beneficiaries, including third party private investors, project developers and providers, and end-users. When covering contractual obligations established in energy efficiency contracts with guaranteed savings, the usual beneficiary is the end-user and the type of insurance is a surety bond (see **Energy Savings Insurance model**).

### BENEFITS AND CHALLENGES

Guarantees help raise financing for energy efficiency investments in commercial markets under more favourable terms than are typically available from commercial banks. Guarantees give commercial banks incentives to lend because they partially compensate financial institutions for losses[75]. The use of loan guarantee programmes, backed with public funds, helps cover perceived high initial business risks, thus tackling the information asymmetry barrier.[76] Experience has shown that loan guarantees are especially useful where the banking system functions well and the fundamental conditions that allow energy efficiency lending to flourish

are already in place (i.e. greater market maturity)[74]. In some cases, loan guarantee programmes are not appropriate because the main barriers to commercially viable energy efficiency lending are not perceived high repayment risks, but rather other structural issues, such as a lack of efficient processes to meet technical assessment requirements or the level of market maturity.[75]

The main benefit of energy efficiency insurance is the trust it builds among market actors (e.g. investor or energy efficiency beneficiary, technology provider or ESCO, and insurance company) by redistributing the risks of project failure and contractual obligation failure. The main challenge is the limited availability of these products in the market because insurance companies are generally not familiar with EE.

## SUPPORT MECHANISMS

Guarantees support commercial **loan** financing schemes. These programmes operate either within the commercial banking system or as specialised development agencies or as **revolving funds. Positive lists** can assist financial institutions in meeting technical assessment requirements for energy efficiency projects, while **financial incentives** offer supporting credit enhancement measures (e.g. grants, interest-rate buy downs, loan loss reserves).

## ROLE OF DIFFERENT ACTORS

Project developers often design energy efficiency projects, sign project implementation agreements with clients (e.g. SMEs, commercial building owners, etc.) and apply for loans with financial institutions. Financial institutions evaluate credit applications from borrowers, conduct due diligence, assess borrower risk and the commercial viability of energy efficiency projects, and seek portfolio guarantees. Where available, insurance covering energy efficiency risks can also support credit evaluation and access to finance. IFIs or government authorities set up and manage guarantee programmes, review guarantee applications, provide technical and financial evaluation of the projects, and sign guarantee agreements.

**CASE STUDY: COMMERCIALISING ENERGY EFFICIENCY FINANCE (CEEF) (CENTRAL AND EASTERN EUROPE)**

The Commercialising Energy Efficiency Finance (CEEF) Programme in Central and Eastern Europe involved a risk-sharing and risk management facility through partial credit guarantees. CEEF provided partial guarantees to share in the credit risk of energy efficiency loans, which local partner financial institutions would fund with their own resources. This helped mitigate loan repayment risk. The risk sharing facility was offered as a joint programme of the International Finance Corporation (IFC) and Global Environment Facility (GEF). IFC used a 50% pari passu risk-sharing structure for the programme. IFC served as guarantor pursuant to guarantee facility agreements with participating local financial institutions. The CEEF was complemented by technical assistance for capacity building within financial institutions performed by energy service companies (ESCOs), project developers, and project hosts. Eligible projects included capital investments aimed at improving energy efficiency in buildings, and industrial processes. In total, 14 participating local financial institutions financed 829 projects. No guarantees have been called for under CEEF and 41 project developers/ESCOs have been involved in the implementation of guaranteed projects.[110]

*Guarantees are also outlined in chapter 3 and 5, given that they are also applicable to the residential and public sectors.*

## k. Energy savings insurance model

### OVERVIEW OF THE MODEL

The energy savings insurance (ESI) model includes financial and non-financial elements that work together to create trust and credibility among key energy efficiency market actors, and to reduce energy efficiency investment risk. The ESI model is typically designed to drive investments from small and medium sized enterprises (SMEs) in efficient technologies.

The elements of the ESI model are:

- **Standardised contracts:** Standardised, simplified contracts offer a clear and transparent framework for negotiations between key actors (SMEs and technology providers) on how a project's energy savings are guaranteed. This reduces the risks involved in energy efficiency projects, distributes the remaining risk to appropriate actors, and fosters trust among them.
- **Energy Savings Insurance:** The strategy facilitates access to a risk coverage product provided by a third party to insure against the technology provider failing to fulfil its contractual obligations regarding the energy savings. The insurance creates trust between the SME and the technology provider and reduces the credit risk of the SME.
- **Validation:** An independent technical validation process is integrated into the model, to overcome the perceived high-performance risk of energy efficiency projects. An independent validation entity evaluates the capacity of the project to deliver promised energy savings, verifies the installation, and acts as an arbitrator if required.
- **Financing:** Competitive credit conditions, favourable loan tenors, and support in accessing collateral can help SMEs finance energy efficiency solutions. It is possible to link existing financial instruments (e.g., credit **guarantees** for SMEs or **"green lines"**) to enable energy efficiency projects, using ESI. The financial institutions benefit from the ESI mechanism because it reduces the credit risk of their borrower and mobilises green finance.

### BENEFITS AND CHALLENGES

SMEs represent a significant market opportunity for energy efficiency improvements. However, this opportunity remains largely untapped. Energy use constitutes a substantial proportion of production costs for many SMEs, particularly in energy-intensive sectors that rely on heating or cooling for their processes or the provision of their services.

Investments in new efficient technologies present attractive returns – often generating cash savings that allow investors to recover their investment in a reasonable period, while also improving productivity, efficiency and reducing emissions. Despite these advantages, investments in energy efficient technologies by SMEs are not happening at the rates expected or needed for achieving energy efficiency improvement goals for climate change mitigation.

There are barriers inhibiting enterprises from investing in EE, especially at SMEs, which represent most enterprises. These barriers include: a lack of trust between market actors, including the clients and the technology providers; energy efficiency not being a high investment priority for enterprises; a lack of stable and accessible financing instruments; and a lack of experience with financing EE. In summary, there is a high-perceived risk of energy efficiency investments that inhibit SMEs from investing in EE. The ESI model has been designed to tackle those barriers.

The implementation of the ESI model requires initial funding for the development of the program and engagement of key actors, such as the insurance companies, financial institutions, technology providers and a validation entity, identification of key sectors with energy efficiency investment potential, and initial targeting of marketing campaigns. Implementation should include supporting activities, such as communication and marketing activities, capacity building for key market stakeholders, and support to build initial pipelines of energy efficiency projects. In the long run, the model is taken-up by the market and is self-sustaining.

Despite being an additional cost to SMEs, the insurance and validation processes for the ESI model are designed to be standardised and to not result in a significant impact on the return of investment in energy efficiency projects.

## SUPPORT MECHANISMS

The ESI model is compatible with other energy efficiency instruments and can be supported by existing credit **guarantees** for SMEs, commercial **green credit lines** or **on-bill financing** schemes.

At the core of the ESI model is the standardised contract, with **energy savings guaranteed,** which can also be an instrument used by ESCOs, independently of the additional ESI elements

## ROLE OF DIFFERENT ACTORS

Development agencies, governments, or private actors can implement the ESI model. Stakeholder engagement is the key for successful implementation. Stakeholders include technology providers, insurance companies, financial institutions, and a validation entity. Government and industry associations can also support communication and dissemination of the ESI model.

