

# Available Attractive **Too slow?**

How to accelerate energy  
efficiency by getting  
financing for it right





The Carbon Trust's mission is to accelerate the move to a sustainable, low carbon economy. We act as a catalyst for governments, multilateral organisations, businesses, and the public sector in this transition. We are independent, world leading experts on carbon reduction action, resource efficiency strategies, and commercialising clean technologies. As a not-for-dividend group, we reinvest any profits into our mission.

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## Executive summary

Energy efficiency is the lynchpin that can keep the door to 2°C open and save trillions of dollars across the global economy. To unlock, it demands a large increase in finance and a re-orientation of investment.

There has been a common struggle across many programmes worldwide to create sustainable private sector markets that are effective in reducing energy demand. Energy efficiency markets continue to face challenges across the supply chain. Smart public programmes are essential to overcome them and to leverage the private finance needed for deployment at scale.

This report outlines best practice for achieving that. It is based on an assessment of 10 case studies; interviews with leading practitioners; evaluations of past programmes; and the Carbon Trust's own 15 years of experience delivering large-scale energy efficiency programmes.

### Key findings:

- Six questions should be asked when designing any energy efficiency finance programme (Figure 1).
- For any programme to be effective, it is critical that: 1) the target market is clearly defined and well-understood; 2) fundamental drivers for action are in place, and if not, efforts are made to strengthen them; 3) the supply chain to deliver energy efficiency is mapped, and if needed, action is taken to build its capacity; 4) barriers across the supply chain are analysed comprehensively and prioritised; 5) programmes are developed which target barriers systematically, with financial and technical solutions implemented in concert; and 6) steps are taken so that once public support ends, the supply of, and demand for, finance for energy efficiency continues.
- Too often, programmes have been designed that only address some of the challenges, or on a short term basis only, leaving important barriers deeply entrenched. A narrow focus on finance needs to be replaced with a more holistic approach to ensure a sustainable legacy.
- With this in mind, the report makes three core recommendations:
  1. Business cases for investment need to be strengthened by strong policy frameworks with the right economic and regulatory drivers. Influencing these needs to be a key objective.
  2. More resources should be devoted to technical assistance than has historically been the case. Activities such as awareness-raising, pipeline generation and de-risking are essential to create sufficient demand and commitment.
  3. Upskilling, equipping and accrediting suppliers and technical advisors is also critical to creating a sustainable, scalable and bankable pipeline, as they have the greatest inherent incentive to identify, appraise and deliver viable projects.

Ultimately, to stimulate sustained private sector investment, programmes need to be designed that help create a market of projects with attractive rates of risk and returns for financiers. This includes long-term finance to match the project payback period, which needs to be structured in an accessible way to enable a project to achieve energy efficiency investment self-sufficiently.

Figure 1: Key questions when designing an energy efficiency finance programme



# Introduction

The Paris Agreement's pledge to keep global average temperature increase below 2 degrees comparative to pre-industrial levels represents a monumental challenge, let alone a limit of 1.5 degrees.

The Deep Decarbonisation Pathways Project describes energy efficiency as one of three key pillars to delivering an affordable 2°C scenario.<sup>1</sup> The International Energy Agency (IEA) estimates that to achieve a 2°C scenario, energy efficiency must account for 38% of total cumulative emissions reductions to 2050 (compared to 32% projected for renewables).<sup>2</sup>

Crucially, energy efficiency has the potential to decouple economic growth from energy demand. The many benefits of its deployment include boosting industrial productivity, reducing energy poverty, and contributing to economic development.<sup>3</sup> Most notably, energy efficiency measures have the potential to save trillions of dollars across the global economy.<sup>4</sup> It also has clear health benefits: the World Health Organisation (WHO) estimates 2.6 million deaths per year from air pollution could be reduced by energy efficiency measures, especially in the developing world.<sup>5</sup>

To unlock these benefits, accelerating the global deployment of energy efficiency demands a huge increase in finance, with estimates projecting that upwards of \$550 billion a year should be mobilised by the 2030s.<sup>6</sup>

More public finance is being promised. At COP21 and in the run-up to it, national governments and multilateral development banks (MDB) announced significant increases in funding for climate mitigation, with some pledging to double the amount they provide. Even more recently, the G20 officially affirmed their post-Paris commitment to 'scale up green financing'.<sup>7</sup>

These commitments are important, but it is vital that energy efficiency is a significant recipient and that the resources provided are used effectively.

Public finance has a critical role to play. Energy efficiency markets face challenges across the supply chain, from financiers, to end-users, via technology suppliers and consultants. Whilst the specific barriers to energy efficiency in any given context are likely to be numerous and varied, there are three broad categories that they fall within (Table 1).

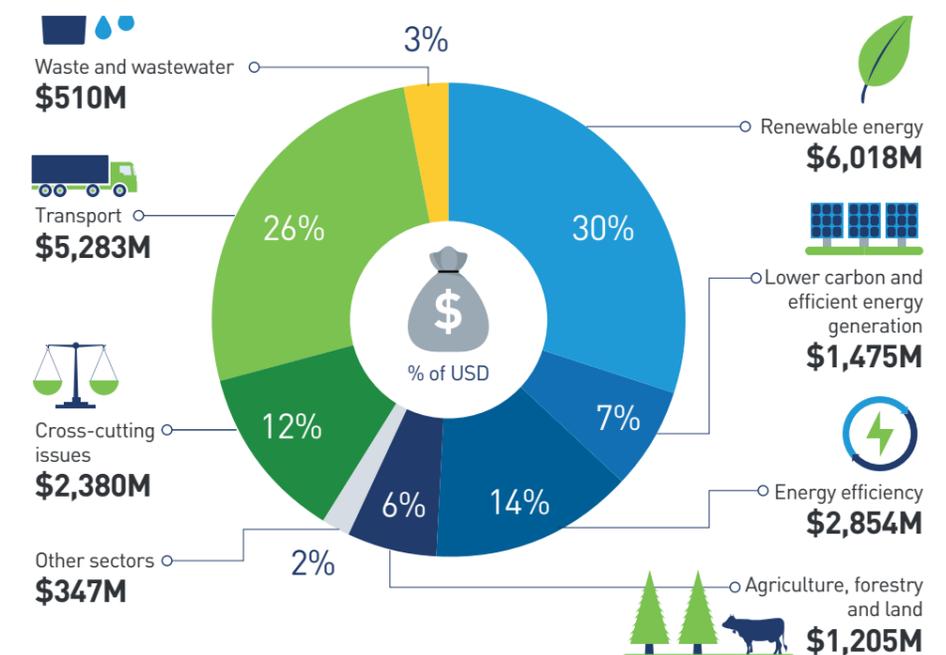
**Table 1: Overarching barriers to energy efficiency deployment**

<b>Awareness &amp; commitment</b>	Lack of knowledge and awareness of energy efficiency; scepticism and misunderstanding of benefits; conflicting priorities; and a lack of motivation across businesses stymie potential demand. Linked to this is the lack of a convincing business case in contexts with cheap energy and absent regulation.
<b>Technical solutions &amp; expertise</b>	Insufficient technical capacity, and a lack of commonality on best practice and standardisation of procedures and technologies, including difficulties in project assessment, monitoring and verification, act as obstacles to delivering energy efficiency solutions that are trustworthy and minimise hassle.
<b>Financial resources</b>	Perceived high investment costs, coupled with prohibitive calculations of risk and return, limit the supply of affordable capital and the demand for such investments.

These challenges are a complex combination of technical and financial barriers. Further exacerbated by the presence of market distortions (such as energy subsidies), and without externalities (such as carbon) priced to incentivise energy efficiency, the private sector has historically not invested heavily in energy efficiency relative to other opportunities that exist. Hence, public programmes are essential to overcome both the technical and financial obstacles, stimulate energy efficiency markets to unlock the opportunity, and leverage the far greater sums of private finance needed to scale up to \$550 billion per year.

A principal source of public funding for programmes are development banks. They help developing economies – where the greatest opportunities lie – move toward a sustainable development path. In 2015, multilateral development banks (MDBs) alone committed \$2.9 billion to energy efficiency programmes.<sup>8</sup> However, this investment represents just 14% of all mitigation investments and is less than half the amount invested in renewables (Figure 2). Given the tremendous potential for further investment in energy efficiency, there is scope for this to increase many times over, while also improving deployment of existing investment.

**Figure 2: Multilateral development bank mitigation finance by sector type, 2015**



Source: 2015 Joint Report on Multilateral Development Banks' Climate Finance

There is also an urgent need to reassess and reorient the focus of investment. There has been a common struggle across many programmes worldwide to create sustainable private sector markets that are effective in reducing energy demand, and consequently greenhouse gas (GHG) emissions, with very few undisputed examples of success – as evidenced by the case studies examined for this report.

Too often, programmes have been designed that only address part of the problem, leaving other barriers deeply entrenched. A narrow focus on finance, the provision of credit and enhanced liquidity, needs to be replaced with a more comprehensive approach.

Many MDBs are well aware of the limitations of past efforts and are striving for more effective approaches. Funders and governments see schemes like the Green Deal in the UK failing to attract uptake. This report attempts to help understand why energy efficiency finance programmes have struggled, and to outline best practice for moving forward.

The insights are intended for development banks, other multi-lateral facilities, bilateral donors, and developing country governments, as well as the host of relevant entities supporting them, who want to understand how energy efficiency programmes can be improved.

This study aims to contribute to the discussion by drawing from the Carbon Trust's 15 years of experience with energy efficiency, in addition to insights from interviews with development banks, commercial investors, programme implementers and non-governmental organisations. The objective is to build a greater common understanding across these organisations about how best to design energy efficiency finance programmes to create and support self-sustaining energy efficiency markets. These topics form the outline for the following sections:

1. **Key questions when designing a programme** breaks down the process of constructing an effective energy efficiency finance programme;
2. **Case studies** examine ten examples of publicly funded programmes through the lens of the key design questions, with analysis of their successes and challenges;
3. **Key insights** draw together the lessons from across the case studies and expert engagement to outline how particular solutions can successfully address the major challenges to energy efficiency finance and deployment.

Following this, the conclusion summarises the critical determinants of success or failure for an energy efficiency finance programme.

## Key questions when designing a programme

The success of an energy efficiency finance programme can be measured according to two criteria:

1. The energy demand reduction, and the subsequent greenhouse gas emissions saved, per unit of resources invested; and
2. The sustainability of the market when the programme expires.

Energy efficiency improvements cover a broad set of options with many paying back quickly and being strongly net present value (NPV) positive. However, programmes designed to unlock savings can be more or less effective and therefore assessing these in terms of energy/GHG savings per unit invested is a key criterion.

Donors also want to change the markets they help start or spur on to create truly lasting change. This is why the sustainability of the market post-expiration of a programme is also a key criterion to assess. Depending on the objectives of any particular programme, achieving progress in one or the other of these criteria could be deemed a success, but ideally both should be realised.

The analysis is framed by six key questions (see Figure 3) that should be asked of any energy efficiency finance programme in order to build an effective package of support. They form the lens for this study, through which the case studies are investigated and the efficacy of their solutions analysed.

These systematic questions form a simple guide for how to think about designing an effective and sustainable programme. The questions do not necessarily have to be followed sequentially and earlier questions may be revisited as a programme's design progresses. For example, if the drivers for action are counterproductive, this could necessitate policy development with a host government to address them, whilst complementing the supply of finance in the private sector for energy efficiency investments further downstream.

The following pages delve into the sub-set of issues that follow from these questions. The aim is to structure a way of thinking about why some programmes succeed, and why others might fail, in terms of reducing energy demand and ensuring the long-term sustainability of energy efficiency markets.

**Figure 3: Key questions when designing an energy efficiency finance programme**



## 1. What is the target market?

Defining the target market will shape the parameters of every solution package. This may seem obvious, but across a number of the case studies examined, the market is often not sufficiently understood before the design and implementation of a programme is undertaken. Consequently, programmes fail to have their expected impact because they are not sufficiently attuned with the market.

A rigorous market analysis is a vital starting point for designing any effective and sustainable solution package. Given any programme will have limited resources available, it needs to be selected for maximum impact. Therefore, a prioritisation exercise will decide which target market within a particular country is the most suitable for a programme. Important indicators include:

- **Energy benefits** as measured by demand reduction, cost savings to energy consumers, and the energy system as a whole; and
- **Non-energy benefits** such as avoiding GHG emissions, increasing productivity, reducing energy poverty and other socio-economic benefits, such as health.

Cost-benefit analysis needs to be carried out where the opportunities for energy savings are related to their payback periods and the returns for end-users, suppliers and financiers. This should show how attractive an opportunity is in the market as it is, and the additional value a programme can achieve.

A detailed understanding of what defines a target market is also necessary in order to understand what is possible:

- What is its size and projected growth, e.g. quantity of organisations or households?
- What are its demographics, e.g. regional or socio-economic distribution?
- What is the size of average energy bills, particularly in relation to other expenditures?
- What is the opportunity for increased energy efficiency, including technology availability, and how accessible and scalable are these opportunities across different customers?
- What is the performance of the target market benchmarked against international best practice?
- What would a well-functioning market look like?
- What choices of suppliers and business models are available?

### Case study: Green Deal

**Objective:** Improve the energy efficiency of buildings in the UK, especially houses, nationwide.

**Solutions:** Project assessment, accreditation of suppliers and project assessors, on-bill financing.

**Lessons:** This failed programme had a clear problem understanding its target market, leading to a critical lack of demand. Central to this was a poor understanding of what an attractive payback period would be for homeowners who were unwilling to borrow money for improvement that could take five years to pay back. This was worsened by failing to make the support on offer attractive with relatively high interest rates (7%) and extra hassle securing loans.

## 2. Are there drivers for action?

Next, it is imperative to understand whether the business case for energy efficiency in the target market is fundamentally undermined or supported by existing market and policy drivers. To illustrate, these drivers are often economy- or sector-wide and can include concerns such as:

- Do the **economic drivers** such as energy price, carbon price, competitiveness and productivity adequately incentivise the business case for energy efficiency?
- Do **policy drivers** such as standards, regulations and incentives support the business case for energy efficiency?

“Pricing frameworks are distorted against energy efficiency; only when they are corrected will programmes be less necessary”

Development Bank

If any of these drivers are not favourable to energy efficiency, or not strong enough, the goals of a finance programme will be undermined. Though challenging to address, drivers that weaken the case for action should prompt concerted efforts to align policy with energy conservation where possible, such as energy subsidies. It is important to recognise that if counterproductive drivers cannot be mitigated, a programme may be better focusing on narrowly targeting emission reductions, as creating a sustainable market will prove problematic. Even with well-aligned drivers, impact is not guaranteed. They are necessary but not sufficient for success.

### Case study: Sustainable Energy Financing Facilities (SEFFs)

**Objective:** Scale-up energy efficiency in Eastern European and North African countries particularly among industrial and commercial businesses.

**Solutions:** Project identification, pipeline generation, dialogue with policymakers, performance incentives, and a credit line.

**Lessons:** The SEFFs have worked well because they have lined up with economic and regulatory drivers. Eastern Europe in particular has had a strong focus on upgrading equipment in its industrial sector to become more competitive. This economic driver has been complemented by policy development to work towards standards and regulations that support greater energy efficiency deployment.

## 3. Is there a supply chain?

To realise the benefits of energy efficiency in a target market, there needs to be a flow of information to build essential knowledge, skills, and behavioural change. Where capital investment is needed, appropriate flows of technology and funding are essential. These flows are facilitated by institutions and companies with the expertise and connections to deliver them efficiently and reliably.

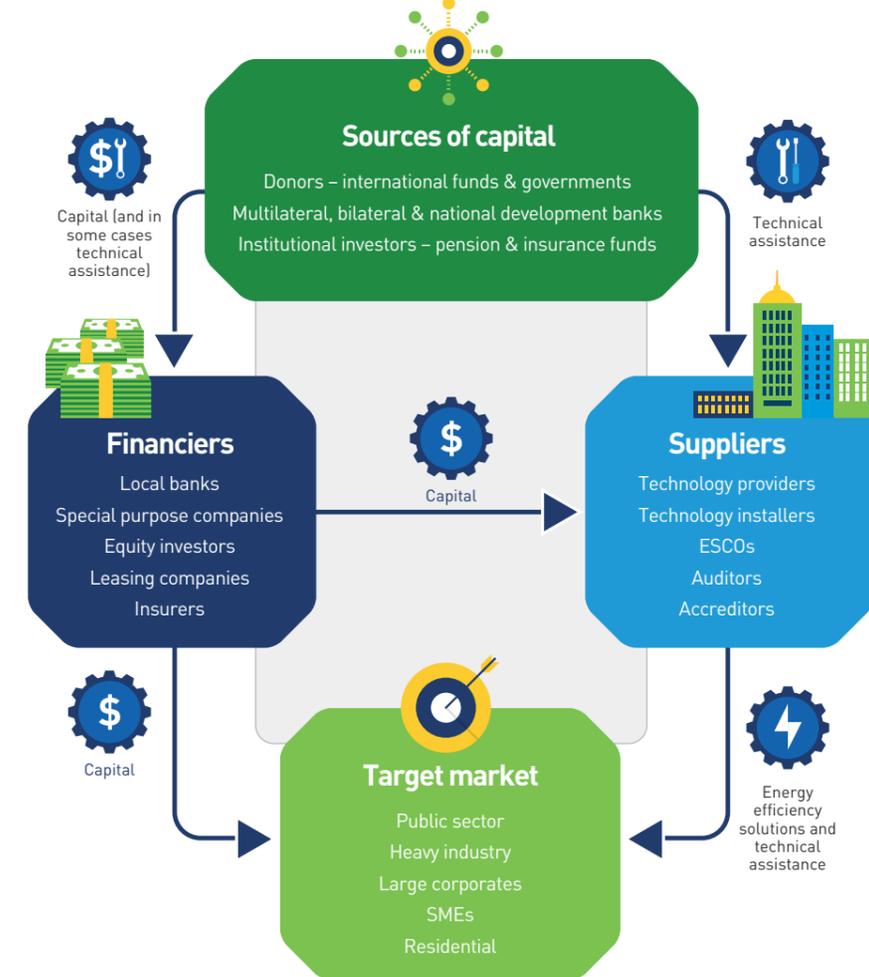
Figure 4 sets out a stylised supply chain illustrating the major components that must be in place for an energy efficiency programme to succeed. Establishing this supply chain is a pre-condition for then considering how a programme can improve the functioning of individual components of the supply chain or the flows of information, technology and funding.

Understanding the capabilities and limitations of the energy efficiency supply chain, and consequently what capacity-building is needed as part of a programme, is vital. It involves not just examining the capacity of existing entities – comprising financial, technical or human resources – but also their internal strategies and structures. Their ability to underpin sustainable change will rely as much on their desire and organisational set-up, as on their access to the target market. Organisations that prioritise growth in the energy or energy efficiency market, and prove it with dedicated teams, are the most likely to sustain activities beyond the lifetime of a programme.