**CASE STUDY: ENERGY SAVINGS INSURANCE (LATIN AMERICA)**

Energy Savings Insurance has been developed and led by the Inter-American Development Bank (IDB), with the support of BASE, and with on-going projects in seven countries. In Colombia and Mexico alone, the model is expected to mobilise over USD 45million in SME investments in energy efficiency technologies.[1]

ESI was recognized by the Global Innovation Lab for Climate Finance[111] as one of the most promising instruments to mobilise private sector investments in EE. ESI also features in the G20 energy efficiency Investment Toolkit.[112]

Beyond Colombia and Mexico, the ESI model is currently being developed and implemented in Argentina, El Salvador, Chile, Brazil, Nicaragua, Paraguay, Peru, by the IDB and supporting partners,[113] as well as in Europe (Italy, Portugal, Spain) by BASE with funding from the European Commission's Horizon 2020 Research and Innovation Programme.[112]

# 5. FINANCING ENERGY EFFICIENCY IN THE PUBLIC SECTOR

## 5.1 INTRODUCTION

This chapter provides an overview of financing mechanisms, business models and risk coverage mechanisms designed to encourage investments in energy efficiency in the public sector. The public sector is broad in scope and includes public street lighting, administrative buildings, hospitals, schools and other public facilities. The models that will be most effective for each segment may vary. The chapter briefly describes a broad range of models, which are designed for different appliances and different country contexts. The list is not exhaustive but provides an overview of the most promising and widely used models.[7]

The following table shows common types of financing and funding sources for public sector energy efficiency. Financing is typically provided by national and international entities.

| SOURCE | TYPE |
|---|---|
| Banking institutions | Credit |
| | Leasing |
| National development banks (NDBs) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| Bi/Multilateral development banks (MDB) | Credit/leasing |
| | Credit guarantees |
| | Grants |
| ESCOs (Energy Savings Companies) | Performance-based financing |
| Guarantee institution | Credit guarantees |
| Utility | On-bill financing |

The public sector can raise capital from the market using green bonds. The use of green bonds is increasing, especially for municipalities and infrastructure projects.

*7 Please consult the many helpful U4E publications and guidelines.*

# 5.2 FINANCING MECHANISMS AND BUSINESS MODELS FOR THE PUBLIC SECTOR

## a. Public private partnerships

### OVERVIEW OF THE MODEL

Many governments are turning to the private sector to design, build, finance, and operate infrastructure traditionally provided by the public sector.[114] It may be appropriate to use private investment for some types of public energy efficiency investments, such as large or higher-risk projects. One way of handling such investments is with public private partnerships (PPPs).[115]

PPPs are long-term contracts, typically 20 or more years, where the private sector constructs and maintains a project's physical assets, and raises the required funding, usually on a project finance basis where contractual payments from the public sector are the primary security for funders. However, "PPP" does not have a legal meaning and can describe a variety of arrangements involving the public and private sectors working together in some way.[114] The general goal is to ensure the lifetime costs of such public assets are minimised and required services are competitively provided.

Under a PPP, a private sector firm creates or maintains the public asset at its own cost. The public sector counterpart agrees to cover the costs over time, including the cost of capital, which is typically higher than if the public sector had funded the project itself. Such projects still result in higher value to the public if the higher cost of capital is offset by greater efficiencies elsewhere.[116] The key advantage of PPPs for municipalities is the source of capital, which is typically the private sector; national governments may incentivise PPP contracts by offering supplementary grants. There is no need for a municipality to raise up-front capital.[117]

Energy efficient street lighting is an example of a public service that can be implemented through a PPP (see case study below).

### BENEFITS AND CHALLENGES

The main benefit of using a PPP arrangement instead of conventional public procurement process is that optimal risk sharing with a private partner delivers better value for the public user; PPPs offer policy makers an opportunity to improve the delivery of services and the management of facilities.[118] [119] Another benefit is mobilisation of private capital. Demand for investment in public services shows that government resources, even when combined with donor funding, can fall short of the amount required for public projects. Access to private capital can speed up the delivery of public infrastructure.

However, PPP arrangements are more complex than conventional public procurement processes. They require detailed project preparation and planning, and proper management of the procurement phase to spur competition among bidders. They also require careful contract design to set service standards, allocate risks, and reach a reasonable balance between commercial risks and returns. These features require skills in the public sector that are not typically called for in conventional procurement.[120]

### SUPPORT MECHANISMS

PPPs can be supported by **green credit lines** and other sources of private equity, **ESCOs and EPCs.**

### ROLE OF DIFFERENT ACTORS

Government policymakers at national or sub-national levels need to create a clear public rationale for PPPs.

Public works department officials identify projects suitable for PPPs and manage the projects. Procurement staff may manage the PPP process.

Private entities secure project financing and install and maintain the energy efficient technology.

National governments may supplement project funding.


**CASE STUDY: LED STREET-LIGHTING IN BIRMINGHAM (UNITED KINGDOM)**

Street lighting is an essential public service typically provided by public authorities at the sub-national or municipal level. Municipalities are increasingly investing in energy-efficient street lighting systems to replace or enhance out-dated systems.[119] Most public lighting is concentrated in cities, where it can comprise up to 65% of municipal electricity budgets.[120] As rural-urban migration continues, and 5 billion people (comprising 60% of the world population) are expected to live in cities by 2050, the demand for public lighting is similarly expected to grow. LED public lighting has the potential to help cities significantly lower costs and improve the quality of lighting, which in turn improves the safety and liveability of cities.[26]

Like many former industrial city powerhouses, Birmingham's industrial tax revenue base eroded over the years while its expenses increased. The city struggled to properly maintain its aging public infrastructure, postponing needed maintenance and upgrades, including streets and street-lighting. In 2000-01, Birmingham City Council (BCC) conducted a Best Value Review to solve this challenge. The decision was to use a PPP, combined with national government support, to finance highway upgrades, including street-lighting improvements. The BCC contracted with a private service provider to conduct the work over a 25-year period (2015-2037). The value of the contract is USD 4.2 billion, of which USD 117 million is for street lighting, including 97,000 street lights and 1,100 traffic lights. The effort was Europe's first LED street light retrofit project financed through a PPP.[121]

Under the PPP contract, BCC receives a modern street lighting system operated and maintained over 25 years. Amey, the service provider, determines what products are procured and funded. Under the PPP agreement, Amey receives a single monthly payment from BCC with certain deductions allowed. Any energy savings that Amey realizes in the lighting scheme, estimated to be 50%, accrue to its benefit. However, Amey also assumes the full risk of potential maintenance costs over the lifetime of the LED lamps.[121]

## b. Revolving loan funds

### OVERVIEW OF THE MODEL

Revolving loan funds are an effective way to encourage public sector investments in energy efficiency. Revolving loan funds start with a fixed pool of capital, which is leant to end users for projects that fit a specific purpose, such as energy efficiency upgrades.[122] The loan is then repaid to the fund, often with a small amount of interest. The replenished money can be re-lent to new end users in a revolving manner.[19] In most case the interest paid by the end users is used to pay the administrative fees for the fund. Public sector focused revolving loan funds are typically managed by a government agency or by a government-backed entity.[19,122]

Revolving loan funds have been successfully used in the USA and in the United Kingdom to improve energy efficiency in public buildings such as schools, universities, hospitals, healthcare facilities, national, state or municipal government buildings.[122,123] The United Kingdom's Salix programme is described below as a case study. In the USA, there are public sector revolving loan funds in Alabama, Texas, Kentucky, Alaska and other states.[122]

### BENEFITS AND CHALLENGES

The key benefit of public sector revolving loan funds are that they are typically offered at very low interest rates with longer term tenors than available from commercial banks. In some cases, repayments can be matched with utility bill savings that result from the improved efficiency, meaning that the public entity would not notice any substantial difference in their expenditures.

A drawback of revolving loan funds is that they require an initial pool of capital, which is often limited or can be difficult to source. For many public sector revolving loan funds, the initial capital is sourced through public channels, including through energy ministries. These sources are often limited, and once the initial pool has been lent, more lending cannot occur until the repayments are made, which takes place over many years. Revolving loan funds also often have high administrative costs.[19]

Revolving loans funds can be well suited to public sector energy efficiency projects, as public sector bodies typically rely on government based sources of revenue as it is, or a combination, and less so on financial institutions directly. In the United Kingdom and USA, public sector focussed revolving loan funds have been operating for many years.[124]

### SUPPORT MECHANISMS

Public sector revolving loans funds can be implemented in conjunction with **energy performance contracts.**

### ROLE OF DIFFERENT ACTORS

Public sector focussed revolving loan funds are typically administered by government entities at national, sub-national or municipal level, including public utilities, universities or other government-backed entities.[19]

**CASE STUDY: SALIX FINANCE LTD (UNITED KINGDOM)**

Salix Finance Ltd. is an independent, not-for-profit, publicly funded company in the United Kingdom. Salix is dedicated to providing interest free loans to the public sector for energy efficiency projects. All public sector organisations are able to access the funds, including schools, higher and further education institutions, emergency services, hospitals, local authorities and others. The loans are repaid using savings made on energy bills. As of 2019, Salix has funded 17,000 projects with 2,300 public sector bodies, with a total value of GBP 742 million. Salix is funded by the Department for Business, Energy and Industrial Strategy, the Department for Education, the Welsh Government and the Scottish Government. Salix offers loans for over 100 different energy efficient technologies. [124]

*Revolving loan funds can also be used to finance energy efficiency improvements in the residential sector and the commercial sector, and are also discussed in chapters 3 and 4.*

## c. Energy performance contacts - shared and guaranteed savings models (ESCOs)

### OVERVIEW OF THE MODEL

Energy performance contracts (EPCs) enable funding of energy efficiency upgrades from cost reductions. Under an EPC arrangement, an external organisation, typically called an Energy Service Company (ESCO) implements an energy efficiency project and uses the stream of income from the cost savings to repay the project costs. The ESCO only receives full payment if the project delivers predicated energy savings; this transfers project technical risks from the client to the service provider.

There are two major contracting models defining the relationships and risk allocations among the ESCO, customer and lender: the shared savings model and the guaranteed savings model. In shared savings models, the ESCO invests in the project. The cost savings resulting from the energy upgrade are quantified, and for the duration of the contract a pre-determined share of this amount will be used to remunerate the ESCO. The ESCO thus takes over both the performance and the customer credit risk, and acquires financing. In guaranteed savings models, the ESCO guarantees a certain level of energy savings by covering, in case of underperformance, the monetary value of the difference between predicated and actual energy bill savings based on a specified utility rate. This shields the customer from any performance risk. The customer is directly financed by a financial institution, repays the loan and assumes the investment repayment risk.[92,93,94] The feasibility of EPC projects depends on the predictability of energy use, the level in energy efficiency, the price of energy, the size of the investment, the complexity of the project, and the legal, financial and regulatory rules.[95,96] Public and institutional sector customers provide great opportunities for ESCOs to develop projects. Indeed, facilities such as municipal agencies, universities, schools and hospitals are large, possess aging infrastructure, and have limited capital budgets for improvements.[125] In addition, the energy consumption of public projects are often predictable, for example in the case of street lighting where load variations are small.

### BENEFITS AND CHALLENGES

ESCO models benefit customers by:

- Reducing or eliminating the performance risk and need for internal technical expertise.
- Incentivising the ESCO to provide state-of-the-art products and services and to optimize its operation to achieve high energy savings.
- In the case of the shared savings model, the customer does not have to invest and the project is financed off balance sheet.

The main risks and challenges to establish EPC arrangements in the case of shared savings contract:

- Possible payment default of customer after installation.
- Uncertainty of baseline measurement and unexpected increase in installation costs.
- Leverage problems for ESCOs who can become too indebted.
- An adversarial relationship between the ESCO and customer can be created because higher than expected measured savings translate into higher payments to the ESCO. New approaches attempt to overcome this.[97,98]

The guaranteed savings concept is also exposed to uncertainties with the baseline measurement, and can be difficult to implement in developing markets because it requires customers to assume investment repayment risk. **Energy Savings Insurance** adds additional risk mitigation mechanisms to EPCs and facilitates adoption in developing countries.[99,100]

## SUPPORT MECHANISMS

Shared-savings EPC models can be supported by financial tools to recapitalise the ESCOs such as sale and leaseback or the securitisation of cash flows, by risk mitigation mechanisms such as payment **guarantees** to reduce the risk of default from the end-client and by **positive lists.**

Guaranteed-savings EPC models can be supported by standardised contracts, independent validation entities, additional insurances to cover the customer in case of non-compliance by the ESCO, credit **guarantees** to support the client to assume the investment repayment risk and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

Governments can support the adoption of EPC models by lifting institutional barriers as a market creator as well as a rule setter through removing barriers and mobilising necessary capital needs.[101] Governments can simplify local regulations, enable agencies to enter into multi-year performance contracts, and offer technical support and facilitation from agencies that develop and administer program regulations.[125] In order to facilitate large-scale implementation of energy efficiency projects, Governments have established and capitalised "Super ESCOs" to implement projects in public facilities, to support capacity building and project development activities of existing private ESCOs, and in some cases to provide these private ESCOs or their customers with financing.[102]

In guaranteed savings models, financial institutions can support the capitalisation of the service providers with loans or through mechanisms such as sale and leaseback.

**CASE STUDY: ENERGY EFFICIENCY PROGRAM FOR PUBLIC BUILDINGS (PEEEP) (CHILE)**

The Energy Efficiency Program for Public Buildings (PEEEP) in Chile focuses on energy efficiency retrofits with a particular focus on hospitals.[126]

Projects were financed through Energy Service Companies (ESCOs) using guaranteed savings Energy Performance Contracts. The energy efficiency upgrade projects were advertised via an open tender to ensure competitive pricing. The technical validation was done by the Energy Efficiency Agency of Chile and used a bank guarantee for one year to guarantee the savings.

The PEEEP commenced in 2009 and is structured in an integrated way covering diagnosis, implementation, measurement and verification and capacity building. The Chilean government, as part of this program, allocated CLP 10,000m (USD 14.7m) for improving energy efficiency in 57 public hospitals up to 2018, out of which 14 hospitals were improved in 2015.[127]

*Energy performance contracts and the ESCO model are also outlined in chapter 4, given that they are also applicable to the commercial sector.*

## d. Crowd funding and crowd lending

### OVERVIEW OF THE MODEL

Crowd funding is the mobilisation of funding for projects from a large number of investors using internet-based platforms and online processes. Crowd funding can take different forms (i.e. donations, rewards, crowd-lending or debt, equity, royalties), which can be split into two categories: community crowd funding and financial return crowd funding[103]. The size of the investment by individual investors can range from very small (e.g. could be as low as EUR 50) to large. Crowd funding uses a large range of modalities and business models[104].

Crowd funding for energy efficiency (CF4EE) can be used when there is a lack of affordable financing or high upfront costs for implementing or scaling up cost-effective energy efficiency measures. A typical CF4EE process follows the following steps.[105]

- A project developer or Energy Service Company (ESCO) enters into a contract with crowd funding platforms (CFPs) defining the fees, terms and conditions.
- The energy efficiency project is listed on the website of the CFPs and the fundraising campaign kick starts with a real-time project funding process for potential investors.
- Potential investors pledge amounts online and enter into individual investment agreements after security and financial clearance.
- Crowd-lending investors provide a loan to the project developer expecting both interest payments and principal return later on, or offer to acquire a share in the project developer in return for dividends or an increase in the value of their share in the future.
- The project developer can then mobilise the funding to finance upfront costs of the energy efficiency project for a public entity (e.g. a school or hospital.)
- The public entity pays back the project developer through a financing mechanism, such as a lease purchase agreement over a fixed period of time with annual payments (see the School LED lighting case study below.)

### BENEFITS AND CHALLENGES

Debt and equity crowd funding can scale-up energy efficiency projects and enable the public sector tap energy efficiency and cost savings potential without investing public money. In addition, crowd funding can lead to better public information and support for energy efficiency projects, and offer market outreach and validation for new energy efficiency technologies.[106] Crowd funding offers the following additional benefits over traditional financial instruments:

- New funding sources, such as small investors with risk appetite for venture capital, and small impact investors.
- Empowers responsible investors seeking greater control over their investments.
- Encourages investors to increase their risk tolerance by offering greater diversification and smaller amounts per investor.
- Increases the speed of decision and transaction processing through standardised online processes.