“The institutional set-up and strategies are equally important when selecting participants as their capabilities and capacity”

Programme implementer

**Figure 4: Indicative supply chain for energy efficiency finance showing components and flow**



Taking a wider view, supply chains as a whole vary in degrees of maturity, and can therefore require different levels of assistance. Here are some examples:

- A.** There is an existing local supply chain that can satisfy the needs of information, technology, and capital but requires synchronisation through better integration between the three;
- B.** There are some local institutions and companies that have the potential to provide the needs for a supply chain, but overall they lack the internal capacity or skills; and
- C.** There is a gap in the supply chain that cannot be filled by existing local capacity and so either requires inviting foreign entities into the market or stimulating the entry of new local entities.

These three scenarios necessitate responses that range from facilitating connections between appropriate components of the supply chain (A), to training and capability building (B), to creatively bridging gaps between organisations (C). In reality, often more than one scenario is relevant in an immature market, therefore necessitating solutions that utilise a combination of these responses.

The fundamental objective here is connecting finance to credible, bankable projects to unite the financial and technical elements of energy efficiency. It can be summarised as pipeline generation, and it is a central challenge that very few programmes have sustained. Indeed the lack of attention to pipeline generation is the key reason why finance schemes often fail to have the impact they should. Creating effective pipeline generation to complement financial support is essential.

On the one hand, it is outside of the conventional business model for financiers to actively generate projects. On the other, customers can lack the knowledge, skills or incentives to propose credible projects themselves.

This leaves suppliers and advisors as the most viable avenue because they have an inherent profit incentive to find bankable projects, and a minimum level of technical knowhow to learn how to appraise them. Leveraging them to identify, prepare and present bankable projects requires investment in developing skills, tools, credibility and demand for their services. Therefore, to underpin sustainable private sector markets, attention and resources must be directed toward building a capable and trusted supplier market and providing this market with resources as needed to support the deployment of available finance capital.

#### Case study: China Utility-Based Energy Efficiency Finance Programme (CHUEE)

**Objective:** Demonstrate that lending to energy efficiency projects in energy intensive industries and SMEs can be low risk.

**Solutions:** Awareness raising, project identification, pipeline generation, and a credit guarantee to participating banks.

**Lessons:** Insufficient attention was paid to building a supply chain with motivated participants that can sustain activity after the programme was completed. The first phase of the CHUEE programme in China resulted in a total of \$512 million of lending to energy efficiency projects. However, one bank, out of the two selected, accounted for 98% of the loans. This highlights how participants must be carefully selected on the basis of a detailed understanding of both their capabilities and willingness to enter the market for maximum impact.

## 4. What are the barriers across the supply chain?

Before an effective programme can be designed, it is vital to comprehensively map the barriers faced by key players across the supply chain. This builds on the analysis of what the supply chain currently looks like to understand what factors are preventing it from operating effectively.

“Too often financial solutions are provided where finance is not the key barrier”

Programme implementer

#### Case study: PROESCO

**Objective:** Scale-up the Brazilian ESCO market.

**Solutions:** Concessional interest rates, credit line, credit guarantees, and unsecured lending.

**Lessons:** This programme did not address non-financial barriers inhibiting the scale-up of the Brazilian ESCO market. Some of the most important barriers required an extensive technical element for upskilling businesses in the first place, as well as a simplification of the process for accessing the finance.

The pervasive problem for energy efficiency is the perceived absence of a convincing business case. A lack of pricing of energy and carbon externalities does not help. Furthermore, energy savings do not create sales or cash directly, but deliver a return by reducing costs relative to a counterfactual situation. This can be a hard sell, and energy savings are often not regarded as a transparent and trusted revenue stream in the eyes of homeowners, boardroom directors, or potential financiers.

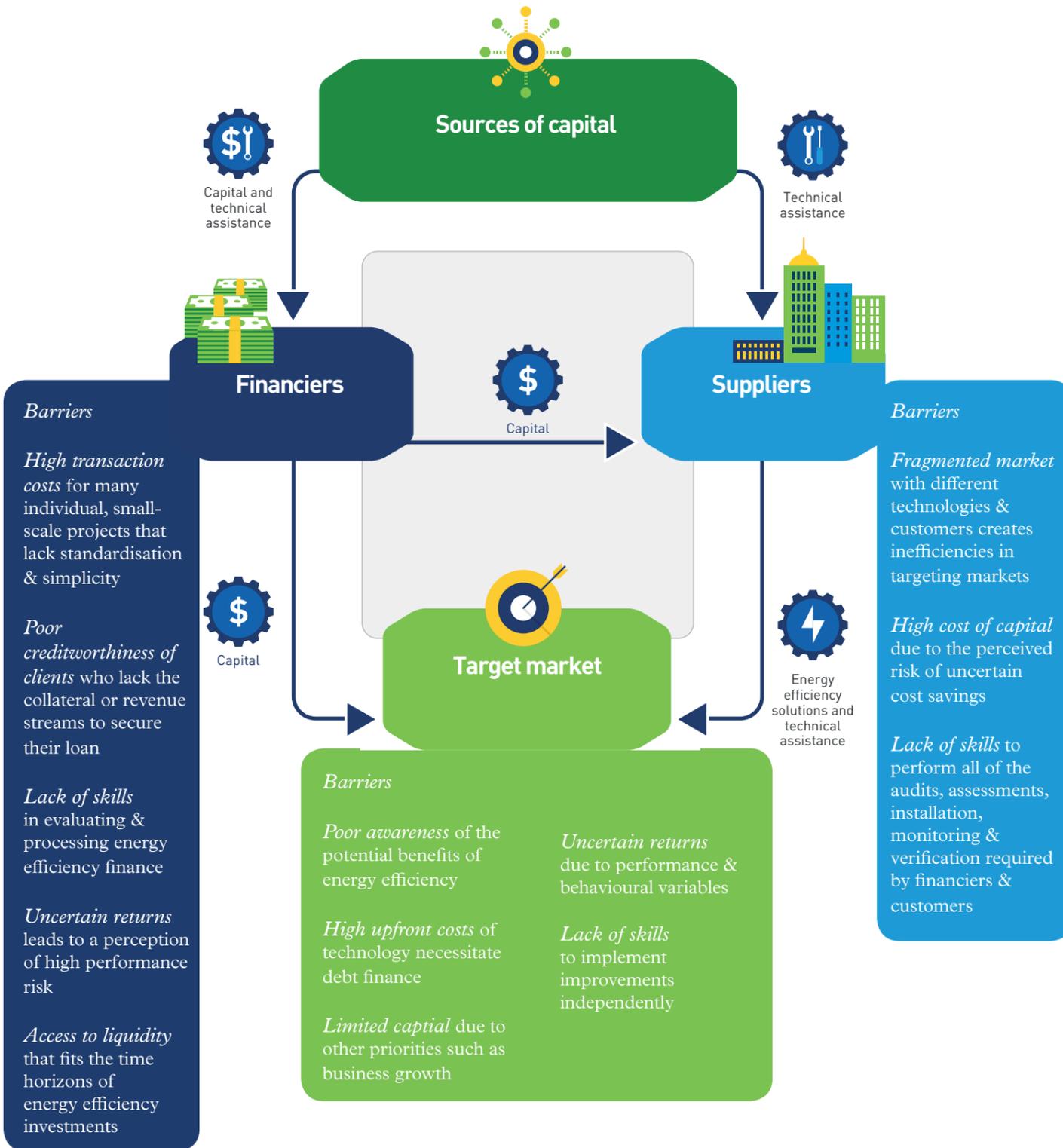
The immediate objective of a programme is to confront the unfamiliar and/or unattractive business case that manifests in barriers that prevent the flow of information, technologies and capital across the supply chain. These barriers can be very specific to a particular context, and apply to individual components of the supply chain as well as to the connections between them. In an immature market, the barriers are likely to be numerous and varied, but there are three broad categories that they fall within (Table 2).

**Table 2: Overarching barriers to energy efficiency deployment**

<b>Awareness &amp; commitment</b>	Lack of knowledge and awareness of energy efficiency; scepticism and misunderstanding of benefits; conflicting priorities; and a lack of motivation across businesses stymie potential demand. Linked to this is the lack of a convincing business case in contexts with cheap energy and absent regulation.
<b>Technical solutions &amp; expertise</b>	Insufficient technical capacity, and a lack of commonality on best practice and standardisation of procedures and technologies, including difficulties in project assessment, monitoring and verification, act as obstacles to delivering energy efficiency solutions that are trustworthy and minimise hassle.
<b>Financial resources</b>	Perceived high investment costs, coupled with prohibitive calculations of risk and return, limit the supply of affordable capital and the demand for such investments.

Effectively identifying the most influential barriers across a supply chain will determine the optimal design of a programme. Of vital importance is also recognising that financial and technical barriers to energy efficiency are interlinked. For instance, whilst an absence of capital in a market can be attributed to the former, technical problems, such as a lack of credible, bankable projects, can be equally significant obstacles to the flow of investment. Understanding how they are interlinked is therefore crucial. Misdiagnosing barriers will invariably lead to misdirected solutions.

Figure 5: Simplified supply chain with example barriers



## 5. What solutions can address the barriers?

The reality of designing different aspects of programmes rarely, if ever, bears a one-to-one relationship with the barriers that are present. In fact, some design features target multiple barriers; and certain barriers can necessitate more than one solution. Across the sample of case studies, the variety of programme features identified and scrutinised are outlined in Table 3.

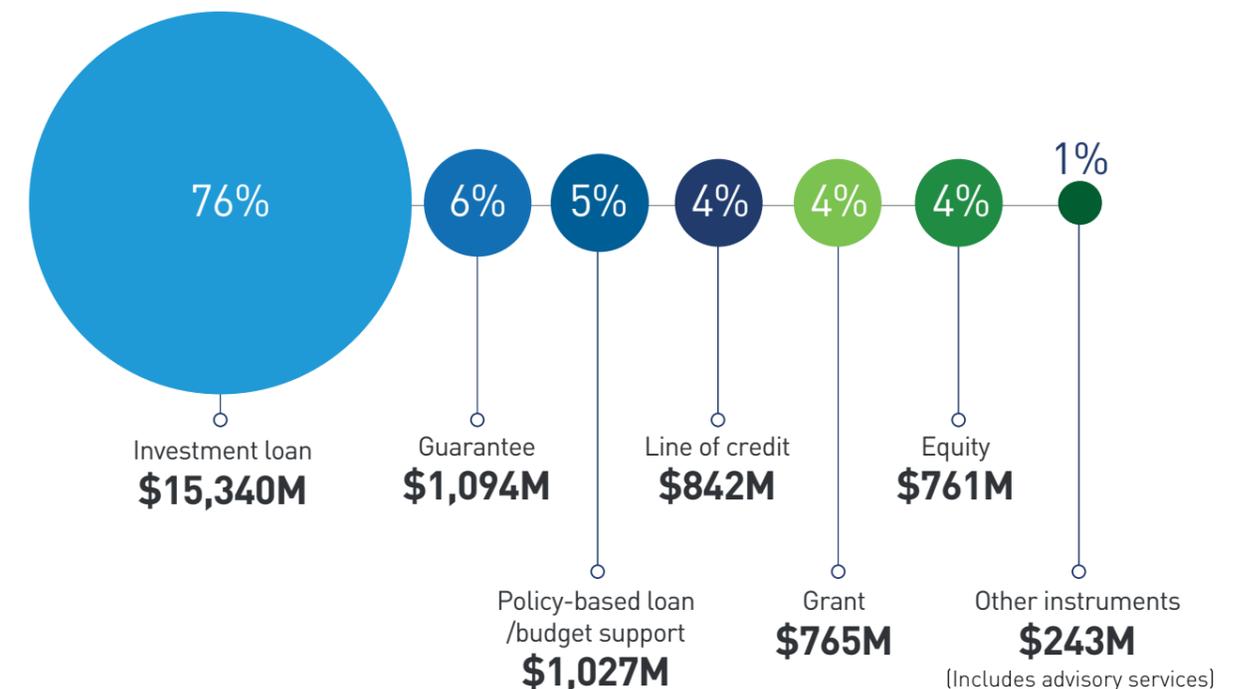
They are assessed according to their relative impact to the three challenges outlined above, where darker shading indicates the design feature is more relevant to that challenge.

The financial and technical design features of programmes must be planned, coordinated and implemented in concert. Their value as a package relies on their complementarity. It is far too common for solution packages to focus on finance and neglect technical assistance (TA). Figure 6 outlines that in 2015 only 1% of MDB spend on climate mitigation was dedicated to 'other instruments' – such as advisory services. The rest is focused on financial instruments. If the energy efficiency opportunity is to be fully realised, the proportionate spend on technical assistance within programmes needs to be higher. The Carbon Trust's own experience suggests that up to 20% of a programme's resources should be invested in technical assistance in contrast to the 5% that is typical.

“The challenge for designing a programme is effectively synchronising the financial and technical elements to address both sides of the problem in an energy efficiency market”

Development Bank

Figure 6: MDB mitigation finance split by instrument type, 2015



Source: 2015 Joint Report on Multilateral Development Banks' Climate Finance

**Table 3: The relevance of different solutions to addressing the overarching barriers**



**Awareness-raising**

**Purpose:** build a critical mass of demand by increasing knowledge and understanding in the target market and their financiers.

**Method:** advertising, educational events or direct outreach depending on the level of pre-existing awareness and the feasibility of reaching the target audience.



**Project identification and pipeline generation**

**Purpose:** develop and prepare a pipeline of bankable projects to establish sufficient market scale to interest financiers.

**Method:** training suppliers, facilitating interactions across the supply chain, tracking potential customers and demonstration projects can all help create market scale in different ways.



**Policy development**

**Purpose:** tackle fundamental drivers that subvert the business case to create a long-term, sustainable market environment.

**Method:** advising on removing pricing distortions of energy and carbon, introducing tax breaks, promoting policy roadmaps, and developing energy efficient codes and standards.



**Incentives**

**Purpose:** temporarily alter the business case to encourage the demand or supply of finance.

**Method:** concessional terms of finance, performance subsidies, tax breaks for energy efficient equipment, discounted TA.



**Project assessment, monitoring and verification**

**Purpose:** develop local capacity and a track record for ensuring and measuring the profitability of projects to reduce perceived risks.

**Method:** training local suppliers of goods and services, or installing entities capable of transferring skills or outlasting the programme.



**Accreditation (technology, suppliers, auditors, financiers)**

**Purpose:** mitigate perceived risks and consolidate trust in promised energy savings for financiers and end-users alike.

**Method:** formal, authoritative qualifications based on historical performance for suppliers and the equipment.



**Standardisation (procedures, decisions, contracts)**

**Purpose:** minimise the extra cost and hassle associated with unfamiliar transactions across the supply chain.

**Method:** simple and replicable contracts between parties, user-friendly interfaces, and fast decision-making processes.



**Support for monetising energy savings (ESCOs)**

**Purpose:** grow a market of suppliers that use energy savings within their revenue model, supporting confidence in the promised cash flow.

**Method:** support for de-risking investments in ESCOs to encourage growth in their business model.



**On-bill financing**

**Purpose:** overcome the lack of upfront capital and lack of trust in energy savings as revenue for property owners.

**Method:** integrating investment costs with pre-existing bills, where energy savings prevent the former exceeding the latter over the payback period.



**Unsecured lending**

**Purpose:** alleviate the need for end-users to provide collateral to secure financing for energy efficiency investments.

**Method:** financier will lend against the merits and predicted cash flow of a project and not require assets as a security.



**Leasing (operating and capital)**

**Purpose:** free end-users from capital constraints associated with high upfront costs.

**Method:** leasing party will lend equipment as part of a service, possibly including maintenance (operating), or until the end-user pays off the cost and owns it outright (capital).



**Insurance**

**Purpose:** mitigate the risk of the technology not performing as expected.

**Method:** premium paid for by the end-user or supplier to cover potential losses reduces the perception of high risk, and possibly the cost of capital if financiers concur.



**Guarantee**

**Purpose:** risk-sharing facility to encourage financiers to expand into new markets perceived as too risky under normal conditions.

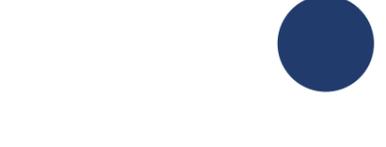
**Method:** programme will cover a fixed percentage of the losses incurred by financiers if their loans do not perform.



**Credit line**

**Purpose:** address limited liquidity in financial institutions, increasing their willingness to use funds for energy efficiency.

**Method:** injection of government, MDB or other donor funds for on-lending, with specified terms for eligible projects attached.



**Aggregation (including green bonds)**

**Purpose:** increase supply of capital into the market by reducing relative transaction costs for investors through scale.

**Method:** either 'pooling' capital prior to identifying projects, or 'bundling' pre-identified projects ready for investment.



Considerations of scale and time play pivotal roles here too. If awareness-raising is deployed either too early or too late, in relation to the availability of a concessional credit line, or its reach is hampered by a lack of resource, potential impacts will be neutered. Programmes also require monitoring of their progress and impact, and a degree of flexibility in their design to respond to changing conditions.

The inner mechanics and finer details of each element of a programme will vary according to the market. The parameters, complementarity and shortcomings of design features should all be stress-tested across the supply chain. For instance, a misguided percentage point or two either way on the cost of capital can be irrecoverably off-putting to financiers, suppliers or the target market.

Ultimately, to stimulate sustained private sector investment, there needs to be a market of projects that adhere to attractive rates of risk and return and are structured in an accessible way for investors. The objective of a programme is to positively influence perceived risk and/or actual returns and ensure the opportunity is structured in a way so financiers invest in energy efficiency of their own accord. This demands an understanding of what the risk-return profile is for target investors.

Local banks are often the primary target investors for energy efficiency, due to their financing the public sector, businesses and homeowners alike. Banks seek stable returns on low risk investments. Once target investors are well-understood, there are variables that can be altered by a programme to make energy efficiency investments more attractive.

The disaggregated nature of many energy efficiency markets (outside of large, energy-intensive sectors) puts off investors: high transaction costs can eat away at limited returns. A programme can attempt to counter this – through project assessment, standardisation, incentives or aggregation.

However, it must consider how to influence the target market as a whole, rather than just isolated projects, and investigating whether there is sufficient scale to interest investors.

### Case study: Energy Savings Insurance (ESI)

**Objective:** To address risk-related barriers and to increase the supply of finance to SMEs in three Latin American countries, to enable the realisation of energy efficiency projects that currently struggle to access finance.

**Solutions:** Awareness-raising, project identification, pipeline generation, incentives (conditional on project implementation), project assessment, monitoring and verification, standardisation (procedures, contracts), accreditation (technology, suppliers), insurance, guarantee, and credit line.

**Lessons:** This case study represents a multi-faceted solution package including standardised energy performance contracts; accreditation of suppliers; verification of projects; and insurance coverage for potential performance failure. Each element is aimed at addressing risk-related barriers and increasing the supply of finance to enable the realisation of projects that currently struggle to access finance. This solution package requires a balancing act to align the benefits that these solutions can provide, and the transaction costs they may represent. Once the market is aware of the real, rather than perceived, risks, familiarity with energy efficiency, and competition within the supply chain, should reduce these transaction costs and amplify the supply and demand of finance in the long-term.