Crowd funding can be financially viable (i.e. have attractive Internal Rates of Return (IRRs)). However, returns can become very low once crowd funding and project developer costs, i.e. 10 to 20% of the funds raised, are factored in.[105]

Other challenges with the model are:

- Legal uncertainty because regulations are missing or are inappropriately adopted from existing pre-crowd funding legislation.
- Missing institutional capacity, including competent crowd funding platforms (CFP) and support services, such as online-payment to ensure high quality projects and efficient online processes.
- Possible competition from donations or government subsidies, rendering crowd funding too costly by comparison.
- Foreign exchange risk in cross-border crowd funding, which neither crowd investors nor project owners want to bear.

Finally, experience shows that Crowd Funding Platforms (CFPs) dedicated to energy efficiency have grown slower than those dedicated to renewable energy (RE).[106] This is due to the nature of energy efficiency projects, which are less visible and attractive to small investors, and to the availability of and competition with concessional funding for EE.

## SUPPORT MECHANISMS

Both **lease** purchase models and **shared savings contracts** are good supporting mechanisms for crowd funding. There is also a need for a clear regulatory framework to support crowd funding. **Guarantees** can support crowd funding by reducing investment and lender risks through a first loss guarantee facility comforting investors that dividend and interest payments will be paid even in the event of project default.

## ROLE OF DIFFERENT ACTORS

CFPs and small investors mobilise funding, enabling project developers (e.g. ESCOs) to afford the high upfront costs of energy efficiency investments, which in return unlocks energy savings shared with public entities (e.g. a school or hospital). Utilities are indirect beneficiaries of those savings. In addition, aid agencies or donors can help governments develop appropriate regulations and offer capacity building to CFPs and regulators. Lastly, professional financial institutions, institutional investors, venture capital and angel investors enable CFPs to tackle more complex and larger projects.

**CASE STUDY: SCHOOL LED LIGHTING (HUNGARY)**

An LED lighting project for a school in the city of Szeged in Hungary was executed by the Hungarian subsidiary of a German Energy Service Company (ESCO). The campaign mobilised 92 investors and was completed within 16 days. The ESCO raised a 7-year loan with an interest of rate 7% per annum through a crowd funding platform. Then, the ESCO sold the LED installation to the school through a lease purchase over 10 years with annual payment of about EUR 6,540 denominated in local currency. The school facility served 1,150 children and youths. The project focused on installing LED lighting in a new extension of the facility (approx. 1,000m$^2$) and on the sports field. The project, with a total investment cost of EUR 46,400, was to generate savings from reducing electricity costs for lighting by over 70% (or approximately EUR 7,280 annually, not accounting for possible increases in energy prices) and from reduced maintenance costs. In addition to financial savings, the project educated young people about practical steps towards creating a low carbon future.[105]

*Crowd funding is also outlined in chapter 4, given that it is also applicable to the commercial sector.*

## e. On-bill financing models

### OVERVIEW OF THE MODEL

On-bill financing is an innovative approach to financing energy efficiency upgrades for municipalities and public buildings. The model enables energy utility customers to acquire energy efficient equipment, such as air conditioning and lighting systems, and to pay for the equipment over time through their monthly utility bills. In many cases, on-bill programmes are designed to deliver overall cost savings from the very first day without the need for the customer to invest (bill neutrality). This means that the energy cost savings equal or exceed debt service, resulting in a lower total bill (debt repayment and electricity) after retrofit.[37,38]

Through on-bill financing, utility customers can purchase efficient equipment with their regular technology provider, who facilitates the credit request. There are several ways to structure on-bill financing models:

- In one approach, the utility incurs the capital cost of the energy efficiency upgrade, which is repaid through the utility. The utility thereby effectively takes on the role of a financing entity in addition to selling electricity.
- Another approach, sometimes referred to as "on-bill repayment", the upfront capital is provided by a third party, typically public or private financial institutions, rather than the utility. In exchange for a management fee, the utility acts as a repayment conduit, collecting the payments through the electricity bills for the original lenders[39,40,41]

### BENEFITS AND CHALLENGES

The biggest customer benefits of this model are the avoided upfront capital expenditure and the ease of repayment. This can help motivate investments that may not otherwise happen. On-bill financing models tend to have low default rates. This is because the loan has bill neutrality, as well as due to the tendency to prioritise utility bill payments and, where allowed, the utility's ability to shut off service in the event of non-payment.[38,39]

*On-bill models are also outlined in chapter 3, given that they are also applicable to the residential sector.*

The increased energy efficiency on the demand side benefits utilities on the supply side through the avoided cost and risks of building additional power plants, new power lines, substations, and transformers. Energy efficiency can also reduce a utility's cost of complying with major national or international environmental rules. In some cases, the on-bill mechanism is a good opportunity for utilities to make inroads into financial services benefiting from their secured client-base who are already making frequent payments for their utility services.

The main risks and challenges to establishing an on-bill financing mechanism are:42

- Engaging the utility to support the transition towards energy efficiency and/or to serve as a financier.
- Evaluating credit risk of customers through their historical payments.
- Changing the utilities data and information management system to allow for on-bill repayment.
- Customer risk of power shut-off. This can be mitigated by enabling customers to obtain assistance with complaints, raise legitimate issues related to the loan and the project funded by the loan, and access a dispute-resolution process.
- Repayment allocation (i.e., whether utility or lender is paid first) can be an issue when customers partially pay their bills.

### SUPPORT MECHANISMS

On-bill financing can be supported by capitalising new on-bill **loan** funds, through credit enhancement for existing on-bill funds, such as loan **guarantees,** and by **positive lists.**

### ROLE OF DIFFERENT ACTORS

The success of the model depends mostly on the interest and engagement of the utility, which in many cases is in part or in whole, government owned. The government can support the model by capitalising new on-bill loan funds, providing credit enhancement for existing on-bill funds, such as loan guarantees.

Governments and development agencies can play important roles by providing technical support in setting up the model.

## f. Leasing

### OVERVIEW OF THE MODEL

A lease is an arrangement in which one party (the lessor) conveys the use of an asset (a parcel of land, building, service, or an air conditioning system) to another party (the lessee) for a specified period of time in exchange for periodical payments. There are two basic forms of leasing: operating leasing and finance leasing. The differences between the two involve: who owns the leased asset; what accounting and tax treatment applies; who bears the expenses and running costs; whether the contract includes a purchase option, and; the lease term length. Leases can be offered directly by the technology supplier (vendor lease), by a financial institution, or by a third-party such as a leasing company.

An operating lease is similar to equipment rental: the ownership as well as all associated risks and rewards remain with the lessor, the asset is returned by the lessee after the lease term, the asset never appears on the lessee's balance sheet and the lease payments are treated as operating expenses. A finance lease is similar to a loan, in which the equipment itself serves as collateral for the lender: the lessor maintains ownership of the asset while the lessee enjoys the use of the asset for the duration of the lease agreement, usually accompanied by an option to buy the asset at the end of the contract or before the contract ends. The lessee bears all costs and risks associated with the use of the leased asset, and the asset appears on the lessee's balance sheet because the lease is recorded by the lessor as a sale and by the lessee as a purchase. Leasing is an attractive tool to finance energy efficiency upgrades for the public sector, such as for municipalities, Public hospitals/ universities/schools, semi-governmental institutions, government ministries, and government owned corporations.[83,84]

### BENEFITS AND CHALLENGES

Leasing arrangements benefit customers from the public sector by avoiding upfront capital investments, the possibility to use the equipment itself (instead of another asset or property) as collateral, the lack of restrictive covenants, industry-leading equipment without the risk of obsolesce, flexible arrangements in which the equipment might be returned or purchased during the contract period, and a transparent and predictable pricing structure.

In case of an operating lease, the model converts client capital expenses into operational expenses, affording the client tax benefits and other advantages such as off balance-sheet financing. Both forms of leasing free-up capital for other investment priorities.[85,87]

The main risks and challenges to establishing leasing mechanisms are:

- Regulations in the country must allow multi-annual financing for municipalities /public buildings.
- Regulatory barriers, preventing leasing without a license by the central bank.
- The legal and tax environment make it less attractive for financial institutions to offer leasing than loans.
- Resource constraints: leasing investment involves significant capital outlay for the lessor, which is a challenge for vendor leases.
- Risk of obsolescence for the lessor in case of short contracts and rapidly-evolving technology.
- The lessor faces the risk of delay in rental payments or payment default, which can be reduced by evaluating the credit risk of customers, and by mechanisms such as payment guarantees and equipment reallocation procedures.
- Equipment reallocation procedures can face legal challenges when the equipment is installed on the client's property and should be considered when designing the leasing contract.

## SUPPORT MECHANISMS

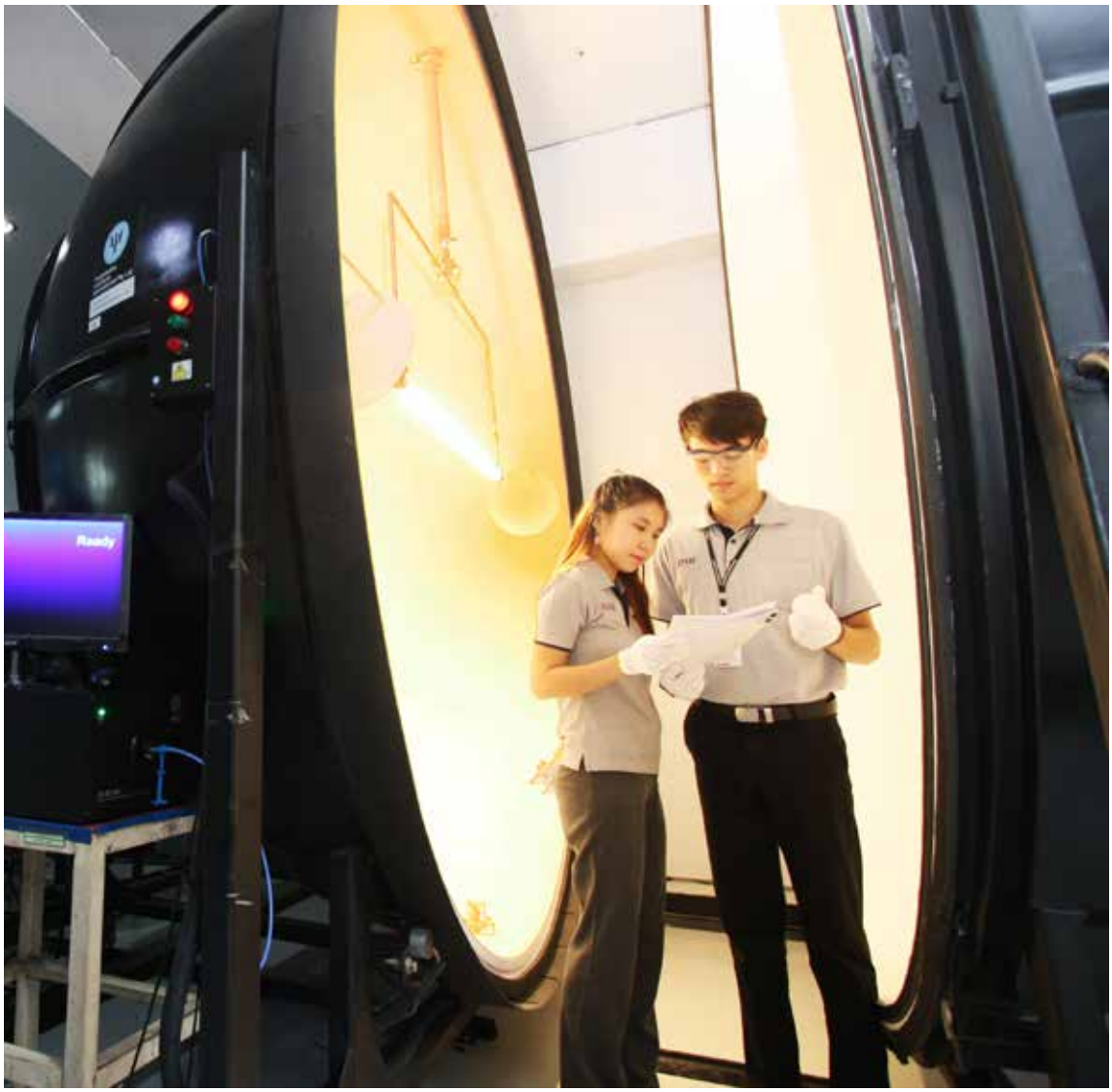
Leasing models can be supported by risk mitigation mechanisms such as payment **guarantees** to reduce the risk of default from the end-client, by carefully analysing the credit risk of the clients, and by validating the technology with **positive lists.** In case of vendor leases, financial tools to recapitalise technology such as sale and leaseback or the securitisation of cash flows can decrease the resource constraints of the lessor.

*Leasing is also applicable to the commercial sector, outlined in chapter 4.*

## ROLE OF DIFFERENT ACTORS

Government regulators can support leasing by simplifying leasing operations in the local regulations, by creating a favourable legal and tax environment, and by authorising, enabling or offering risk mitigation mechanisms such as payment guarantees.

The private sector must be involved because technology providers need to re-evaluate their business operations, and in some cases take part of the credit risk. Financial institutions can offer leasing directly or support the technology provider capitalisation through mechanisms such as sale and leaseback. Utilities can also play an important role, such as in utility-led leasing programmes.[88]



## g. Pay-per-service models: Equipment-as-a-Service and district service models

### OVERVIEW OF THE MODEL

The standard business model for delivering energy services such as lighting, cooling, heating, mechanical power, compressed air, involves the manufacture, sale, use, and disposal of equipment. Higher production volumes support more sales and more profit. As a result, manufacturers lack a strong incentive to voluntarily minimise the energy and resource use of the equipment they sell. Alternative business models are possible, and can promote much more energy and resource efficient technologies.

Pay-per-service (PPS) models are based on the servitisation concept - transforming a traditionally product-focused business model into a service-focused one. This involves end customers paying for the service they receive, rather than the physical product or infrastructure that delivers the service. The technology provider installs and maintains the equipment and recovers costs through periodic customer payments. These payments are fixed-cost-per-unit for the service delivered (for example, dollars per cubic meter of compressed air, per tonne of refrigeration, or hours of lighting), and are based on actual usage. The payment is not dependent on the savings (as with an **ESCO model**) but agreed in advance as a function of actual usage. This makes it easier and more transparent for the client. The equipment can either be installed directly on the customer's property (Equipment-as-a-Service), or in the case of services such as cooling, heating and compressed air, a larger infrastructure can be installed in a separate location to serve several customers with the same facility (district service). Public and institutional sector customers such as municipal agencies, universities, schools and hospitals can benefit from pay-per-service models.

### BENEFITS AND CHALLENGES

Pay-per-service models benefit customers through lower energy and maintenance costs, the absence of upfront capital investments, industry-leading equipment, and a transparent and predictable pricing structure. The model effectively turns a capital expense into an operational expense for clients, freeing up capital for other investment priorities. The model also reduces the perceived technology risk for the clients, as they are not required to invest in the technologies directly, and are not exposed to equipment failure.

PPS gives technology providers a stronger incentive to increase their own profits by reducing their products' operating costs through innovation, helping overcome 'split incentives' between manufacturers and users.

PPS can also increase the likelihood that the equipment is effectively serviced and maintained, lowering the risk of unplanned breakdowns and creeping inefficiency. PPS business models typically require a circular economy whole lifecycle approach to asset management, maximising the value of equipment and benefits provided by the asset throughout its operating lifetime, including at end-of-life (e.g. for re-use/ re-sale, parts harvesting, etc.).

The main risks and challenges to establishing PPS mechanisms are:

- Regulatory barriers might need to be addressed individually in some countries by designing contracts aligned with national legislation (e.g. leasing or service contracts, or barriers for public agencies to enter into multi-year performance contracts).
- Technology providers face the risk of payment default, which can be reduced by evaluation of the credit risk of customers, with mechanisms such as payment guarantees and equipment reallocation procedures.
- Equipment reallocation procedures can face legal challenges when the equipment is installed on the client's property and should be considered when designing the PPS contract.