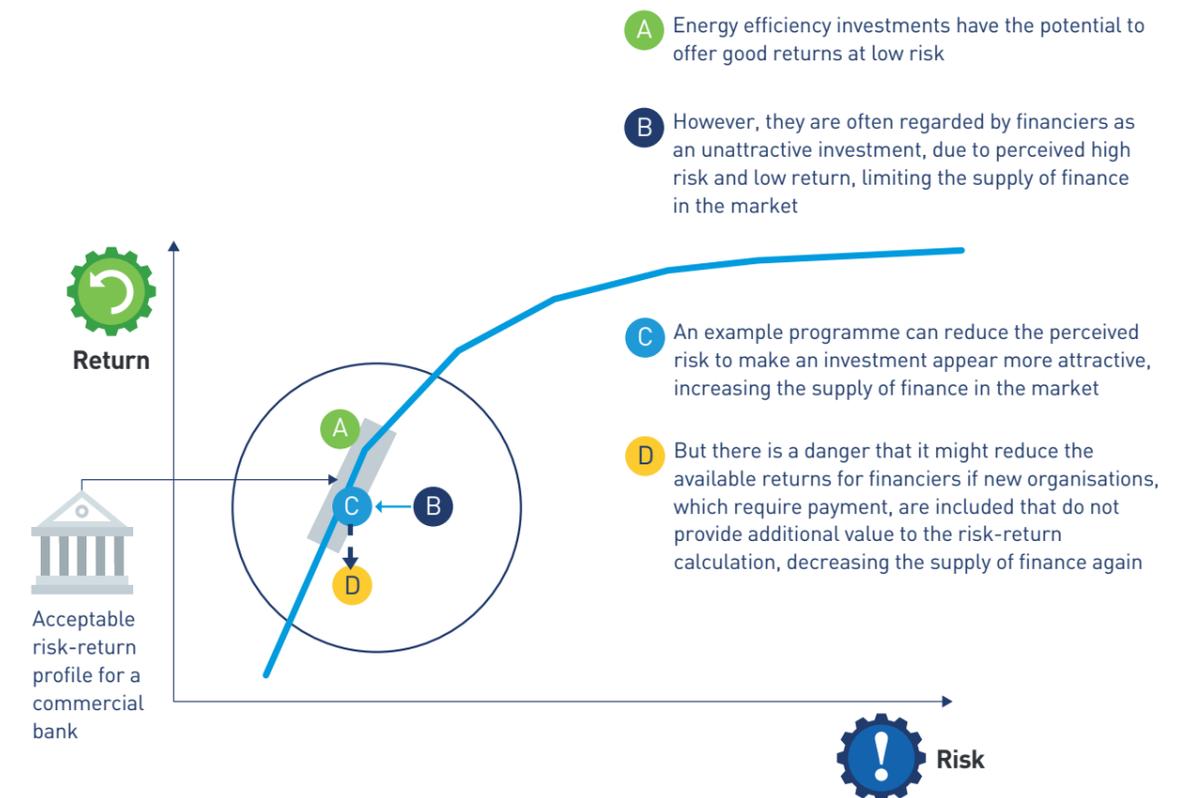
More often perceived risks can be easier to influence. This constitutes dispelling negative perceptions rather than changing material returns. Reducing perceived risks for financiers can have the knock-on effect of decreasing the cost of capital for suppliers and customers – increasing their potential returns.

The perceived risks for financiers can be allayed by introducing new organisations or procedures into the supply chain to assess, monitor, verify, accredit or insure, to increase the supply of finance in a market. But these additions must necessarily be paid for, potentially reducing the available returns for the end-user, the financier or both, if there are not consequent cost savings realised by reducing the risk (such as the cost of capital for end-users) or efficient procedures (minimising transaction costs).

Figure 7 illustrates how, although energy efficiency investments have the potential to offer attractive returns at low risk of default (A), they are often perceived to represent lower returns at higher risk (B). As a consequence, the objective of a programme should be to mitigate these prohibitive perceived risks (B to C), thus creating an attractive investment for financiers. However, there is a danger that the de-risking measures can have unintended consequences by reducing the available returns and therefore the attractiveness of an investment by introducing new organisations or processes that cut away at the limited pot of returns (C to D).

Therefore, when designing a programme, there must be careful consideration given to balancing the benefits of additional measures with their effects on risk-return calculations. The objective must be to align the interests of the entire supply chain, so that energy efficiency projects represent attractive investments.

**Figure 7: Illustration of how a programme can alter the risk and return calculations of a financier for energy efficiency investments**



## 6. How can change be sustained?

At the beginning of this analysis, two objectives were set out for measuring the success of an energy efficiency finance programme: 1) the energy demand reduction, and the subsequent GHG emissions saved, per unit of resources invested; and 2) the sustainability of activity in the market when the programme expires. While the first can be realised in isolation with targeted programmes, too often they involve one-off or short-term fixes. The danger for any seemingly successful programme is that once its support is no longer available, the supply of, and demand for, finance withers too.

There is an urgent need to drive self-sustained activity. To realise the 2°C target and the long-term benefits of energy efficiency, quick fixes are inadequate. To achieve lasting change, a programme must focus on the energy efficiency problem comprehensively and on the legacy of its solution package.

While each context has unique elements, key commonalities exist for achieving sustainability:

- Technically, a programme must ensure sufficient transfer of expertise across the local supply chain for it to continue without needing practical support; and
- Financial solutions must leave behind sufficient confidence and skills in the market for there to be sustained flows of capital into energy efficiency investments under business-as-usual conditions.

Achieving these goals is no mean feat. They necessitate an approach that demands significant resources and time. If either of these two are lacking, then a programme will struggle to instil a sustainable legacy.

Furthermore, it is vitally important to recognise that a sustainable legacy must involve attracting new entry into the supply chain, to grow the private sector market. Convincing new financiers, suppliers and end-users is best realised through simple solutions. Complex ones may appear convincing at addressing barriers on paper, but these groups will always seek the path of least resistance. To grow and sustain private sector markets solutions must either be simple, or if they begin from a complicated starting point, they must develop over time to approximate commercial conditions as closely as possible.

These principles can manifest themselves in a number of practical lessons for energy efficiency programmes aiming for sustainable legacies. The conclusion illustrates a number of the most important lessons to emerge from our study.

### Case study: Energy Efficiency Revolving Fund (EERF)

**Objective:** To stimulate lending from banks for energy efficiency projects to energy intensive industries, SMEs, and ESCOs in Thailand.

**Solutions:** Awareness-raising, project assessment, incentives (concessional interest rates and long loan tenors), technical assistance, and a credit line.

**Lessons:** Participants in this programme came to rely on its support rather than modifying their own approach to enable them to sustain involvement in the market.

Commercially available interest rates in Thailand were set a minimum of 5.75% for businesses during 2002 to 2005. The EERF provided a concessional interest rate cap of 0.5% to banks and 4% to businesses. This drove uptake with 294 projects being funded over 9 years. Training was also provided to the banks for assessing projects. However, only one bank had a dedicated team for energy efficiency financing in 2015 - displaying a lack of sustainable skills transfer.

## Case studies

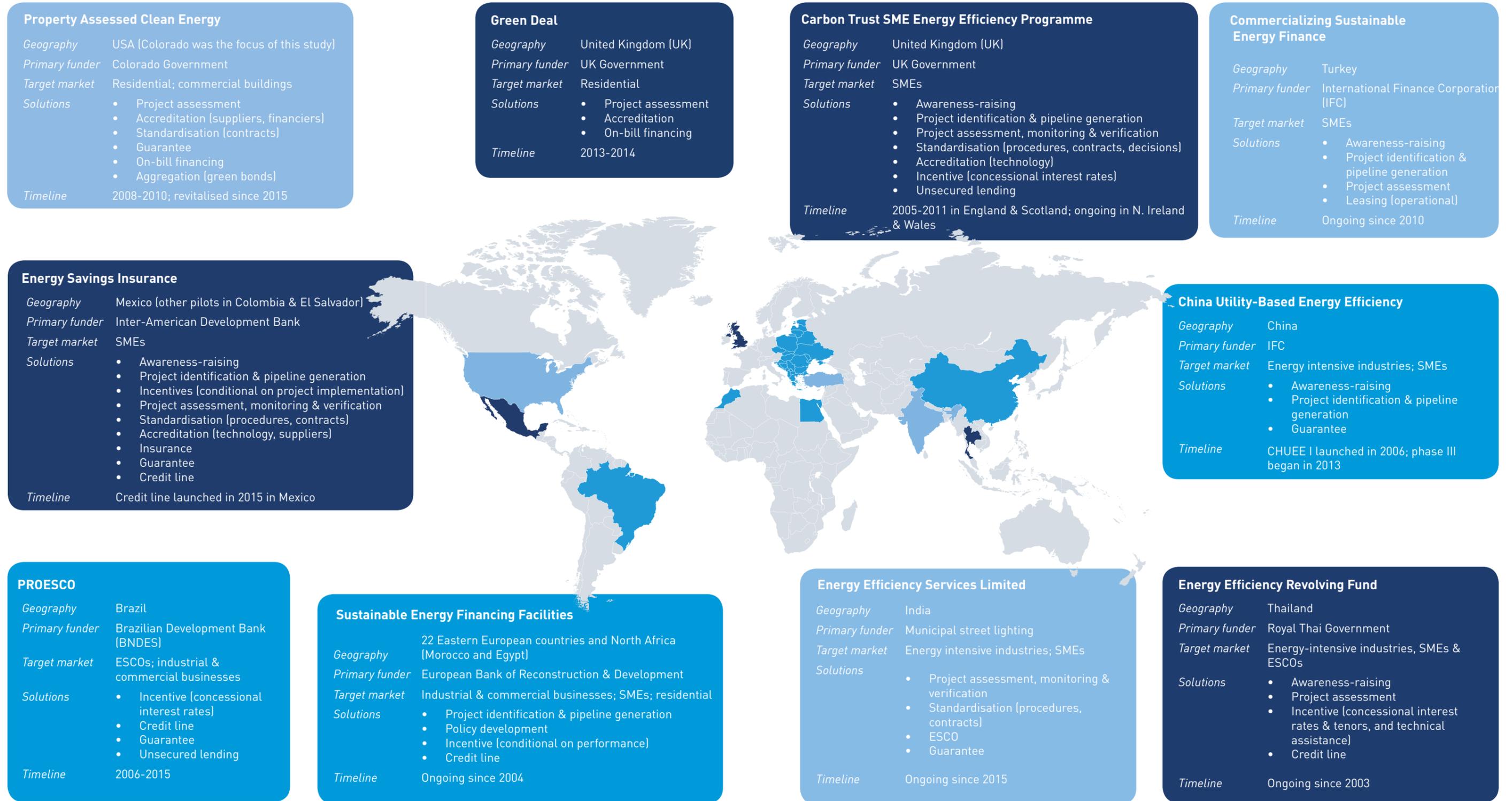
This document sets out the strengths and weaknesses of the ten case studies of energy efficiency programmes featured in *Available, Attractive, Too Slow* according to the solutions they have implemented.

Although this sample is not comprehensive in its coverage of programme types, it provides insights into the effectiveness of the broad range of financial mechanisms and technical assistance that are employed in the examples chosen. Ultimately, the success of programmes will be judged on the extent to which they deliver against two measures:

1. The energy demand reduction, and the subsequent GHG emissions saved, per unit of capital invested; and
2. The sustainability of the market when the programme expires.

The sample of ten case studies includes programmes from Europe, North Africa, the Americas and Asia. They also vary according to different target markets and solutions. Most programmes have been running for a number of years, with some finished and one at a pilot stage. Figure 8 on the following page summarises the sample accordingly.

Figure 8: Summary of the case studies



## 1. China Utility-Based Energy Efficiency Finance Programme

Building on the success of previous World Bank programmes in the Chinese energy efficiency market, the IFC blended its own funds with those from the GEF. The scheme, launched in 2006, was known as the China Utility-Based Energy Efficiency Program or CHUEE.<sup>9</sup> It comprised of two phases and ran from 2006-2012 with Phase III being launched in 2013. Banks lent \$512m to June 2009 (\$384m linked to impact of scheme) to 98 projects, with zero defaults, with estimated CO<sub>2</sub> savings of 14Mt per year, over the initial target.<sup>10</sup>

### Target market

The initial target market for the CHUEE scheme was SMEs, who traditionally found it difficult to access finance, particularly for energy efficiency, due to banks perceiving them as high credit risks and the projects as having high performance risks. However, during the programme, large companies from energy-intensive industries, such as steel, chemicals, and cement dominated loan applications. Small loans, intended for SMEs with smaller balance sheets, represented less than 10% of the total loans disbursed.<sup>11</sup>

### Drivers

Energy demand in China has increased by over 100% in less than a decade with the country becoming the world's largest CO<sub>2</sub> emitter in 2007.<sup>12</sup> Correspondingly, there has been a strong policy commitment from the Chinese government to support energy efficiency, particularly in the industrial and building sectors. Increasing energy efficiency was made a priority in the 2006 Five Year Plan with a target of reducing energy consumption by 20% across the five-year period.<sup>13</sup>

### Supply chain

The World Bank's successful Energy Conservation Project that began in 1998 helped introduce the ESCO model in three Chinese provinces, establishing a crucial level of technical market readiness for CHUEE's finance to find an appropriate supply chain.<sup>14</sup> The emerging supplier market provided fertile ground for delivering energy efficient solutions to the market. However, the lack of experience within Chinese banks when dealing with energy efficiency contributed to the high perception of project performance risks and, in turn, unattractive interest rates, stifling the flow of finance through the supply chain. Two banks were selected to participate in the CHUEE programme with the intention of building their familiarity with energy efficiency.<sup>15</sup>

The lack of awareness was not limited to the financial sector but rather was spread across the wider market, including end-users. Thus, there was a need to couple the de-risking measures designed to stimulate the flow of finance with awareness-raising and capacity building in the broader market.

### Barriers

#### Awareness & commitment

- Widespread lack of awareness and understanding of the energy efficiency opportunity across Chinese banks and end-users.

#### Technical solutions & expertise

- The Chinese supplier market was immature, and there was therefore an absence of technical skills for project assessment.

#### Financial resources

- Banks perceived high risk due to lack of familiarity with the technology and the revenue model based on future cost savings. This performance risk was joined by the credit risk of lending to SMEs, which often lack collateral or have poor credit histories. These factors led to high interest rates.
- High transaction costs turned off banks from the energy efficiency market as they had difficulties in preparing, financing and implementing unfamiliar investments. This was particularly concerning for small scale loans.

### Solutions

A **guarantee** facility was provided in two stages by the IFC and GEF to reduce the high perception of risk within the participating banks. The guarantee would compensate losses incurred on corporate finance loans for energy efficiency projects at a fixed percentage. The GEF would cover 75% of the first 10% of losses; the IFC would then cover 40% of the remaining 90% of losses.<sup>16</sup>

**Awareness-raising** was subsidised by the GEF for market studies to help demonstrate the cost effectiveness of energy efficiency investments to both the target market and the financial sector.

**Project identification and pipeline generation** was also subsidised by the GEF and helped to identify and appraise projects for suppliers, support the banks with deal structuring, and create a network between them to integrate the supply chain.

### Impact & Lessons

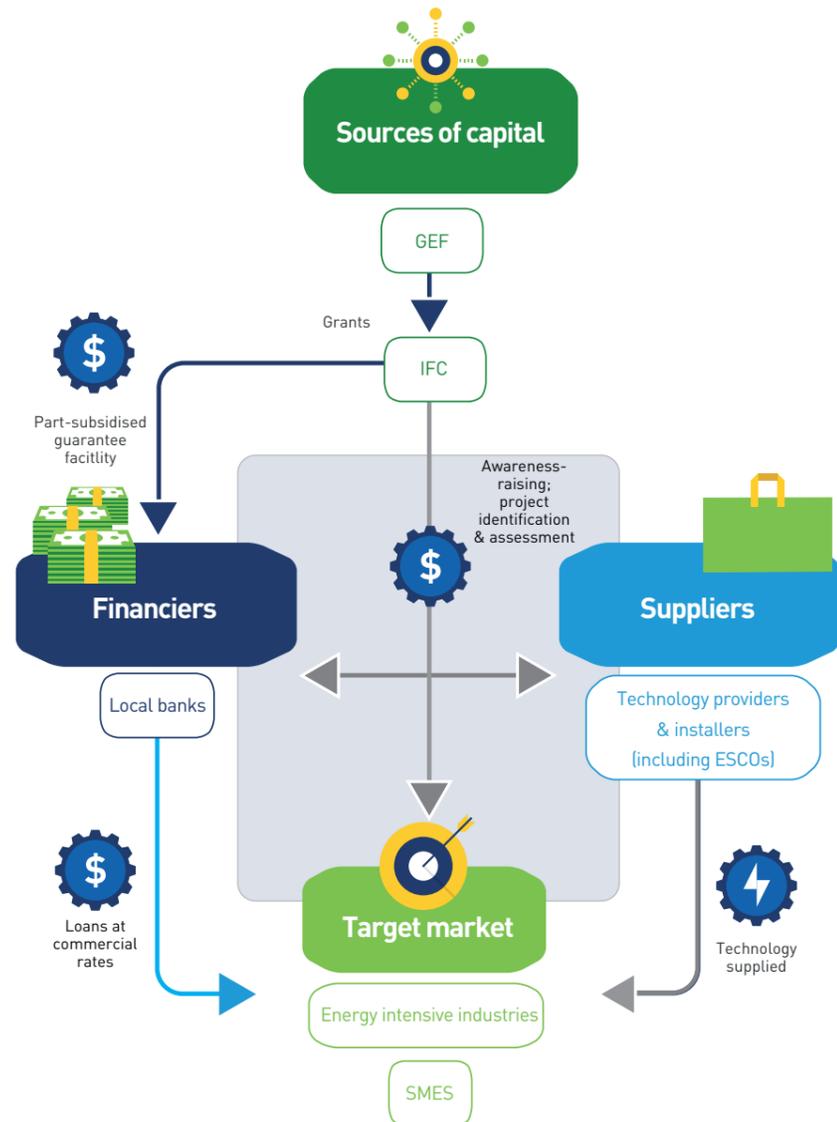
Overall, the programme exceeded its CO<sub>2</sub> savings target, however there were limitations in its design. Sustained change in the energy efficiency market in China driven by this programme has been modest.

First, large companies from energy-intensive industries dominated lending under the programme, rather than the initial target of SMEs. This was perhaps due to the guarantee mechanism mitigating perceptions of performance risk, related to energy efficiency technologies, but with no distinction in the mechanism dependent on company size, the banks favoured the lower credit risk of larger companies rather than SMEs.

Second, one of the two banks was responsible for 98% of the loans. This bank had a strategic desire to expand into the market and a viable customer base, mainly large customers in the energy-intensive industries, representing accessible demand. By contrast, the other bank lacked this connection to the market, and was not as prepared to commit internal resources to developing the opportunity. Such a result emphasises the importance of involving the right participants.

There were major positives from the technical assistance provided to all parties. The awareness-raising campaign, combined with the increased pipeline generation and fund disbursement, has been influential in demonstrating a potential market for energy efficiency. Along with the technical assistance for training banks and suppliers (including ESCOs), the effect of the programme has had an important legacy in China, and has helped China to develop the largest, and growing, ESCO market in the world.<sup>17</sup>

**Figure 9: China Utility-Based Energy Efficiency Finance Programme**



## 2. Energy Efficiency Revolving Fund

In 2003 the Thai government launched the Energy Efficiency Revolving Fund (EERF) as part of their wider Energy Conservation Programme to stimulate investment from Thai banks for lending to energy efficiency projects.<sup>18</sup> As of February 2012, 294 energy efficiency projects had been funded, without any defaults on the loans, realising savings of 0.98MtCO<sub>2</sub>/year.<sup>19</sup> In addition, the EERF has been able to leverage private sector investment into energy efficiency projects at a 3:1 ratio.<sup>20</sup> However, as of 2015, there was only one out of the original eleven participating banks still active financing energy efficiency.<sup>21</sup>

### Target market

Originally targeted at buildings, factories, ESCOs and project developers, in May 2004, the EERF was expanded to include any commercial or industrial facility and ESCOs because of the difficulty the EERF was having disbursing funds.<sup>22</sup> The majority (80%) of these funds have gone to industry and building projects.<sup>23</sup> Funding for industry projects has been used mainly to support energy efficient equipment, but also included support for renewable energy sources.

### Drivers

This programme fell under the Government of Thailand's policy target to reduce Thailand's energy intensity by 25% between 2005 and 2025.<sup>24</sup> It was also designed to promote the competitiveness of Thai businesses, by reducing their energy costs and dependence on oil imports from abroad. Though not a specified driver, the programme also needed to redress energy price distortions caused by historic subsidies for diesel and a longstanding Oil Stabilization Fund set up by Thailand's government in 1973 to maintain the oil price and reduce the effects of price fluctuation.<sup>25 26</sup>

### Supply chain

In 2003, the Thai energy efficiency supply chain was very immature. The EERF was not only designed to stimulate capacity-building and experience within the financial sector, but also to contribute to the growth of a supplier market, and in particular ESCOs, through the availability of attractive credit.

The concessional credit line is managed by the Department of Alternative Energy Development and Efficiency (DEDE).<sup>27</sup> This government body also provides technical assistance to the local banks who lack the capacity to assess the projects themselves. It is left to the banks to promote the EERF and the benefits of using the cheap credit for energy efficiency to end-customers.

### Barriers

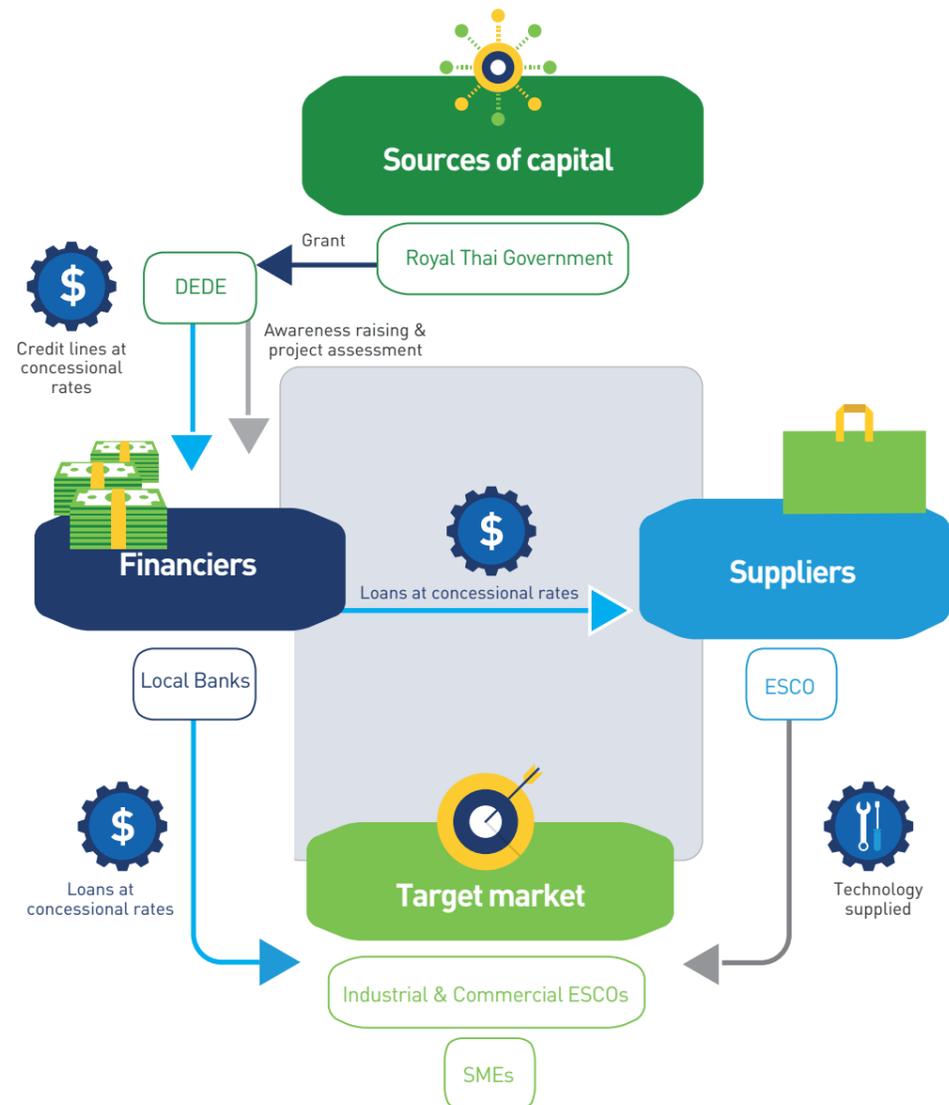
<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>Pervasive lack of awareness of the benefits and bankability of energy efficiency across both financiers and end-users.</li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>Absence of mature and trusted suppliers, including ESCOs, across the supply chain acts as an obstacle to implementing energy efficiency.</li> <li>Limited experience among financial institutions for assessing loan applications for energy efficiency projects and their bankability.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>High perceived risks prevented banks offering finance for energy efficiency projects.</li> </ul>

## Solutions

**Credit lines provided at concessional terms to act as an incentive** are the primary feature of the EERF. The Royal Thai Government provides the initial capital which was on-lent at discounted rates to commercial banks. The DEDE offered banks low interest loans (0% originally, but 0.5% after the first two years to cover administrative costs – recently it has returned to 0%) with tenors of up to seven years. These banks would then in turn charge a 4% interest rate on loans for energy efficiency projects for ESCOs and the wider target market.<sup>28</sup> This compared favourably with a 2-5% cost of funds for banks and a minimum lending rate to end customers set by banks outside of the EERF of 5.75% from 2002-2005.<sup>29</sup>

**Awareness-raising and project assessment** is provided by the DEDE for banks who lack the skills and capacity. The aim is to train these banks so that they were capable themselves of assessing the potential cost savings of an energy efficiency project. In addition, DEDE helps build up wider awareness of the profitability of energy efficiency projects across the local banking sector through advertising initiatives.

**Figure 10: Energy Efficiency Revolving Fund**



## Impact & Lessons

The programme has been successful in realising significant energy savings, with over 7 billion THB disbursed to projects that have helped save 0.98MtCO<sub>2</sub>/year.<sup>30,31</sup> However, there are questions over whether the programme has been effective at stimulating a self-sufficient market that can work without the incentives of concessional finance and technical assistance.<sup>32</sup>

To begin with, it was initially effective at attracting interest from commercial banks, with the numbers of participants increasing from six to eleven over the course of the programme.<sup>33</sup> But their interest has not been sustained, as previously stated, only one bank continues to actively finance for energy efficiency projects.

The banks' initial interest was kicked off by the market distortions of the concessional credit and technical assistance. The concessional credit line means that returns on their investments in energy efficiency are more attractive, whilst the technical assistance for assessing projects can help build capacity and mitigate the high perceived risk.

However, it appears that the local banks have not gained sufficient experience, and therefore confidence, in providing finance for energy efficiency projects. This could suggest a lack of skills transfer achieved by the technical assistance.

Part of the problem here could be the reliance on banks to move beyond their core business to assess the technical aspects of the projects. Given the immaturity of the supply chain, this process could be seen as desirable, but ultimately commercial banks are not geared institutionally to providing such a service. In addition, because the solutions are primarily geared towards increasing the supply of finance, demand-side issues may not have been fully addressed. Outside of the banks selling the cheap finance and raising awareness themselves, there is not a provision for technical training of the supply chain to provide a reliable pipeline. This is evident because even when the banks have lent, they have tended to favour larger, energy-intensive companies because these are seen as lower risk.<sup>34</sup> This left the original target market of SMEs underserved.

### 3. Energy Efficiency Services Limited

Energy Efficiency Services Limited (EESL), a joint venture company of power utilities, was set up by the Ministry of Power and Government of India in order to offer street lighting solutions using LED lighting to Municipal Corporations (MCs) and Urban Local Bodies (ULBs) via an energy savings performance contract. EESL is billed as a 'super ESCO' and is intended to both support activity directly and also stimulate the ESCO market in India more generally.<sup>35</sup>

#### Target market

The programme run by EESL aims at replacing street lighting across multiple municipalities in India with LED lighting. This was seen as particularly worthwhile as it was estimated by the Government of India that it would take only two years to replace the country's existing 35 million light bulbs with LEDs and would save approximately 9000 million kWh annually from the time of installation.<sup>36,37</sup> Given India's electricity consumption in 2013 was estimated at 897 TWh, this 1% reduction is a sizeable opportunity given the speed with which LEDs could be installed.<sup>38</sup> The EESL model is also expanding into other technologies and sectors.<sup>39,40</sup>

#### Drivers

In 2001, the Energy Conservation Act (ECA) was enacted to provide a conducive regulatory and policy framework to catalyse market based energy efficiency implementation in India.<sup>41</sup> In 2008, the government followed the ECA with a National Mission on Enhanced Energy Efficiency, which promotes innovative policy and regulatory regimes, financing mechanisms and business models for achieving energy efficiency in the national economy.<sup>42</sup>

The work of India's Bureau of Energy Efficiency (BEE) also supports municipal energy efficiency. BEE has led projects across 15 states, finding that energy costs account for a significant proportion of their expenditure, with energy efficient streetlights being identified as an area of major savings potential.<sup>43</sup> However, whilst the economic incentive is there, the upfront costs of replacing existing lights is a major barrier for many municipalities that are in a challenging financial position.

#### Supply chain

EESL aims to bring together the supply chain for energy efficiency financing and technical assistance by acting as a super ESCO in the Indian market. EESL executes bulk purchase orders of LEDs from manufacturers enabling economies of scale and helping drive down costs. EESL replaces inefficient lighting operated by MCs and ULBs with LEDs – maintaining them as needed over a seven year period.<sup>44</sup> The MCs and ULBs pay EESL back with the savings generated by the more efficient lighting.<sup>45</sup>

The ESCO model works because MCs and ULBs are public entities with large, on-going, consistent energy bills. This means that there is high confidence that the savings from a proven technology such as LED bulbs will be delivered with a direct impact on bills for the MCs.<sup>46</sup> Successful delivery leads to a virtuous circle as higher economies of scale and innovations from manufacturers can be realised. The EESL model also demonstrates to the wider Indian market the viability of the ESCO model.

#### Barriers

<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>• Unappealing terms and conditions in contracts such as long payback periods and duration.</li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>• Lack of baseline data on MCs streetlights' energy consumption.</li> <li>• Lack of technical knowledge.</li> <li>• Inaccurate billing.<sup>47</sup></li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>• High upfront capital costs.</li> <li>• Municipalities lack access to finance.</li> </ul>

#### Solutions

**Grants** are invested into EESL by a collective of public and private utilities. These are then provided as capital investment to manufacturers who supply the LED lights to MCs.

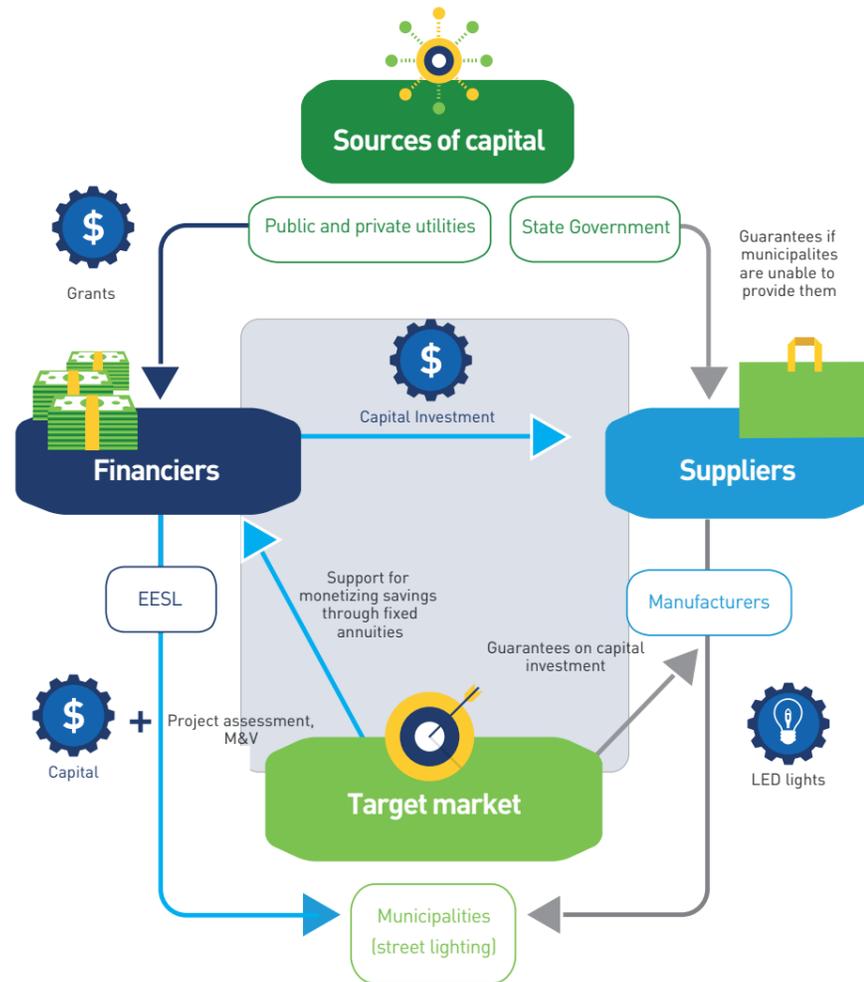
**Standardised procedures and contracts** have been developed by EESL when dealing with MCs that ensure high standards of service but require no minimum savings guarantees from MCs due to lack of data available to record these savings. Savings are accounted on a 'deemed savings' basis.

**Support for monetising energy savings** is provided by repayments made by MCs to EESL through fixed price annuities, thereby avoiding the problem of linking repayments to energy bills, for which the data is poor and can involve complex and/or costly negotiations and agreement.<sup>48</sup>

**Project assessment**, monitoring and verification is provided to MCs to help them through the technical process of installing LEDs and recording savings.

**Guarantees** of the capital cost of equipment provided by EESL are provided either by the MCs or, if they are unable to provide the guarantees themselves, by state governments.

Figure 11: Energy Efficiency Services Limited



### Impact & Lessons

The provision of standardised contracts without a minimum savings guarantee for MCs, coupled with repayments as fixed annuities, is expected to encourage MCs to commit to contracts with longer payback times as they are not subject to such stringent requirements which are difficult to prove due to poor data availability. In addition, capital investments provided by EESL for manufacturers, backed by MC or state guarantees of payment, are likely to have a large impact on reducing the risk of investing in LED lighting.

However, though the scheme is ongoing, there are outstanding questions regarding its sustainability. This is firstly because manufacturers rely on the capital investment from the EESL in order to pay for LED lighting, and secondly because it is unclear how effectively the technical assistance for installation, operation and maintenance will be retained by MCs.

In order to be both effective and sustainable in design, manufacturers will need to see a clear market case for energy efficiency - meaning they no longer require grant financing. In addition, MCs will need to retain the technical knowledge which will be required for the installation and maintenance of LED lighting once the technical assistance is withdrawn.

## 4. Commercialising Sustainable Energy Finance Programme

The Commercialising Sustainable Energy Finance Programme (CSEF) was a leasing initiative set up by the IFC in 2010, funded by the Clean Technology Fund (CTF) (\$21m) and the IFC's own balance sheet (\$100m).<sup>49</sup> The aim was to help local financial institutions (including leasing companies) to develop the capacity to assess and finance energy efficiency projects. Phase II was approved in April 2015.<sup>50</sup>

The scheme has been considered a success and in the first four years of operations, leasing companies invested approximately US\$100 million of CSEF funds in over 50 energy efficiency projects. CSEF is expected to directly mitigate over 200,000tCO<sub>2</sub>e per year.<sup>51</sup>

### Target market

The CSEF was designed for the commercial, residential and municipal sectors with a particular emphasis on SMEs and smaller energy efficiency projects. SMEs represent a key sector within the Turkish economy, generating 25% of the country's GDP and 10% of the country's exports.<sup>52</sup> Additionally, as the largest energy consumer at 33% of total consumption, the residential sector was also considered a key target market.<sup>53</sup>

### Drivers

Economic growth has corresponded to high growth rates in the country's energy and electricity usage, raising Turkey's coal and natural gas imports, thereby driving up national debt. Turkey's GHG emissions grew from 188 to 422 MtCO<sub>2</sub>e between 1990 and 2011.<sup>54</sup>

As a result, energy efficiency has been a key priority of the Turkish government for a number of years with several new laws and policies being enacted. This has included a wide-ranging energy efficiency law in 2007<sup>55</sup>, and an energy efficiency strategy in 2012 setting a target for reducing energy intensity by 20% by 2023 on 2008 levels.<sup>56 57</sup> The drive to higher efficiency has particularly been assisted by the move to a cost-based energy pricing mechanism from 2008, which has increased the exposure of customers to the underlying costs of energy, particularly electricity.<sup>58</sup>

### Supply chain

At the time of the introduction of the CSEF, end-users were reluctant or unable to invest in energy efficiency on their own due to high-upfront capital costs, therefore they needed access to external finance.<sup>59</sup>

However, the financial sector was not in a strong position to support energy efficiency investment in Turkey. Poor awareness of the benefits of energy efficiency<sup>60</sup> was exacerbated due to the global financial crisis making it difficult for banks to offer loan terms that matched the payback period of energy efficiency investments.<sup>61 62</sup>

**Barriers**

<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>• Turkish financial institutions have historically been reluctant to offer financing for energy efficiency products due to perceived higher risk.</li> <li>• A lack of information about the operational and cost benefits of energy efficient products dampened customer demand for financing.</li> <li>• For SMEs, smaller energy efficiency projects were a lower priority.</li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>• Financial institutions typically had limited internal capacity to properly assess, develop, and market financing instruments for energy efficiency.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>• High upfront costs for energy efficiency equipment made commercial and industrial companies, especially SMEs, hesitant to purchase equipment outright.</li> <li>• Loans with maturities of more than one year were almost non-existent from commercial banks.</li> </ul>

**Solutions**

**Credit lines** were provided by the CTF and IFC at **concessional rates** to three Turkish leasing companies for the express purpose of sustainable energy financing for projects and equipment that reduced absolute energy consumption by at least 15%.<sup>63</sup>

**Leasing** companies then marketed energy efficiency products to its current and prospective customers, predominantly SMEs. The leasing company purchased the equipment using CSEF funds and provided a lease to the customer.