## SUPPORT MECHANISMS

PPS models can be supported by financial tools to recapitalise technology providers such as sale and leaseback, or the securitisation of cash flows, by risk mitigation mechanisms such as payment **guarantees** to reduce the risk of default from the end-client, and by **positive lists.**

## ROLE OF DIFFERENT ACTORS

PPS models need strong engagement from the private sector, since technology providers need to re-evaluate business operations and take part of the credit risk.

Governments can support by simplifying leasing or service contracts in local regulations, by enabling public agencies to enter into multi-year service contracts, and by authorising, enabling or offering risk mitigation mechanisms such as payment guarantees. Financial institutions can support the capitalisation of technology providers through mechanisms such as sale and leaseback.

*District service models and servitisation are also outlined in chapter 3 and 4, given that they are also applicable to the residential and the commercial sectors.*

**CASE STUDY: DISTRICT COOLING (COLOMBIA)**

In Colombia, UNDP and the National Ozone Unit provided technical assistance for the establishment of a district cooling project which is currently under construction, and will include several public buildings led by Empresas Publicas de Medellin (EPM) and the National Ozone Unit.[128]

## h. Bulk Procurement

### OVERVIEW OF THE MODEL

Innovative, high-efficiency and high-quality products often face barriers to market entry, from price to lack of product recognition. Market transformation tools like bulk procurement help bring these products to market at an accelerated pace.[46]

Bulk procurement is a no-subsidy, demand-driven mechanism that provides economies of scale, enabling manufacturers to bring down their prices through successive rounds of efficient and transparent bidding to create a large and sustainable market for energy efficient technologies.

Government authorities or utilities issue tenders with a set of qualifying criteria to buy large numbers of energy efficient products, while manufacturers compete on price bids. In each round, multiple bidders are selected and all of them are asked to match the price of the lowest bidder. The volume of the bid is then allocated to all the manufacturers who agree to match the lowest price in the bid. Aggressive bidding by manufacturers and the exclusion of regular dealers and retailers tend to drive down the price of procured energy efficient products. Improved manufacturing and competition lower retail market prices for the targeted energy efficient products as well.

For instance, using bulk procurement, India is implementing the Street Lighting National Program (SLNP) where government authorities or utilities retrofit conventional streetlights with LED light bulbs in municipalities or cities and maintain them for a certain period of time. Parties enter into long-term annuity agreements using a savings approach and monthly instalments. The entire investment is made upfront by government authorities or utilities and recovered along with operation, maintenance, and financing costs, from the energy savings of municipalities and cities over time.[48]

Building on the success of SNLP, India is expanding its programs to new market segments that offer significant opportunities for EE, including the Building Energy Efficiency Program (BEEP) for energy efficiency in public buildings, by procuring the necessary equipment for carrying out retrofits, payable under a **guaranteed savings** approach or **ESCO model.**

### BENEFITS AND CHALLENGES

With bulk procurement, large-scale energy efficient technology deployment is feasible without government subsidies. There are many examples in the literature of effective bulk programmes carried out in developed and developing economies for energy efficient products.[46]

One benefit is that repeated tenders of bulk procurement increases and improves domestic manufacturing capacity and fosters competition. Buying directly on a mass scale reduces risk for manufacturers. Bulk demand is also a strong economic incentive for manufacturers to invest more in local assembly lines and lower their costs. As the model allows manufacturers to deal with one procurement agency or entity, they can bypass distributors and retailers and save transportation costs.

By aggregating the demand for a certain product on a national scale, bulk procurement has the potential to transform markets. Most importantly, bulk procurement supports the implementation of efficiency standards, and helps create sustainability in a market, passing on resulting savings to end-users.

However, the potential for product cost reduction through bulk procurement depends on the volume of tenders and the number of suppliers in an energy efficient product market. If both are small, the potential will be limited. Also, retail market disturbances could be challenging if withdrawal plans from bulk procurement are not well-prepared.

## SUPPORT MECHANISMS

Possible supporting mechanisms include:

- Long-term annuity agreements to finance LED streetlights in the public sector (i.e. deemed savings approach and monthly instalments).
- **Guaranteed savings or ESCO model** to finance energy efficiency retrofits for public buildings.
- Credit **guarantees** and concessional **loans** to help government authorities and utilities access new commercial financing sources and scale-up bulk procurement programmes.
- Policies and regulations, voluntary labelling and standards to increase energy efficiency technologies uptake, quality and efficiency.

*Bulk procurement is also outlined in chapter 3, given that is also applicable to the residential sector.*

## ROLE OF DIFFERENT ACTORS

Equally important are the implementing entities buying large quantities of energy efficient products (i.e. government authorities, utilities), and the manufacturers responding to the demand by ramping up production and lowering prices. Municipalities, cities and the public buildings sector play important roles by opening their markets for energy efficiency retrofits and entering into financing agreements with the implementing entities. Multilateral Development Banks (MDBs) or aid agencies also play a role by providing technical assistance and financial instruments to inform the design and scale-up of the programmes.

## i. Municipal financing models

### OVERVIEW OF THE MODEL

Municipal financing models involve revenue and expenditure decisions by municipal governments to fund energy efficiency projects in the public sector. Common sources of municipal revenue include taxes, user fees, intergovernmental transfers, investment income, property sales, and licenses or permits. Municipal financing models finance energy efficiency infrastructure through the use of operating revenues and borrowing, as well as through charges on developers and **public-private partnerships** (PPP). Municipal finance also addresses issues around expenditures at the local level, including expenditure accountability and revenue decisions made through budget processes and financial management.[129]

A municipal government with weak credit or little-to-no borrowing capacity will not be able to access commercial financing or engage in **leasing** or **energy performance contracts.** In these cases, cities may be limited to relying on budget financing or energy efficiency funds established by governments or donors. A municipality with stronger credit and borrowing capacity can use a larger number of financing options (e.g. **credit lines**, risk **guarantees**, etc.)[109]

If the municipal financing model relies on budget revenues, the municipal government typically uses a mix of local taxes and national government transfers to feed annual capital funds for infrastructure investments such as LED street lighting. The funds are tapped to acquire the necessary energy efficiency retrofit equipment from a technology provider who is selected through a competitive bidding process (i.e. national or international procurement.) The winning bidder undertakes equipment installation, in addition offering a fixed-term warranty covering equipment replacement and repair. The municipal government owns the equipment and is responsible for the maintenance after the warranty ends. In this model, the municipal government covers the high upfront costs of the energy efficiency retrofit equipment with its budget. The municipal government recovers the project upfront costs through the expected energy savings of the project over time.

### BENEFITS AND CHALLENGES

The main advantage of the municipal financing model is that financing costs are low. The main disadvantage is that municipal programmes can take a long time to develop, depending on the availability of municipal resources.

Municipal financing models using budget financing (i.e. tax revenues and transfers) allow the municipal government to avoid issuing green bonds and paying additional interest costs on borrowed capital. The expected energy savings achieved by energy efficiency retrofit projects lead to future budget savings that can be allocated by the municipal government to tackle other urgent investment needs. However, budget resources are often limited and the sustainability of budget financing is not assured.

When energy efficiency projects are not fully owned by the local government, such as street lighting (see case study below), the question of asset ownership and financing arrangements between owning entities is challenging. The share of ownership determines the extent of expected energy savings that in time impact the project financial viability (payback time).[130] Other challenges can arise with procurement when bidding on government contracts is restricted to local companies, or ventures in which a local majority ownership is required, which might be a barrier for bidding by cost-effective foreign technology providers, driving up project costs.

## SUPPORT MECHANISMS

Supporting mechanisms for municipal financing models include energy efficiency policies to promote energy efficiency investments such as minimum energy performance standards, which improve procurement processes and increase bid quality, and building inspection and evaluation procedures to ensure procured energy efficiency equipment compliance and performance.