**Project identification & pipeline generation** was provided by the IFC to leasing companies in order to help build internal capacity.

**Project assessment** was provided by the IFC to each leasing company in the form of advisory services to help build internal capacity to successfully identify, assess, and market a portfolio of leases specifically for energy efficiency.

**Awareness-raising** was conducted by leasing companies who would market energy efficiency products to prospective customers, predominantly SMEs.

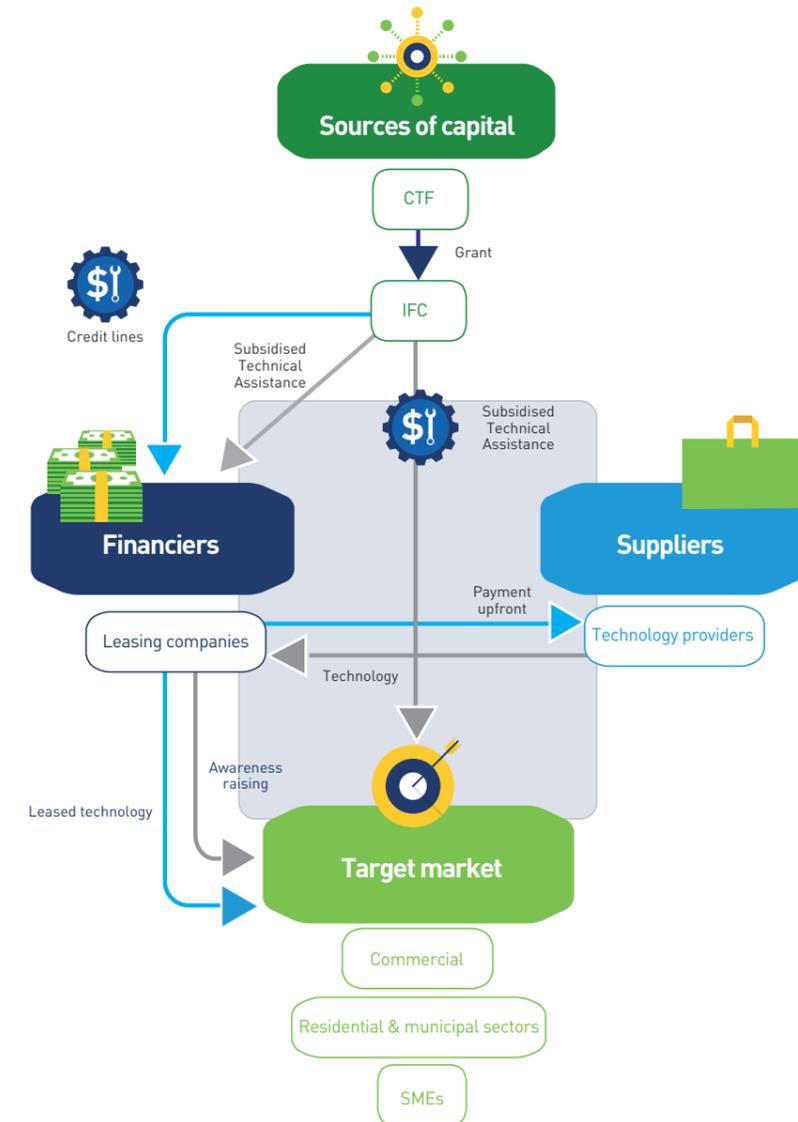
**Impact & Lessons**

The leasing model of the CSEF has helped to catalyse an increase in both the supply and demand of energy efficiency equipment enabling Turkish leasing companies to progress from receiving concessional loans, to loans at commercial rates. Indeed, in 2014, the IFC was able to provide a \$96m loan to Yapi Kredi Leasing on fully commercial terms.<sup>64</sup>

This has largely been thanks to the financial and technical assistance provided to the leasing companies. Once the supply side challenges were addressed, the leasing companies, who already have extensive customer networks, have subsequently been able to assess technologies and market them to end-users. The customers benefit as SMEs who can access the products through leasing but who perhaps do not have strong enough balance sheets to be able to purchase equipment themselves.<sup>65</sup>

This growth in technical expertise has made leasing companies more confident in seeking finance for energy efficiency equipment. In order to have a self-sustaining market, the confidence generated by leasing companies will need to be matched by the awareness and expertise of Turkish commercial banks who have traditionally been more reluctant to provide loans with lengthier tenors that are suited to energy efficiency projects.

**Figure 12: Commercialising Sustainable Energy Finance Programme**



## 5. Sustainable Energy Finance Facilities

The Sustainable Energy Finance Facilities (SEFFs), first launched by the European Bank for Reconstruction and Development (EBRD) in 2004, were introduced to promote efficient energy use in 22 Eastern European and North African countries with a relatively high energy intensity across various sectors. Since their introduction they have saved over 4 MtCO<sub>2</sub>, channelling over €2.8 billion of EBRD's own funding via 104 local financiers to over 75,000 end-users.<sup>66</sup>

### Target market

The SEFFs were designed to target either a country or a specific region, with Turkey and Bulgaria being the largest beneficiaries in both absolute and relative terms. In terms of specific sectors, while the largest number of projects (93%) were in the residential sector, the industrial sector (including SMEs) has been the main beneficiary in terms of funds (85%), followed by the residential (12%) and municipal (2%) sectors.<sup>67</sup> The SEFFs tend to focus initially on sectors that are easier to reach and have a convincing business case for energy efficiency.<sup>68</sup> Therefore, energy-intensive industries are often the first to receive attention, before markets such as the residential sector are approached. This helps establish a track record and familiarity within a location.

### Drivers

It is important to note that the energy context and challenges are similar across many of these Eastern European and North African countries. This has laid the foundation for the wide-reaching SEFFs programme. The most important drivers include:

- Technical inefficiencies with old equipment and long-standing under-investment, which had reduced the international competitiveness of industries;
- For those in Eastern Europe, there has been political desire to align with EU directives and regulations as Eastern European countries sought EU membership, but their carbon intensity ranged from two to four times the EU-15 average;<sup>69</sup> and
- A desire to correct the energy pricing and regulatory distortions which did not incentivise energy efficiency investments, thereby highlighting the need for changes in policy.

The objectives of the SEFFs, to boost local investment in cleaner energy solutions, matched these drivers with a particular focus on offsetting market distortions by incentivising energy efficiency. Policy discussions were also undertaken where possible to work towards correcting these distortions.

### Supply chain

The majority of countries have suitable suppliers for providing energy efficient products and services to the target markets. However, financial institutions are often ill-prepared to deal with loans for energy efficiency. Where local capacity is absent, an EBRD implementation team provides free technical assistance to financiers and the target market for project identification and assessment. Where possible, the EBRD trains local experts to provide this support as the market develops.

### Barriers

#### Awareness & commitment

- Low recognition of the benefits and financial viability of energy efficiency.
- Pricing and regulatory distortions undermines the business case.

#### Technical solutions & expertise

- Lack of technical know how and funds for feasibility studies and audits in the target markets.
- Limited experience among financial institutions for assessing loan applications for energy efficiency projects and their bankability.

#### Financial resources

- Absence of available capital for energy efficiency investments.

### Solutions

**Credit lines** are provided at commercial rates by the EBRD to financiers to address illiquidity in energy efficiency markets. Conditions link the disbursement of these funds to energy efficiency projects.

**Incentives**, grant-funded by donors, can be claimed by end-users via performance subsidies tied to the installation and performance of energy efficient technology. They are used to generate demand and commitment where the perceived business case for energy efficiency is considered weak.

**Project identification and pipeline generation** is grant-funded by donors. This involves helping financiers to assess loan applications and end-users to identify viable projects. It is channelled through an EBRD team introduced on the ground as part of the programme, with the intention that this team will transfer its skills to local suppliers through delivery.

**Policy development** involves working with local governments to help strengthen demand by correcting energy price distortions, compose energy action plans for countries or cities, and work on regulatory standards.

### Impact & Lessons

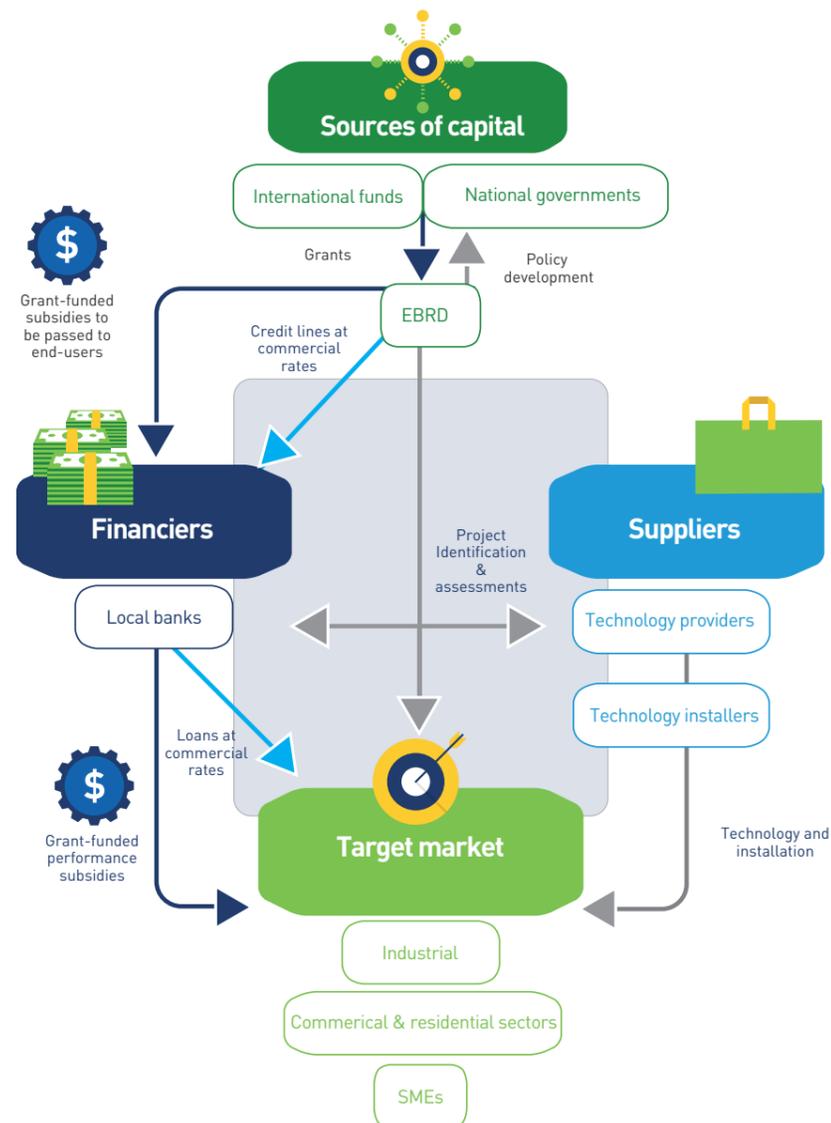
The technical assistance is seen as invaluable to financiers, helping to reduce the perceived risk of energy efficiency projects and build their awareness and capacity. For every euro invested in technical assistance, the SEFFs leverage €83 in private sector investment. Financiers and end-users do not suffer any deterioration in returns from energy efficiency projects as a result of this technical assistance because it is grant-funded. However, it is difficult to know whether the transfer of skills to local organisations has been sufficient to ensure self-sustaining private sector markets.<sup>70</sup>

Performance-based incentives increase the potential returns for end-users, fuelling greater demand. As the SEFFs have matured, there has been a greater emphasis on tying incentives to CO<sub>2</sub> reduction, mimicking the function of a carbon price. Incentives have diminished over time as markets have become established and shifted to new sectors to avoid creating a dependence on subsidised returns.

The relatively unusual policy dialogue component addresses the longer-term problems with incentivising energy efficiency in commercial markets. Importantly, it is complemented by action on the ground – actual projects delivering energy and carbon savings – to reinforce the case with policy-makers for considering the impact of policy settings.

Overall, while more can be done to establish sustainable markets, the SEFFs' synchronisation of financial and technical elements has helped realise impressive results in diverse contexts and sectors. The simplicity of the programme has been highlighted as a key attraction, especially for financiers, when compared with other EU programmes such as the Structural Funds.<sup>71</sup>

**Figure 13: Sustainable Energy Finance Facilities**



## 6. The Green Deal

The Green Deal financing scheme was launched by the UK Department of Energy and Climate Change (DECC) at the end of 2012 to help households and workplaces make energy-saving improvements with loans which could be repaid through energy bills.<sup>72</sup> Despite the addition of a £214m Home Improvement Fund in 2014 (released in three stages) providing upfront grants to homeowners, the Green Deal was scrapped in July 2015 as it was far off course from delivering on its target to upgrade 14 million homes, with only 14,000 homes taking up loans from the Green Deal.<sup>73 74 75 76</sup>

### Target market

The target markets for the Green Deal were the residential and commercial building sectors, which represented 13% and 20% of the UK's CO<sub>2</sub>e emissions respectively.<sup>77</sup> By providing loans for energy efficiency upgrades repaid through energy bills, it was anticipated that 14 million properties would participate in the scheme and would experience energy bill savings thanks to the equipment by 2020.

### Drivers

The Green Deal intended to capture some of the estimated £3 billion per year in energy cost savings opportunities for UK households and businesses, reduce carbon emissions, and reduce fuel poverty (for homes) by improving the efficiency of the residential and commercial building sectors.<sup>78</sup>

The introduction of the Green Deal also brought the UK into compliance with the EU Directive on the Energy Performance of Buildings 2010, requiring member states to draw up financing schemes for private property owners, SMEs, and ESCOs.<sup>79</sup> More broadly, the initiative was also part of meeting the 2008 Climate Change Act to reduce its emissions by 80% from 1990 levels by 2050.<sup>80</sup>

### Supply chain

The UK possesses many suppliers of energy efficiency products and services. However, the financial supply chain for energy efficiency retrofits was immature before the introduction of the Green Deal, with limited third-party financing available for smaller scale projects.<sup>81</sup>

### Barriers

<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>• Lack of awareness among households of the positive effect of energy efficiency equipment on energy bills.</li> <li>• Reluctance due to the perceived hassle.</li> <li>• Unwillingness to incur substantial capital costs in upgrading properties, which may be sold in future prior to the investment paying for itself in savings.<sup>82</sup></li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>• Limited technical understanding within the private financial sector leading to high interest rates for energy efficiency products.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>• High upfront costs and lack of capital among individual property owners.</li> <li>• Limited private financing of energy efficiency for the residential sector.</li> </ul>

## Solutions

**Accreditation** enabled technology suppliers and assessors to apply to a Certification Body Register, which allowed them to conduct assessments under the Green Deal.<sup>83</sup> The intention was to quality assure the suppliers under the scheme and provide visibility and reassurance to end customers.

**Project assessment** was provided by appointed Green Deal assessors who assessed the Energy Performance Certificate (EPC) for each property and determined which technologies would be appropriate for each. Technologies recommended for installation were selected such that they never exceeded the anticipated cost reductions due to energy saved thanks to the upgrades. This was known as the Golden Rule.<sup>84</sup>

**On-bill financing** was used to pay for the improvements. Costs were charged to property owners by their electricity companies and passed back up the supply chain to investors at an interest rate of nearly 7%.<sup>85</sup>

In June 2014, faced with weak uptake, DECC launched a Home Improvement Fund designed to provide grants for energy efficiency upgrades, to kick-start demand for plans. After the first round of funds was exhausted in the first six weeks, and the second in 48 hours, it was re-launched in March 2015, with grants being capped at £5,600.<sup>86</sup>

## Impact & Lessons

The Green Deal was largely regarded as a failure as it did not meet anticipated targets for uptake and was then turned into a grant scheme after the introduction of the Home Improvement Fund in 2014. Property owners were not convinced that the upgrades offered an attractive enough payback period.

One of the main flaws of the scheme was its failure to address the lack of technical understanding of the bankability of energy efficiency projects in the financial sector. This resulted in high interest rates on finance of around 7%, reflecting their perception of the high risk of such projects.

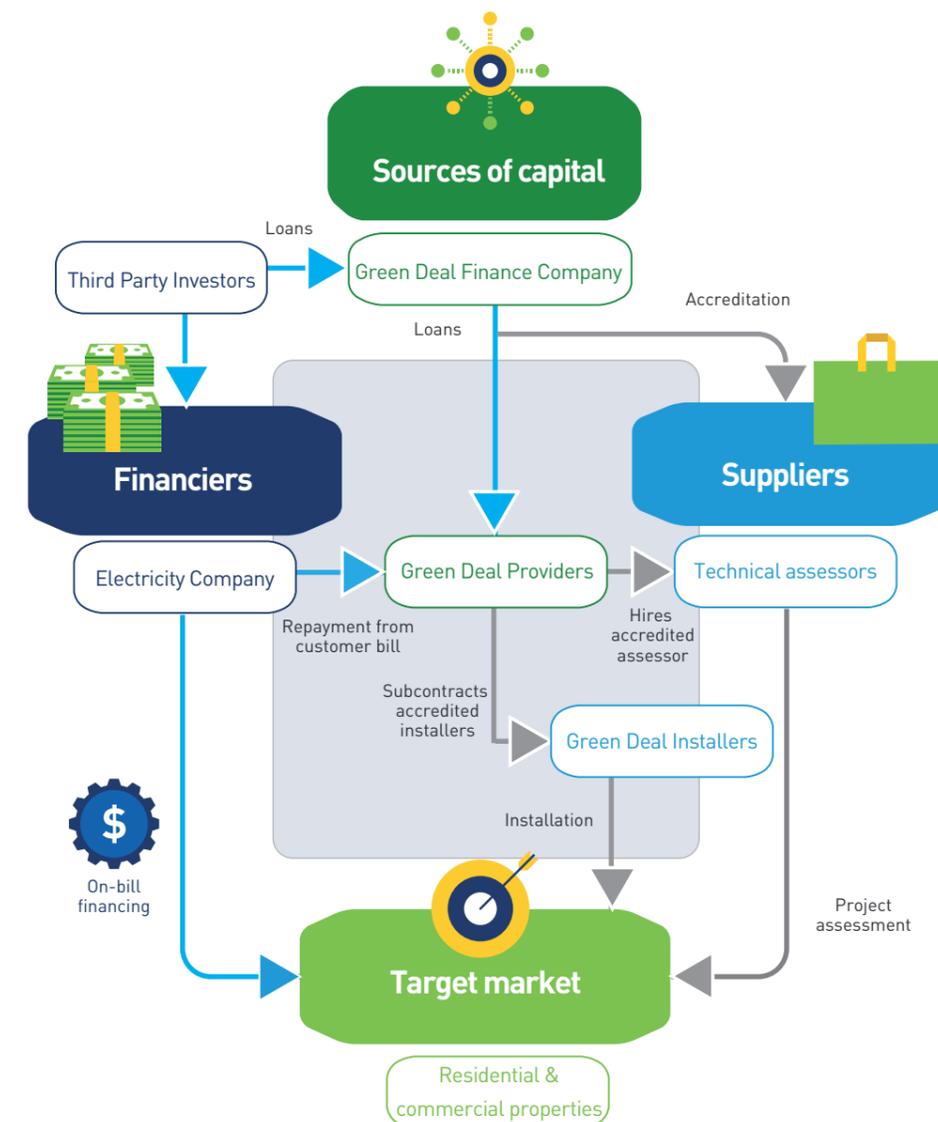
The high finance cost worsened the payback periods of the loans for property owners. As a result, these loans were largely unsuccessful at supporting investment in energy efficiency. Property owners were unwilling to borrow money for improvements with lengthy payback times.

Moreover, the very fact these were communicated as “loans” when financing was arranged by Green Deal providers, limited the scheme’s appeal to property owners who were unwilling to incur further debt. It therefore failed to address the lack of awareness among property owners of the longer term benefits of energy efficiency upgrades.<sup>87</sup>

To compound this problem, the technical assistance provided to property owners was conservative in its estimation of which energy efficiency technologies would satisfy the Golden Rule, limiting the pipeline of viable projects. The complexity of having to deal with multiple separate parties for both households and the installer industry also dampened demand, as did confusion with the Energy Company Obligation scheme, which targeted a similar pool of customers.<sup>88</sup>

Finally, the Home Improvement Fund, whilst very popular among homeowners, was unsustainable and ran out of funds in its first six weeks when it was first launched. Furthermore, though connected to the Green Deal scheme, it had very little lasting impact on the uptake of loans from the original scheme or in the marketplace in general as both the fund and the scheme were scrapped in July 2015.

Figure 14: The Green Deal



## 7. Carbon Trust SME Energy Efficiency Programme

The Carbon Trust, set up as an independent company by the UK government in 2001, has managed a \$300 million programme with the objective of opening up the market for energy efficiency. The funds were originally provided by the government and disbursed via unsecured, 0% interest loans ranging from \$4,600-\$600,000. The programme has realised savings of over 2MtCO<sub>2</sub> and \$560 million on energy bills. Since 2011 it has only been available in Northern Ireland and Wales due to changes in UK government priorities.

### Target market

The loan scheme was aimed at any non-domestic business, though particularly SMEs. The emphasis on SMEs reflects the difficulties they have providing the necessary collateral for debt financing in general, which exacerbates their tendency to place a low priority on energy efficiency given their (typically) low energy bills. The types of project financed included building technologies (e.g. air conditioning and heating), industrial process technologies (e.g. compressed air fittings and motors), and on-site renewables (e.g. solar PV and solar thermal). Projects were selected on the basis of meeting a minimum CO<sub>2</sub> saving threshold. In total, the scheme reached over 7,000 SMEs across a range of non-domestic business sectors.

### Drivers

Under the 1997-2010 Labour Government, there was a growing commitment from the UK to set ambitious climate goals, leading to the world's first legally binding GHG target with the 2008 Climate Change Act. Increasing energy efficiency was perceived as a key instrument in this commitment, which could also reduce operating costs for SMEs and grow the nascent energy efficiency job market.

At this time the government's Climate Change Levy was viewed negatively by business groups, which perceived the government to be taxing them without providing them support to move to a lower carbon more sustainable basis. As a result, the Carbon Trust was created as an independent company with a mission to accelerate the shift to a lower carbon, more sustainable future. The Carbon Trust was a natural home for implementing the energy efficiency loans scheme introduced shortly afterwards.

### Supply chain

There was an existing supply chain for energy efficiency in the UK but in 2002 it was immature. The Carbon Trust acted as a central facilitator for financial and technical needs. The Carbon Trust ran an extensive marketing campaign and provided technical assistance for engaging, training and formally accrediting suppliers and auditors, as well as providing the loans themselves. The intention was for the scheme to demonstrate to the broader market that energy efficiency projects were bankable.

Backed by government, the accreditation of suppliers and technologies by the Carbon Trust became an important means of building trust in the market. Although the Carbon Trust ran awareness-raising campaigns, it leveraged third-parties to provide 75% of project proposals. These mainly came from suppliers, but trade associations were also used to reach a wider sample of the target market.

### Barriers

#### Awareness & commitment

- Lack of awareness in the marketplace on the benefits of energy efficiency.
- Energy efficiency seen as a low business priority compared to growth and productivity concerns.

#### Technical solutions & expertise

- Limited integration between end-users and technical providers – suppliers and auditors.
- Lack of trust in the energy efficiency solutions proposed by suppliers.

#### Financial resources

- Lack of available capital for energy efficiency projects - especially for SMEs whose balance sheets may already have been substantially leveraged.

### Solutions

**Awareness-raising** focused on a multi-million pound national advertising campaign, educational events for target audiences and direct outreach through emails and calls. Its progress was synchronised with the loan scheme to achieve maximum impact with repeated marketing drives.

**Project identification & pipeline generation** through advice to the target market, via a call centre, was combined with outreach through suppliers and trade associations who could submit applications for projects themselves.

**Project assessment, monitoring & verification** through training for auditors who could suggest potential projects and verify the quality of projects.

**Accreditation** of quality energy efficient technologies in an authoritative and accessible database increased trust in the investments made by customers.

**Standardisation of procedures and decisions** created a very quick and simple application process. A conditional offer could be granted on the loan in 30 minutes via an online application.

**Unsecured lending** was an essential element in persuading businesses to prioritise energy efficiency investment. Whilst businesses had to undergo a credit check, they were free from providing collateral, with lending granted based on the merits of the project. The loan included the incentive of a 0% interest rate to further boost demand.

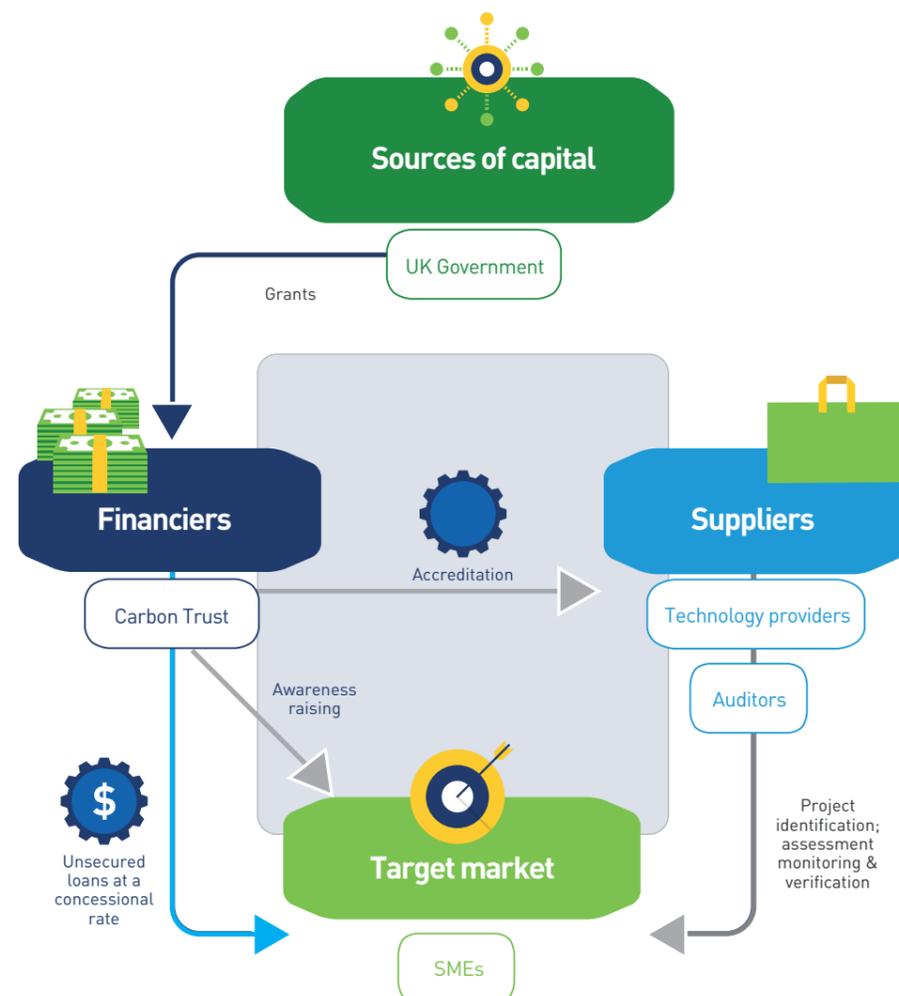
### Impact & Lessons

The extensive marketing and supplier engagement was influential in not just building awareness, but connecting potential customers with technology providers. This integration across the supply chain was enhanced through training and accreditation of suppliers that gradually built greater trust. Strict quality assurance was needed to ensure supplier-led projects met quality standards.

Demand generation was achieved through attractive loan conditions and the ease of the application process. The unsecured lending and 0% headline rate circumvented conventional barriers of SMEs needing to post their limited collateral against the loans and a high cost of capital.

Sustaining activity beyond the life of the programme has proved challenging. The loan terms on offer, as well as the free technical advice, are unsustainable in the long-term without ongoing government funding. The scheme has left a legacy in the shape of a recognised accreditation process and standard. There are indications of greater commercial lending to SMEs for energy efficiency but ideally the scheme would have created a smoother transition to working with banks and suppliers directly in the UK with a clear pipeline of projects extending beyond those supported by the programme.

**Figure 15: Carbon Trust SME Energy Efficiency Programme**



## 8. Energy Savings Insurance

The ESI is a pilot programme launched in Mexico in 2015, administered by the Inter-American Development Bank (IDB), and funded by the IDB, FIRA (Mexico's Development Bank) and the Clean Technology Fund (CTF) with additional support from the Danish Energy Agency.<sup>89</sup> Separate pilots are also being conducted in Colombia and prepared in El Salvador.<sup>90</sup> It is the first energy efficiency programme to deploy an insurance mechanism mitigating perceived performance risk in developing countries.

The insurance is complemented by a standardised performance contract, validation mechanisms, and processes designed to increase trust between contracting partners, reduce perceived risk, and ensure that energy savings are realised that can ultimately pay back a loan taken for the energy savings project.<sup>91</sup> This integrated de-risking solution aims at aligning market participants' incentives and thereby creating a sustainable environment for increasing private investments in energy efficiency for the local market.

### Target market

In Mexico, the focus is on SMEs in the agricultural sector, where there is a well-defined set of energy efficient technologies with proven track records ready for deployment.<sup>92</sup> The rationale for targeting SMEs is based on their:

- Share of the economy;
- Prevalent use of inefficient and old equipment;
- Current prioritisation of other investments over energy efficiency due to perceived risks; and
- Poor access to suitable finance for energy efficiency.

### Drivers

In Mexico there is an increasingly positive policy framework for energy efficiency. Policies include: subsidies for energy efficiency; efficiency standards for technologies; a national accreditation system for technologies; and standardised contractual arrangements for supply side energy efficiency.<sup>93</sup>

### Supply chain

A major motivating factor for the programme in Mexico is the lack of a trusted equipment technology supplier market. The lack of trust particularly applies to the ESCO model, where ESCOs have in the past not delivered promised savings and have suffered challenges trying to finance multiple projects. The ESI programme targets the lack of trust in energy efficiency technologies by providing contractual guarantees, third party validation of technology providers and technical proposals, verification of correct equipment installation, and insurance coverage. All these features are designed to assure SME end-users that they will get their promised energy savings returns and thus will be able to pay back any loans taken out with financial institutions.<sup>94</sup>

These additional processes aim to address risk-related barriers perceived across the supply chain, to increase the supply of, and demand for, energy efficiency finance.

## Barriers

<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>• Low end-user awareness of potentially profitable investments.</li> <li>• The lack of a robust pipeline of bankable projects lowers interest from the financial sector.</li> <li>• Energy efficiency is currently a low priority for SMEs who often favour revenue growth investments over cost cutting.</li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>• There is an endemic lack of trust in the technology supplier market, often based on limited experience, which needs successful project implementation examples before end-users and financiers alike will be confident making energy efficiency investments.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>• Financial institutions perceive high risk due to lack of familiarity with the technology and the underlying revenue model based on future cost savings. This performance risk is compounded by the credit risk associated with lending to SMEs who typically lack collateral or have poor credit histories.</li> <li>• Furthermore, financial institutions in developing countries lend at relatively short maturity rates, do not account for future cash flows, and do not account for the impact of these productive investments in lowering financial risk. These factors currently lead to high interest rates and/or a lack of capital supplied in the market with attractive terms and conditions.</li> <li>• SMEs often struggle to access long-term debt that is necessary for some energy efficiency investments.</li> <li>• As a result of the difficulty accessing affordable capital, SMEs often have to self-finance, which is insufficient to realise the scale to achieve the significant energy and GHG savings that are available.</li> </ul>

## Solutions

In Mexico the solutions include:

**Awareness-raising** through promotional activities in the agroindustry and with local financial institutions, with an expert supporting FIRA to implement the campaign.<sup>95</sup>

**Project identification and pipeline generation** by promoting pilot cases of bankable investments through technology-targeted energy audits and assistance with project design.<sup>96</sup>

**Project assessment, monitoring, and verification** of the feasibility of investment proposals from suppliers, including their capacity to deliver them. This includes the verification of installation of the equipment, and the potential arbitration of disputes by an internationally recognised third party. The verification process is optional for companies looking to pay for an extra safety net.

**Standardised energy performance contracts and validation procedures** between suppliers and end-users ensure that customers only pay 75% of the cost of the kit until the savings are realised, when the remaining 25% follows. The standardisation of contracts and technologies aids rapid education and scale-up in the sector.

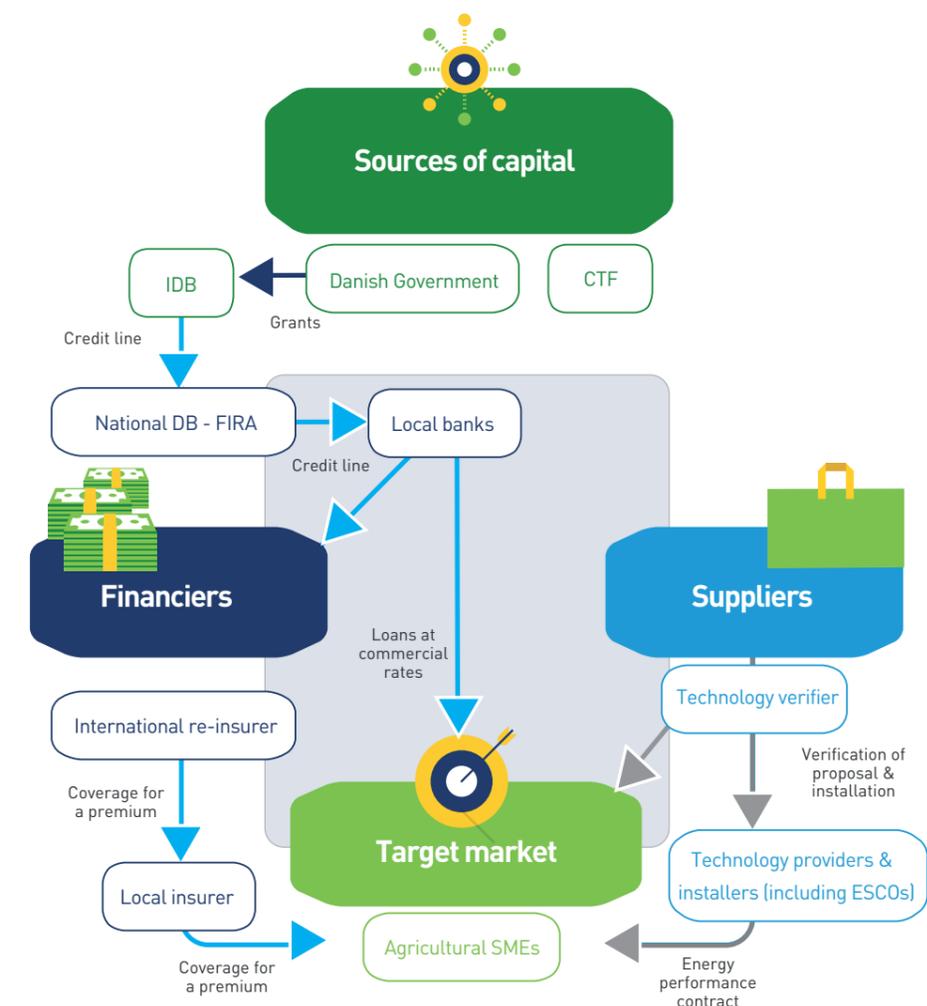
**Guarantees** are provided by FIRA to mitigate the credit risks of the target market and therefore increase the supply of finance.<sup>97,98</sup>

**Insurance** paid by the technology supplier against energy savings short-fall will cover one third (i.e. 25%) of the 75% paid by customers in advance. Since 25% of the cost of the kit is paid by customers only when savings are realised, this amounts to 50% of the potential losses in total. This lowers the risk for the SME not being able to pay back the loan and provides additional safeguards and signalling to the financial institution and insurer to adjust their risk perception about energy efficiency projects. The local insurer will also re-insure internationally with companies experienced in insuring energy efficiency investments in order to offer lower premiums.<sup>99</sup>

The combination of all of the above should reduce the risks banks perceive when lending to agricultural SMEs for energy efficiency. As a result the cost of capital for SMEs should fall.

**Credit lines** from the Mexican development bank (FIRA) will supply capital with eight year tenors to local banks at non-market distorting concessional rates, matching the payback of the technologies and underpinning the long-term loans for SMEs.

Figure 16: Energy Savings Insurance



## Impact & Lessons

As this programme is currently at a pilot phase, with several technology providers having been validated and first projects in the assessment process, there is insufficient information to judge the effectiveness of its design yet. However, the combination of standardised energy performance contracts, project assessment and verification, and insurance against potential energy savings shortfalls, represents an impressively holistic approach to de-risking the market. This could be effective in building trust within the supply chain and, consequently, the establishment of a self-sustaining market.

This multi-faceted solution package requires a balancing act to align the benefits these solutions can provide and the transaction costs they may represent. In short, these extra processes need to bring down the cost of capital sufficiently for end-users to increase energy efficiency investments and for financiers to supply finance at adequate rates. The aim is for the market to align with real rather than perceived risks, become more familiar with energy efficiency, and therefore spur on competition. The effect of these shifts would be to reduce transaction costs and amplify both the supply of and demand for finance in the long term.<sup>100</sup>

## 9. PROESCO

The PROESCO programme was a funding mechanism created in 2006 by the Brazilian development bank, BNDES, which provided direct concessional loans and guarantees to ESCOs and provided guarantees covering credit risk for commercial banks lending to ESCOs.<sup>101</sup> The objective was to enable investments in energy efficiency projects.

The project witnessed very limited demand for its finance and eventually closed in 2015. This was due to a mix of several factors, such as an overly bureaucratic process when applying for finance, high collateral requirements limiting the capacity of small and medium-sized players to access it, and a general lack of technical assistance to build the pipeline of projects.