## ROLE OF DIFFERENT ACTORS

Municipal governments play a crucial role in leveraging tax revenues to finance cost-effective energy efficiency projects. Most importantly, they engage with utilities, who lose short-term revenues due to reduced consumption, but could share incurred energy cost savings, while assuring the project is still financially viable for the city which accepts a longer payback time though. Also, donors or aid agencies play a role in raising local awareness and building capacity by providing technical assistance to municipalities. Finally, the central government develops energy efficiency policies, standards and labelling, and ensures cost-efficient procurement processes with the procurement staff of the municipal government.

**CASE STUDY: LED STREET LIGHTING IN QUEZON CITY (PHILIPPINES)**

The municipal financing model was used in Quezon City, Philippines to finance a major public LED lighting project during the 2015 to 2018 period. Project revenue was raised through local and national taxes. Prior to the project, the city's street lighting constituted 65% of municipal electricity costs and 5% of its overall budget. As of June 2015, a total of 3,856 LED luminaires were installed, with a further 2,678 installations underway. Energy savings of 60% were expected at the end of implementation. The program was designed and implemented by a stable city government with enough resources to launch the program on its own, and by partners (i.e. the World Bank, the Climate Group) interested in helping the city given its track record in making environmentally friendly investments. A special purpose vehicle oversaw LED installations, and the luminaire supplier assumed the technology risk by providing a eight-year product warranty. [130]

## j. Guarantees

### OVERVIEW OF THE MODEL

Partial-risk loan guarantees are instruments that can help expand loan financing for commercially viable energy efficiency investments. Financial institutions (e.g. commercial banks, leasing companies) that are not familiar with energy efficiency business models and their risk mitigation options, tend to perceive repayment risks as high. Guarantee instruments are designed to cover part of the risks of loan repayments. They aim to both reduce financial institutions' perceived risks in the short run and to improve their technical and financial confidence in specific energy efficiency project developer models (e.g. ESCO business models) in the long run.[72]

In many cases, international financing institutions (IFIs) or government entities set up and maintain partial-risk guarantee funds, backed by IFIs or government resources (see case study below). These partial-risk guarantee funds enter into guarantee framework agreements with participating financial institutions that initiate the relevant transactions with project developers (e.g. ESCOs) who are seeking loans. These agreements lay out the eligibility criteria and guarantee support (e.g. % of loan amount, first loss coverage, remaining default coverage, maximum tenure, etc.). Then, borrowers submit detailed project documents to the financial institutions, which subsequently apply to the funds for loan guarantees. In return, fund managers ask for small fees (i.e. processing fee, guarantee fee) and then issue partial-risk loan guarantees.[73]

Even with loan guarantee programmes in place, borrowers should still satisfy loan conditions that are commercially viable (e.g. providing collaterals as security).[74]

### BENEFITS AND CHALLENGES

The use of loan guarantee programmes, backed with public funds, helps cover perceived high initial business risks. The experience has shown that loan guarantees are especially useful where the banking system functions fairly well and the fundamental conditions that would allow energy efficiency lending to flourish are already in place (i.e. greater market maturity).[74] In some cases, loan guarantee programmes are not appropriate because the main barriers for commercially viable energy efficiency lending are not perceived high repayment risks, but rather other issues, such as a lack of efficient processes to meet technical assessment requirements or level of market maturity. Loan guarantee programs are not a solution for all difficulties faced in efforts to boost energy efficiency investment in the public sector.

### SUPPORT MECHANISMS

Guarantees support commercial **loan** financing schemes. These programmes operate either within the commercial banking system or as specialised development agencies or **revolving funds**. Partial guarantee funds support the ESCO business models and facilitate **Public Private Partnerships** (PPP), while **positive lists** can assist financing institutions to meet the necessary technical assessment requirements for energy efficiency projects.

## ROLE OF DIFFERENT ACTORS

International financial institutions (IFIs) support partial-risk loan guarantee programmes by helping structure transactions and providing technical assistance to financial institutions (e.g. commercial banks) and energy efficiency project developers (e.g. technology providers, or ESCOs). Project developers design energy efficiency projects, sign project implementation agreements with clients (i.e. public building owner entities) and apply for loans to financial institutions. Financial institutions evaluate credit applications from energy efficiency project developers, conduct due diligence, assess project developers' risk and commercial viability of energy efficiency projects, and apply for guarantees if needed. Government authorities can set up and manage partial-risk guarantees funds, review guarantee applications, provide technical and financial evaluation of the projects, and then sign guarantee agreements.

*Guarantees are also outlined in chapter 3 and 4, given that they are also applicable to the residential and commercial sectors.*

**CASE STUDY: ENERGY EFFICIENCY IN PUBLIC BUILDINGS AND INFRASTRUCTURE PROGRAMME (SOUTH AFRICA)**

The Energy Efficiency in Public Buildings and Infrastructure Programme in South Africa (EEPBIP) includes a guarantee fund to support ESCOs in raising the necessary finance for entering contracts with the public owners of buildings. Its overall goal is to ensure that all South African spheres of government contribute to the national greenhouse gas (GHG) mitigation, energy efficiency and energy security targets. EEPBIP's financial component enables provinces and municipalities to develop bankable energy efficiency investment plans for their public buildings. EEPBIB targets the mobilisation of public and private sector investment in public buildings on a 1 to 3.3 ratio basis and the mitigation of GHG emissions of 610 kt $CO_2$ annually by the end of the programme.[131]

# 6. CONCLUSIONS AND RECOMMENDATIONS

Addressing the challenge of climate change, and achieving the goals set out in the Paris Agreement will require a significant global effort and a significant increase in current levels of funding. Much of this funding will need to come from domestic and private sources.

Energy efficiency is critical to quickly reducing global greenhouse gas emissions, and also delivers numerous other benefits, such as reduced operating costs, increased service quality levels, enhanced energy security, and reduced air pollution.

However, the current rate of investments in energy efficiency is limited by barriers at the global, regional and national levels. Many of these barriers, including the upfront cost hurdle, can be overcome with well-designed financing mechanisms, business models and risk redistribution mechanisms, together with complementary measures such as market transformation policies, regulations, awareness raising activities and behaviour change initiatives.

This manual has outlined innovative financing mechanisms, business models, and financial supporting mechanisms from around the world that have spurred investments in energy efficiency, increasing the leverage of limited public financial resources. Many of these models can be adapted and replicated for new markets or in new regions.

The following recommendations and conclusions are noted:

## MULTI-FACETED AND COLLABORATIVE APPROACHES WILL ACHIEVE THE GREATEST IMPACT

- Financing mechanisms, business models and incentives for energy efficiency are key for mobilising investment, but should be complemented by other efforts in an integrated approach, such as market transformation policies, regulations, awareness raising activities and behaviour change initiatives. These efforts work alongside each other in a complementary manner.
- A multi-faceted, integrated approach that includes policies, regulations, awareness raising activities, as well as smart financing and incentive mechanisms, guided by a national strategy is the best way to ensure long-term market transformation to energy efficient products. In most markets, there are multiple barriers inhibiting energy efficiency investment, which may require a combination and integration of different mechanisms to overcome.
- Impact increases with public and private cooperation. There is a need to bring public and private actors together in partnerships, in order to achieve investments at the scale needed to meet the targets set out in the Paris Agreement and the Sustainable Development Goals. Moreover, public and private sources of finance, when used together can achieve a multiplying effect.

## MECHANISMS AND BUSINESS MODELS SHOULD BE ADAPTED TO LOCAL MARKET CONDITIONS

- There is no “one size fits all” approach to energy efficiency finance. The barriers for each country and market sectors will likely be different, and financial mechanisms should be tailored to the local barriers and the local market and cultural context, as well as the specific target market.
- Mechanisms that work for different end user groups may also vary significantly, depending on the sector (public, commercial or residential sector), as well as the income level. Worldwide, more than 1.7 billion adults are without an account at a financial institution or through a mobile money provider,3 and hence cannot necessarily be serviced with financing mechanisms that are common in economies with high rates of financial inclusion. In these cases, alternative financial mechanisms may be needed.

- Different financial mechanisms are suited to markets at different levels of maturity, both in terms of energy efficiency policies, and regulations; as well as the maturity of local financial systems and overall governance.
- New mechanisms may become appropriate or better suited as energy efficiency and financial markets mature over time.