### Target market

The target clients of the programme were ESCOs, utilities and end-users interested in funding the purchase of energy efficiency equipment for the commercial, public and industrial sectors. These sectors accounted for broadly two thirds of electricity consumption in Brazil in 2006.<sup>102</sup>

Although there was no specific threshold, PROESCO loans were intended to be above R\$1m drawing from a credit facility of R\$100m.<sup>103</sup> Additionally, equipment being installed was anticipated as having a payback of six years. Both the payback duration and initial funds show this was a scheme intended for ESCOs on the larger end of the SME scale.

### Drivers

The two main objectives of the PROESCO scheme were to support investments in energy efficiency equipment across Brazil's industrial, public and commercial sectors and to accelerate the development of Brazil's SME-sized ESCO market. These represented significant economic opportunities for boosting competitiveness and growing a new industry.

PROESCO was introduced within a policy environment which had clear objectives to promote the growth of an energy efficiency market. Specifically, in 2001, the Brazilian Clean and Efficient Energy Program was introduced to establish a dialogue between ESCOs and financial institutions.

### Supply chain

Before PROESCO was introduced, the lending market for energy efficiency was very immature. As a result, BNDES acted to increase the supply of finance and support the establishment of ESCOs, intended to bring technical support together with this finance.

Specifically, BNDES provided ESCOs with up to 100% of the funding for energy efficiency projects directly, or ESCOs could obtain loans from commercial banks, with BNDES guaranteeing up to 80% of the project risk and placing a cap of 9.1% on the interest rate of these loans. In each situation, either the ESCOs or the commercial banks would make a payment of 20% of the project cost to BNDES in case of default.

**Barriers**

<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>Market immaturity meant energy efficient technologies and concepts were regarded as having high energy savings risks.</li> <li>Lack of awareness of energy efficiency measures amongst the industrial sector.</li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>Lack of capacity among banks to evaluate energy efficiency project loan applications.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>Lack of access to medium term credit for projects.</li> <li>High interest rates faced by end-users and ESCOs for energy efficiency projects.</li> <li>SMEs were regarded as higher credit risks and, with less collateral, struggled to secure loans.</li> </ul>

**Solutions**

**Credit lines** were provided by BNDES at a concessional interest rate of 5.1% for up to 100% of the finance for energy efficiency projects to ESCOs. Additionally, BNDES also capped interest rates for selected projects funded by commercial banks at 9.1%.

**Guarantees** which assumed 80% of the credit risk were provided to banks or, alternatively, 80% of the project risk to ESCOs, with BNDES receiving a 20% return (in case of project default) from projects in exchange.<sup>104</sup>

**Project verification** was required from third parties in order to access funding.<sup>105</sup>

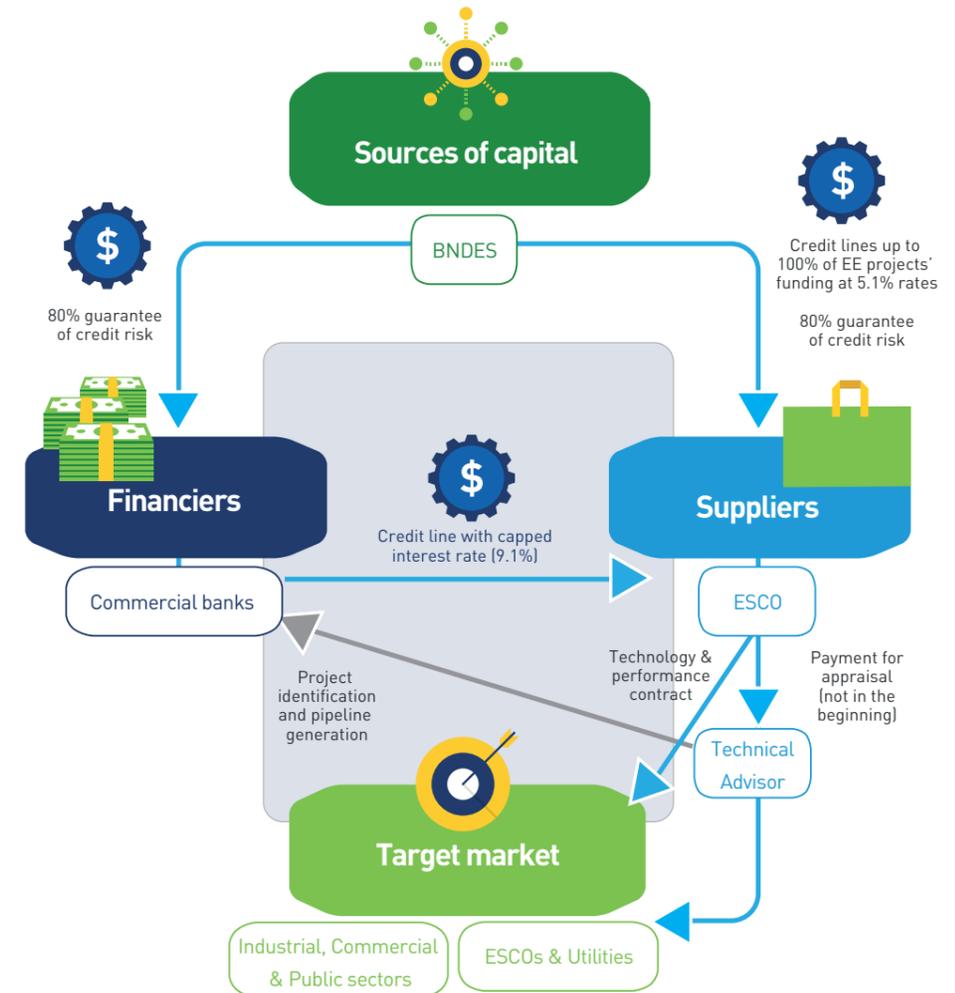
**Impact & Lessons**

The solutions developed for PROESCO largely failed to incentivise the uptake of energy efficiency projects. This was partly due to the fact that, despite guarantees to cover 80% of project costs, the perceived risk for these projects made commercial banks unwilling to accept even the remaining 20% on their own. For SME-sized ESCOs, this was also problematic due to low awareness and also low willingness to adopt energy efficiency upgrades that made it challenging for them to secure finance. The collateral requirements of participating in the scheme further limited the demand for finance.

In addition, the capping of interest rates at 9.1% for loans channelled through banks, whilst potentially decreasing risk for ESCOs, also decreased the available returns for the banks, thereby disincentivising these banks building their capability to appraise energy efficiency loan applications.

Finally, the process by which ESCOs could obtain loans, or banks could obtain guarantees, was overly bureaucratic, thereby hindering uptake. Complex processes were particularly unwelcome given the perception of energy efficiency as a low priority given the historic low cost of energy.

**Figure 17: PROESCO**



## 10. Property Assessed Clean Energy

Property Assessed Clean Energy (PACE) financing legislation was first introduced in California in 2008.<sup>106</sup> PACE refers to a framework for financing where new technology projects are paid for through additional tax assessments placed on the homeowner's property. These types of loans have been offered across a range of sectors. By 2010, legislation was in place in 31 States for renewable energy and energy efficiency financing in both the commercial and residential sectors.

PACE loans for the residential sector ran into challenges in 2010 due to complaints from mortgage lenders Fannie Mae and Freddie Mac.<sup>107</sup> The Obama Administration however revived the scheme in 2015.<sup>108</sup> The case below looks at an example in Boulder County, Colorado which used bonds as a method of financing energy efficiency technologies, a fairly unique approach to a PACE scheme.<sup>109</sup>

### Target market

In 2009, a report by the Council on Environmental Quality identified PACE financing programmes as a means of expanding the residential energy efficiency and retrofit market.<sup>110</sup> For Boulder County, Colorado the residential sector was particularly important due to the County's 2008 programme, BuildSmart, mandating energy efficiency improvements to homes.<sup>111</sup>

### Drivers

The PACE funding framework was initially designed as a financing mechanism for solar PV projects to help meet climate goals in San Francisco, California.<sup>112</sup> PACE was designed as a means of incentivising renewable energy projects by tackling one of the biggest barriers to implementation – upfront costs. This barrier is exacerbated with energy efficiency in the residential sector, particularly as property owners often move house before investments have paid for themselves. As a result, PACE tries to mitigate this influential disincentive. More broadly, from 2015 onwards, PACE was also seen as a key mechanism to help policymakers deliver the USA's economy-wide target of a 26-28% emissions reduction by 2025 from 2005 levels.<sup>113</sup>

### Supply chain

One of the main features of the PACE framework is the use of special tax districts which allow for additional tax assessments to be placed on both residential and commercial properties, which in turn pay for the renewable energy or energy efficiency project being installed.

The process of creating these districts has existed throughout the U.S. for decades, with many being used to finance municipal projects.<sup>114</sup> As such, both the mechanism and the expertise among local counties and cities for financing projects in this way was already well entrenched before the creation of the PACE framework.

This was similarly true for the process of raising bonds chosen by Boulder County, Colorado, which were used to raise capital among third party investors to provide loans to customers. With a historic AAA rating, the county was able to issue bonds rated at A- investment grade.<sup>115</sup>

### Barriers

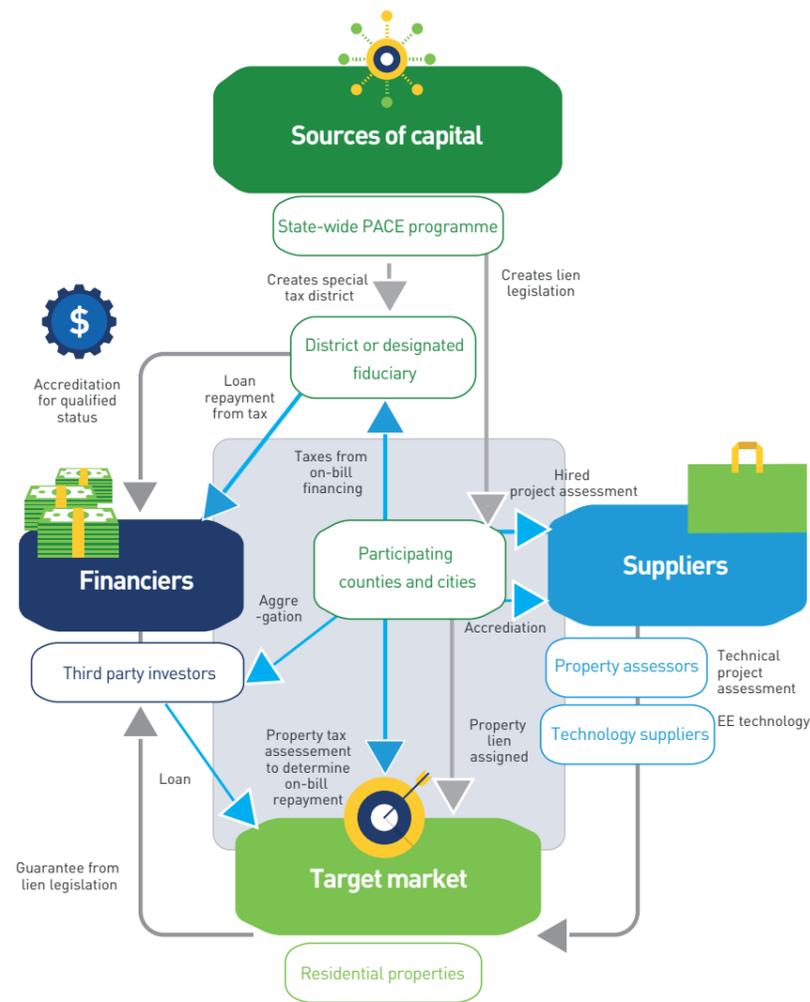
<b>Awareness &amp; commitment</b>	<ul style="list-style-type: none"> <li>Energy efficiency was seen as a low priority among households and businesses due to perceived risk of investment and low energy bills.</li> <li>On average homeowners in the U.S. move once every seven years or less thereby reducing the incentive to commit to energy efficiency improvements with perceived long payback times of between 15-20 years.<sup>116</sup></li> </ul>
<b>Technical solutions &amp; expertise</b>	<ul style="list-style-type: none"> <li>Lack of quality assurance of technologies and suppliers thereby discouraging participation.</li> </ul>
<b>Financial resources</b>	<ul style="list-style-type: none"> <li>Lack of disposable capital among households and businesses.</li> <li>Requirement by private investors for homeowners to provide collateral.</li> </ul>

### Solutions

The solutions chosen resulted in a complex process.<sup>117</sup> These were implemented in the following order, largely arranged by the state and local government to minimise hassle for the end customer:

- Accreditation** was provided by the county by ensuring that both technology suppliers and financiers registered for qualified status.
- Standardisation of contract forms** were provided by the county to technology suppliers.
- Technical assistance for project assessment** was provided by hired project assessors to determine project repayment according to the cost of the energy efficiency technology chosen with additional support (webinars, online guides) provided by the federal government.
- Loans** repayable through on-bill financing were secured by consumers *either* directly from accredited third parties *or* from the county in order to purchase upgrades from suppliers.
- Guarantees** from the state were offered to third party investors through senior lien legislation on properties – a collateralisation of the actual property itself in the event of default on repayments for the energy efficiency technology – to address perceptions of risk.
- On-bill financing** was achieved through special tax districts that placed additional tax assessments on properties in order to pay back the upgrades over 15 years either to the municipal government or to private financiers directly. Additionally, for some low-income households, the use of the tax system meant interest rates on repayments were tax deductible.
- Aggregation** of projects by Boulder County to back the issuance of bonds, thereby attracting investment from third parties and allowing the original capital to be recycled.
- Green bonds** were issued in order to provide liquidity to the municipal government who would then provide upfront loans from \$3,000 to \$50,000 repayable through the on-bill financing method over 15 years at interest rates ranging from 5.2% to 6.8%.<sup>118</sup>

Figure 18: PACE



**Impact & Lessons**

The PACE framework was largely considered successful since the tax assessments combined with senior liens addressed the separate resourcing barriers for both homeowners and third-party investors, namely the lack of capital and requirement for collateral respectively.

In addition, local municipalities engendered trust through their technical assistance and programme outreach to homeowners by linking them with technology suppliers and also ensuring that financiers were properly registered.<sup>119</sup>

Despite the successes of this design however, in 2010, the sustainability of this model was brought into doubt after mortgage lenders Fannie Mae and Freddie Mac complained that the liens had priority over mortgages, thereby causing difficulties in the residential sector. The scheme was revitalised in 2015 following new legislation but the extent to which the model described above can be sustainable without interfering with other markets (e.g. the mortgage market) could be seen as a limiting factor.

# Insights into designing a programme

The purpose of this final piece of analysis is to extract the most important lessons from across the case studies.

It is structured around the categories of barriers noted earlier: awareness and commitment; technical solutions and expertise; and financial resources. The most common solutions that have emerged from the case studies and wider energy efficiency programmes can be matched with these barrier categories. As previously stated in the section on 'Key questions', and exemplified in the subsequent case studies, solutions often address multiple barriers, to varying degrees of significance.

The following pages highlight the key insights for each of these solutions. Each is discussed with regards to its purpose, method and relative merits and shortcomings. It is crucial to recognise that these lessons are all subject to contextual variations and challenges. Their purpose is to synthesise important reflections for understanding why solutions have, or have not, worked.

## Awareness and commitment



### Awareness-raising

**Purpose:** Build a critical mass of demand by increasing knowledge and understanding in the target market and their financiers of the benefits of energy efficiency as a business opportunity, and the solutions and the services available, while creating a trusted, authoritative brand to promote them.

**Target barriers:** Lack of knowledge and awareness of the benefits of energy efficiency.

**Method:** Advertising, educational events or direct outreach depending on the level of pre-existing awareness and the feasibility of reaching the target audience.

**Key insights:** Awareness is the first fundamental step for establishing the foundations for a scalable market and demands attention if a programme is to be successful. The need to raise awareness was identified as a key component for nearly all the case studies examined in this report. Possible awareness-raising activities for programmes include:

- **Advertising and marketing campaigns** through national or local media, which can address a large number of potential customers, and more targeted campaigns through third parties such as trade organisations, which are often more effective at reaching specific target markets. This activity can build general awareness, but usually only communicates limited information.
- **Educational events**, which can provide more comprehensive information. They initiate the transition from awareness to commitment by inviting direct participation, which can help address remaining questions and obstacles to action. Often these events can also combine education or training with introductions to potential suppliers of equipment or finance, raising awareness not only of the existence of an opportunity but how to address it.
- **Direct outreach** through emails and calls, which can deliver messages to individuals in the target market without the extensive resourcing requirement of major advertising campaigns or educational events. They can provide easy links for potential customers to find out more information beyond the initial outreach.

Identification of a clear and accessible target market is key if resources are to be deployed efficiently and effectively. Tools such as surveys during market research are useful before full advertising campaigns begin. Moreover, it is important to focus on the key decision-makers in the target market. If dealing with businesses, it is important to pitch the campaign to boardroom-level executives and finance directors who ultimately will have to sign off on any necessary investments.

The careful synchronisation of an awareness-raising campaign with the other technical and financial elements of a programme is important. Ideally, the majority of the awareness-raising will occur before and during the early (pilot) period of launching a programme, so that demand is built up that can then be met by the other resources employed in the programme. However the enduring impact of awareness-raising should be sustained by feeding back results from the programme into further efforts to attract more customers. This necessitates monitoring progress to track the behaviour of the market to effectively time awareness-raising efforts to incentivise customer action.

Indeed, monitoring and evaluation is vital to observe wider market factors affecting the uptake of finance, helping to better understand the messages and channels that best work. This can be used effectively in conjunction with the setting of targets (e.g. for monthly and yearly financial disbursements in the context of a loans programme) to incentivise action and to track progress.

The caveat for awareness-raising campaigns is that in isolation, they are insufficient for generating a pipeline of projects. Whilst they can be highly effective in raising the profile of energy efficiency and drawing attention to the opportunities on offer, convincing potential customers and financiers to actually invest, particularly in less accessible sectors, will likely require formal project identification and pipeline generation processes. These are analysed later in this section.

As such, awareness-raising campaigns are best applied when they are administered by, or directly linked to, the suppliers of financial and technical solutions. For instance, one of the successes of the Thai Energy Efficiency Revolving Fund was that the banks were effective in generating awareness amongst their customer bases of the energy efficiency opportunity through advertising the cheap credit.

In addition, leveraging third parties including business groups, trade bodies, local governments, and technology suppliers can be useful for approaching customers in a target market. For the Carbon Trust's programme, accessing networks through trusted intermediaries was important for building awareness, and then capitalising on this with suppliers close to the action. Indeed, the suppliers themselves ended up proposing approximately 75% of the total projects for the finance, emphasising the positive impact on pipeline generation. Hence awareness raising materials should not only be targeted at advertising the scheme to potential customers, but also at stakeholders along the energy efficiency supply chain, notably suppliers, who can use them to support sales of best performing technologies and products. A warning, however, is that it may be in the interest of suppliers to be speculative in their proposals, necessitating quality assurance processes for any suppliers gaining access to support from a programme (see below).