## MECHANISMS AND MODELS SHOULD BE DEVELOPED WITH A LONG-TERM MARKET-BASED VIEW

- Financial mechanism, business models and incentives should be designed with a long-term view. Concessional or grant finance is best used to help markets mature, and unlock or encourage private investments. Grants or subsidies for example, should be designed in a "smart" way, have a clear exit strategy and should aim to catalyse future growth.
- Care should be taken when designing non market-based financial mechanisms so as not to distort markets in an unsustainable way.
- In many cases, there are winners and losers when new energy efficiency measures are introduced and there is often resistance from various actors. Institutional barriers can be some of the hardest to overcome. For example, electric utilities will sell less electricity as a result of energy efficiency measures and in some cases may resist change. There are often alternative business opportunities for these organisations that present long-term benefits and can help to garner buy in and engagement in a programme.
- Care should be taken not to lock out new technologies or to discourage investments in technology innovation.

## FINANCING MECHANISMS AND MODELS ARE MOST EFFECTIVE WHEN THEY ARE CONSUMER-FOCUSSED

- For energy efficiency finance mechanisms to be effective there is a need to build interest and demand for the right products from consumers. In some cases, this involves developing trust, or awareness, and removing administrative or financial barriers.
- Energy efficiency delivers multiple benefits, which should be communicated and highlighted to the end consumer in order to unlock investments and trigger behavioural changes. In many cases, even when the repayment period is longer term, the other benefits (such as improved comfort, productivity or improved product performance) can be immediate. The appealing benefits for different actors can often be different.
- Various mechanisms can be used to support investments with longer or shorter-term payback periods, but may need to be adapted to the local financial conditions, prices and usage patterns. Some models are designed specifically to deal with investments that have longer-term payback periods.
- Financing mechanisms also include financial risk mitigation instruments that reduce the risks perception for consumers and the other stakeholders involved in a project (e.g. banks, technology providers). Risk mitigation instruments can reduce risk at different levels: Consumers, banks (lenders), energy efficiency technology providers, public sector, etc.. Risk mitigation instruments can unlock access to finance and provide better financial conditions for investors (residential, commercial and public sector).

Standard financial products available on the market can be, and in many cases are being used to finance energy efficiency. In many cases financial products that are in place for other purposes can be adapted to be suitable for energy efficiency. Similarly, many mechanisms that are in place for one sector, be it in the public, residential or commercial, can be adapted to address other sectors.

# 7. USEFUL RESOURCES

## GENERAL GUIDANCE ON ENERGY EFFICIENCY

The IEA has numerous reports and publications on energy efficiency which are released each year. This includes a market report series, global status reports, energy efficiency indicator reports, energy technology research and development reports and others: www.iea.org/topics/energyefficiency/

United for Efficiency has numerous technical reports and guidance documents, such as country assessments, policy guides and model regulations, for different energy efficient technologies: united4efficiency.org/resources/publications/

## FINANCING SOURCES

There are few resources available with an overview of energy efficiency financing sources. The following two publications provide an overview of types, and a directory of sources:

- OECD. Development Co-operation Report 2014: Mobilising Resources for Sustainable Development. (2015). doi:10.1787/dcr-2015-en
- UNEP and BASE. Financing Sustainable Energy Directory: A list of lenders and investors. (2002). doi:10.1057/9780230378384

## FINANCING MECHANISMS AND BUSINESS MODELS

This manual provides an overview of financing mechanisms, business models and risk mitigation instruments for energy efficiency.

The following publications have more detailed explanations of specific models, or case studies:

- Basel Agency for Sustainable Energy, “Public Finance Mechanisms to Increase Investment in Energy Efficiency,” (2006).
- G20 Energy Efficiency Finance Task Group, “G20 Energy Efficiency Investment Toolkit,” (2017).
- The World Bank Group, ESMAP, “Energy Efficiency in the Public Sector”, (2018).
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- WWF, “Financial Vehicles Driving Private Investments in Climate Innovations.” (2012)
- IEA. “Joint Public-Private Approaches for Energy Efficiency Finance.” 1–78 (2011). doi: 10.1016/0360-3016(90)90234-B

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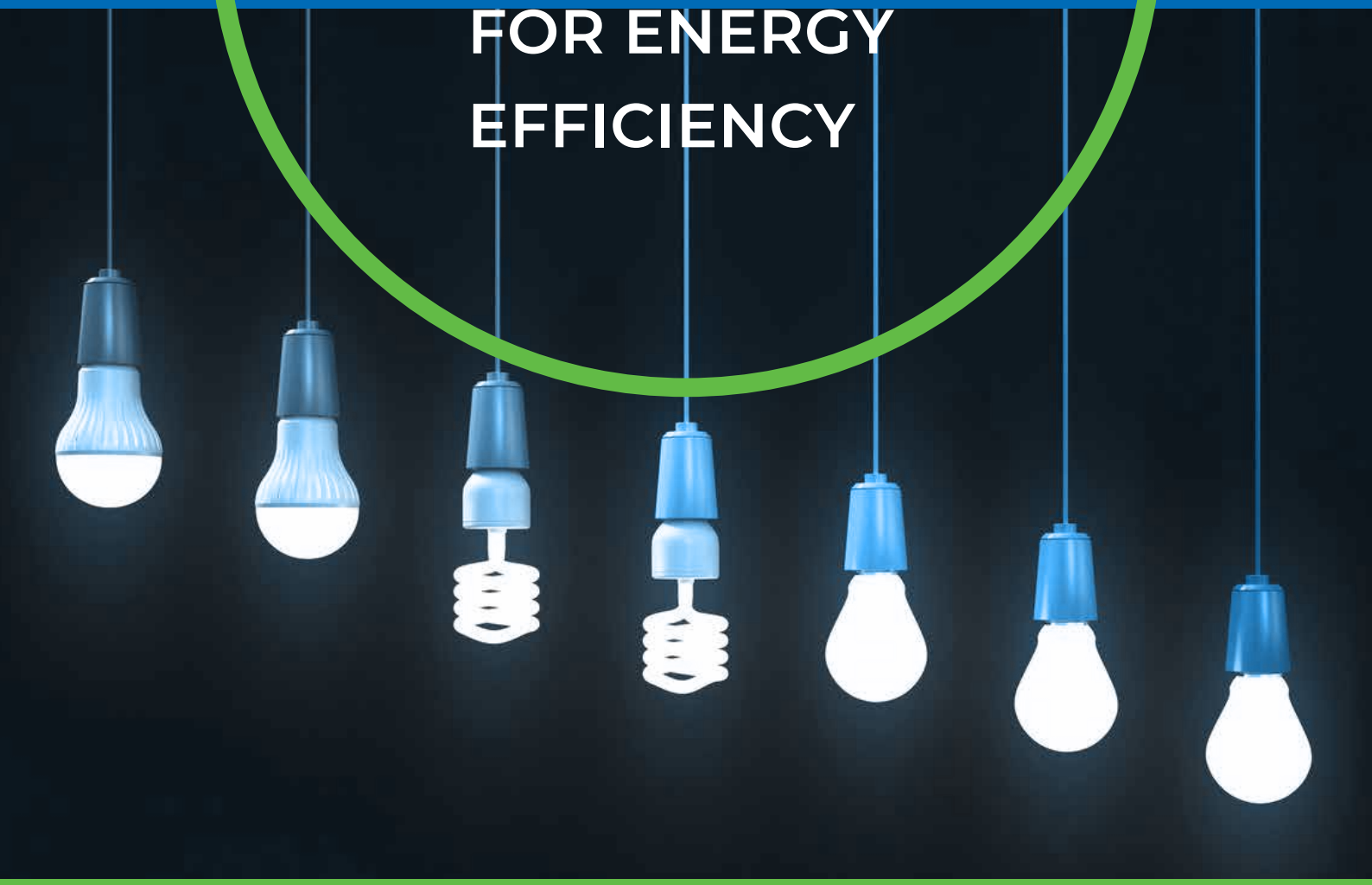

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