### Project identification and pipeline generation

**Purpose:** Identify, develop and prepare a pipeline of bankable projects to establish sufficient market scale to interest financiers.

**Target barriers:** Lack of knowledge and awareness of specific energy efficiency opportunities amongst both end customers and financiers limits demand.

**Method:** Providing energy audits, training suppliers (e.g. to support the development of business cases for finance), facilitating interactions across the supply chain, tracking potential customers, and creating demonstration projects can all help create market scale in different ways.

**Key insights:** In immature markets, there may not be capacity or enthusiasm within the supply chain to identify new energy efficiency projects, which may not be prioritised by many market participants. Technical assistance for project identification and pipeline generation can fill this gap and hence prove that an attractive opportunity exists to financiers and end-users. For example, the provision of energy audits at a subsidised rate and to a quality assured standard may be an important part of identifying specific project opportunities for the target market. One challenge in many developing country markets is that the quality or even presence of energy auditors can be variable, meaning that at first it may be necessary to raise the numbers and quality of – and trust in – the local pool of energy auditors.

Generating a pipeline for energy efficiency investment in particular is outside the remit of most financiers. They do not expect to have to identify potential customers and assist them in creating a financeable project. Therefore, programmes that only feature financial solutions may only succeed where there is already a pipeline of projects, or at least a well-developed supply chain to generate a pipeline. If this is not the case, financial institutions will struggle to disburse funding.

There have been attempts to train financial institutions to identify projects themselves or to assess the merits of projects presented to them. Evidence suggests only moderate success. In the Thailand Energy Efficiency Revolving Fund case study, participating banks became overly dependent on the assistance provided by the DEDE to identify projects. The banks did not invest in developing their own internal expertise sufficiently since they did not have internal capacity for this in their everyday business.

In addition, when financiers play a large part in identifying projects, for example in the CHUEE scheme in China, they tend to favour existing clients with strong balance sheets. This can divert the impact of the programme away from those target markets that find it more difficult to access affordable finance for energy efficiency, including SMEs and the residential sector, and therefore reduces the additionality or cost-effectiveness of a given programme.

Programmes have been more successful with pipeline generation in immature markets when they have leveraged suppliers (e.g. Carbon Trust) or have employed their own specialist team to aid such a process (SEFFs). Local expertise normally requires the existence of a mature supply chain. If one of these elements is lacking, then upskilling and awareness-raising will be a key component of the programme. If a special entity is installed, it needs to either transfer its skills to local capacity, or endure beyond the lifetime of the programme, to avoid being only a temporary solution.

### Policy development

**Purpose:** Put in place fundamental drivers to strengthen the business case to create a long-term, sustainable market environment.

**Target barriers:** Fundamental drivers that weaken the business case for energy efficiency such as energy subsidies or alternatively the lack of pro-energy efficiency policies, such as mechanisms monetising energy demand reduction or energy efficiency performance standards.

**Method:** Advising on removing energy price distortions, putting a price on carbon, introducing tax breaks for energy efficiency investment, promoting policy roadmaps, and developing energy efficiency regulations, codes and standards.

**Key insights:** This is not a particularly common feature across the energy efficiency finance programmes examined in this study. It is important to note that often there is minimal policy commitment beyond the scheme itself from governments that either design an energy efficiency programme or sanction third parties designing one. In the case study where policy advice has most extensively featured, the SEFFs, the host countries wanted to adhere to the rules attached to EU membership and so were more receptive to policy development. Such drivers can be influential but they are not always present.

To fully commit to creating a self-sustaining private sector market, the market conditions need to support the business case. The process for addressing market barriers through policy development may require addressing politically sensitive areas, like the withdrawal of energy subsidies, which is likely to be opposed by those that benefit from them.

The creation of the Carbon Trust in the UK in 2001 helped make the imposition of the Climate Change Levy on the business community more palatable by simultaneously offering advice and finance to help businesses become more energy efficient thus reducing their exposure to the levy and saving them money.

To be effective policy development must target what is operationally relevant and work with action on the ground. For example, the impact and availability of new technologies on what is being taken up in the market should feedback to policymakers setting new minimum energy efficiency standards.

To ensure operational relevance, policy development must focus on approaching the ministries, individuals and policies which have the most impact on the energy efficiency market. Further, if the programme design more broadly demonstrates real benefits of energy efficiency on the ground, for example by showing how to achieve emissions reductions cost-effectively, the case for policy reform is bolstered. If policy and on the ground action are not well integrated, both will be hindered.

### Incentives

**Purpose:** Temporarily make the business case for energy efficiency more attractive through financial concessions or compensation to encourage the demand for energy efficiency projects and/or the supply of finance for energy efficiency investments.

**Target barriers:** Real or perceived factors that make energy efficiency opportunities unattractive to developers, financiers, and end customers, including costly and time consuming project development processes; the high transaction costs and small scale (and therefore limited prize) of energy efficiency projects; high up-front costs of energy efficiency technology; unfavourable prioritisations between energy efficiency and other business priorities; and unappealing payback periods.

**Method:** Concessional terms of finance, performance subsidies, tax breaks for energy efficient equipment, discounted technical assistance.

**Key insights:** Incentives have been proven to generate significant demand across a number of case studies, acting as a pull for investing in energy efficiency and for the accompanying energy efficiency finance. This is particularly true when there are pricing distortions - such as subsidies for energy - where incentives can be fundamental to creating an attractive business case by offsetting the impact of the subsidies.

Incentives can aid the disbursement of finance by attaching (implicit or explicit) concessional interest rates or longer tenors to credit lines to financial institutions. Rates can be implicitly lower for end-customers by development banks providing local banks with a lower cost of finance or a longer term on lending, allowing them to offer a lower retail rate. Rates can be explicitly lower for end-customers by explicit subsidies or discounts being applied by finance providers, for example the Carbon Trust SME Energy Efficiency Loan Scheme offered loans at 0% interest.

The availability of credit for local financial institutions on easier terms from development banks increases the potential returns available to financial institutions from participating in the programmes and encourages them to invest in understanding the opportunity, thus reducing perceived risk due to unfamiliarity. In order to minimise processing costs and particularly in markets where liquidity might not be a constraint, it could also be possible to offer a standalone subsidy, without the supporting credit line. This has worked for end-customers, for example where an upfront or performance linked capital subsidy is accessed instead of credit at a concessional rate.

Aside from the financial incentives outlined above, some programmes deploy subsidised technical assistance as an incentive to foster engagement with the programme. This can be attractive to financiers, suppliers and end-users depending on the type of assistance on offer. It is most common in our sample where development banks preferred to lend on commercial terms but supplement this with donor-funded technical assistance. This is evident in both CHUEE and the SEFFs.

A major challenge for incentives is that they can create unsustainable reliance on support if they are distant from normal commercial conditions and last too long without a smooth transition towards what would be offered commercially. Two clear examples of this are the Carbon Trust and Thai Energy Efficiency Revolving Fund case studies, which both offered highly concessional interest rates to end-customers that lasted a long time without gradual phasing out.

Hence, if they are deployed, incentives should be intelligently phased out through an exit strategy. In addition, like the SEFFs, they can be tied to performance, to generate greater energy savings. This maximises the potential impact of the programme in terms of GHG emissions avoided, and has a concurrent effect of demonstrating the higher potential of energy efficiency investments.



## Technical solutions and expertise

### Project assessment, monitoring and verification

**Purpose:** Properly assessing the best energy efficiency opportunities in each situation and monitoring and verifying their impact will help ensure the most profitable projects are recommended, helping to stimulate demand for energy efficiency investments and reducing the perception of risk amongst investors helping to increase the supply of finance.

**Target barriers:** Project assessment, monitoring and verification is difficult without sector knowledge if there is insufficient technical capacity; commonality on best practise; and standardisation of procedures and technologies.

**Method:** Training local suppliers of goods and services to properly assess potential opportunities for a given business through gaining understanding of different technologies and building capacity to conduct or at least understand key reports such as energy audits. Alternatively, programmes can install entities with existing experts that are then capable of either transferring skills to the local supply chain or outlasting the programme.

**Key insights:** The lack of technical skills to accurately assess and monitor energy efficiency projects across a supply chain is a common market barrier. It both limits the demand for energy efficiency solutions and the potential flow of finance to them. Without these skills, the lack of trust in promised savings is exacerbated. There is a need to build a credible track record of successful projects that are backed by assessments from local experts.

Identification of a clear and accessible target market is key if resources are to be deployed efficiently and there are many options for supporting project assessment, monitoring, and verification. Options explored in the case studies examined included:

#### Training local suppliers including technology providers, ESCOs and auditors.

On face-value, upskilling local technical capacity is the most desirable type of technical assistance. It provides the most convincing approach to the challenge of long-term sustainability in a market. However, it requires an existing supply chain able to take on the responsibilities, and that the training can be effective in transferring the key skills to the recipients, so that they can support the market on their own after the programme's completion.

#### Training financiers, in particular local banks.

Technical project assessment is not a prerogative, nor interest, of banks. They are very unlikely to develop expertise so far from their core business model. This is revealed by the lack of capacity building evident in the Thai Energy Efficiency Revolving Fund, and, to some extent, the SEFFs. Nevertheless in almost all cases there is a need to build capacity and confidence in delivering financing programmes for energy efficiency investments. However, financiers need to consider their strategic, and institutional, parameters. Energy efficiency finance should adhere as closely as possible to existing priorities and departments to ensure an appetite for the transfer of such skills. However, even this can be difficult for certain financiers who prefer ready-made (prepared, assessed and monitored) projects to keep costs and hassle at a minimum. In these cases, only a technical intermediary will do.

### Install a new entity to perform the functions missing from the local supply chain.

If there is a total absence of local companies or institutions capable of carrying out project assessments, monitoring or verification, then programmes have to bring in expertise. This can be foreign experts, as some SEFFs have had to do. Alternatively, a programme can create special purpose companies in the location, such as the Green Deal Finance Company and the EESL, and look to build local capacity from the start.

The requirements for installing a new entity are:

- It needs to have a high degree of credibility, which may take time to establish, meaning the programme as a whole will take longer;
- It needs to develop strong working relationships with others in the supply chain; and
- It should be capable of transferring skills to local equivalents, or have permanence beyond the duration of the programme.

If one or more of these factors is lacking, then the pipeline generation will suffer. Either it will suffer from a lack of trust in the new entity, or leave a vacuum when it departs.

Here it is also important to note that there are absolute savings from every energy efficiency project. Therefore, if another entity is installed, this will result in lower returns for other programme members, potentially harming the business case. The key determinant is whether such new entities can reduce the cost of capital for end-users or suppliers by a sufficient margin to offset the loss of some of the returns.

### Accreditation (technologies, suppliers, auditors, financiers)

**Purpose:** Stimulate demand, and supply of finance, for energy efficiency investments by reducing the perceived risk of technology performance, and advice from suppliers, auditors, and sometimes financiers.

**Target barriers:** Mitigate perceived risks and lack of trust that financiers and end-users have in energy savings promised from technologies, suppliers, and energy audits.

**Method:** Provide third-party verification of the energy savings promised or credentials of energy saving technologies, suppliers of energy saving technologies or services, and energy audits. Build the market's trust in such third party verifications such that the verification itself becomes a mark of quality encouraging energy efficiency actions by end-users.

**Key insights:** Given the reliance on promised savings, energy efficiency markets can benefit greatly from independent, third-party assessments of unknown technologies, suppliers and energy auditors. This is particularly pertinent in developing countries, where the supply chain is immature or non-existent. Both the Carbon Trust and the Investor Confidence Project show that accreditation is also important for scaling private sector action in developed countries.

Formal accreditation is best applied through a singular authoritative scheme. In countries where there are competing lists of accreditors, such as India, there can be extra confusion and distrust. The credibility of the process depends on it being thorough, accurate, and easily recognised. In addition, accreditation requirements can be tightened over time to push suppliers to innovate, and end-users towards realising greater energy savings. Moreover, if accreditation is supported by policymakers, there is scope for introducing tax breaks for technologies which are accredited.

For equipment, this process is aided by the standardisation of technology. The reasoning behind this is twofold. Firstly, it can aid the scale-up across a target market that uses a set technology. Secondly, there is a large, verified track record of performance. Using only a strict set of standardised and verified technologies that can be monitored for correct installation and performance helps to simplify the programmes, whilst building greater confidence in the target markets, and their suppliers of finance.

In order to utilise the benefits of standardised technology, programmes such as the EESL in India and the SEFFs in Eastern Europe have kicked off by targeting specific sectors that can use established and proven energy efficient technologies.

### Standardisation - procedures, contracts and decisions

**Purpose:** Build confidence in the business case for projects and minimise the extra cost and hassle associated with unfamiliar transactions across the supply chain by making procedures, contracts, and decisions straightforward and transparent.

**Target barriers:** The extra cost and hassle associated with unfamiliar transactions across the supply chain that discourage uptake.

**Method:** Simple and replicable contracts between parties, user-friendly interfaces, and fast decision-making processes.

**Key insights:** Without a standardised set of procedures and contracts, it will be very difficult for an energy efficiency market to reach significant scale. The benefit is that standardisation can homogenise a fragmented market, minimising the effort and resources that would otherwise need to be spent on assessing individual projects, and hence cutting costs and hassle.

Standardisation is crucial for:

- Demand generation – mitigating problems associated with excessive hassle for a potentially low priority investment for end-users.
- Supply of finance – where transaction costs can be minimised through efficient processes.

Financiers, suppliers and customers all greatly favour simplicity, therefore any form of standardisation should try to avoid over-complicating transactions.

The simplicity of the Carbon Trust programme, CHUEE, and SEFFs was cited as a major strength in generating commitment across the pipeline. In contrast, inherent complexity was a hindrance to the Green Deal. On the other hand, despite being complex, the PACE loans in Boulder County were not hindered since much of the processes were handled by the local government, rather than the end customers, who had existing procedures in place. Accordingly, any energy efficiency finance programme should attempt to put clear, simple, standardised processes in place at its outset. This can be complemented by educational outreach to familiarise the supply chain and target market.

The Investor Confidence Project in Europe aims to accredit suppliers and standardise procedures for financing energy efficiency in the buildings sector. This involves collaboration between approximately 175 financial institutions across Europe to develop a common standard and instrument for evaluating projects, and streamlining the process for approving them, in essence, acting as a cross-border translation tool for the fragmented market.

## Financial resources



### Support for monetising energy savings

**Purpose:** Grow a market of suppliers that use energy savings within their revenue model, supporting confidence in the promised cash flow.

**Target barriers:** Lack of familiarity and trust from end-users and investors in business models that monetise energy savings such as ESCO service offers. This makes it difficult for companies based on these business models to raise capital.

**Method:** Support for de-risking investments in ESCOs to encourage growth in their business model.

**Key insights:** Investors and customers can find it difficult to understand the value of energy efficiency because it. To try and alleviate this, there has been a growth in companies who monetise the savings as their cash flow. In particular, ESCOs are well-known for guaranteeing the performance of energy efficient solutions, and therefore trying to create a more visible source of value from the savings for end-customers.

Developing a local ESCO market is a key feature in numerous programmes, but with varying levels of success. Fundamentally, if part of the solution is to try and develop an ESCO market, finance is not the place to start. There must be some pre-existing capacity for financial solutions to be used, therefore technical assistance should be the first priority.

The success of this is evident when the CHUEE programme was able to build on the market readiness established by the World Bank's preceding 'Energy Conservation Project'. China now has the world's largest ESCO market with an estimated value of \$12 billion.<sup>120</sup>

However, for cases where an ESCO market is immature and small, such as in Brazil with PROESCO, then financial solutions such as guarantees will be insufficient for developing the supply chain. ESCOs require investment in technical capacity building and accreditation processes first and foremost, to build experience and establish trust between them, the rest of the supply chain, and end-customers.

Overall, the case studies highlight that the ESCO model is better suited for programmes that target sectors with large and consistent energy bills – for example, municipalities with EESL in India, or large energy-intensive industries with CHUEE in China. These sectors support the ESCO business model with clearly identifiable value delivered via energy efficiency. In contrast, for SME markets this is less well-suited given their relatively small, less predictable energy bills.

The major weaknesses of ESCOs are often their own lack of collateral, preventing them accessing debt financing for growth, and the inherent unfamiliarity and complexity of their business model to end-customers. This prevents them accessing cheap credit on the one hand, and convincing potential customers to part with their cash on the other.

However, ESCOs can prove to be useful for implementing energy performance certificate (EPC) guarantees that address the lack of trust across the supply chain. Additionally, as illustrated by the EESL, they can be effective at aggregating smaller projects for financing and ultimately driving down unit costs substantially for certain standardised energy efficiency technologies. This latter point is explored in more detail under the sub-section below on aggregation methods.

### On-bill financing

**Purpose:** Provide an accessible means of avoiding the upfront cost of capital for energy efficiency upgrades through a hassle-free regular repayment plan that can be subsumed into a normal energy bill or tax payments.

**Target barriers:** The lack of upfront capital and lack of trust in energy savings as value for property owners.

**Method:** Integrating investment costs with pre-existing bills, where energy savings prevent the former exceeding the latter over the payback period.

**Key insights:** On-bill financing can be an effective way of encouraging the uptake of energy efficiency among consumers as it represents a hassle free regular repayment plan that can be subsumed into normal energy bill or tax payments. For the Green Deal and the PACE loans, the solution has had mixed results, with the latter succeeding and the former regarded as a failure. Mostly these differences in success were due to factors outside on-bill financing.

For the Green Deal, one of the key problems during implementation was the overly conservative estimation of consumers' energy bills. However, combined with an ambition to have any upgrades paid back quickly (by 2020), this had the effect of limiting the number of technologies eligible, and hence the pipeline of projects. By contrast, though a similar approach was used within the PACE framework, the evaluation process was less conservative and payback times were generally longer.

In addition, from an investor perspective, though both schemes offered similar rates of interest (both just under 7%) for repayment of energy efficiency technologies, PACE loans were more attractive to third party financiers than the Green Deal, in part due to the additional guarantee of a lien placed on properties. The lien gave investors a legal claim on the real estate such that in the event of its sale their debt would have to be repaid.

Furthermore, when financing is achieved through engagement with the end-user directly, institutional capacity, often from public bodies, is key to ensuring trust and participation. Specifically, though the high interest rates were partly attributed to the failure of the Green Deal, this did not appear to hinder the PACE financing. This discrepancy can in part be attributed to the PACE repayments appearing as part of property taxes, a common method of funding municipal projects in the USA for decades. Household in the US were perhaps more receptive to such financing that is routed through a trusted local government, rather than an external provider.

### Unsecured lending

**Purpose:** Alleviates the need for end-users to provide collateral to secure financing for energy efficiency investments.

**Target barriers:** Insufficient collateral available from end-users to borrow against to fund energy efficiency investments.

**Method:** Financier will lend against the merits and predicted cash flow of a project and their assessment of the creditworthiness of the borrower – but not require the borrower to post assets as a security.

**Key insights:** Many potential target markets only have limited collateral and cash flows with which to secure debt financing. When they do seek external finance for investment it is typically to grow their business and boost productivity. Energy efficiency is lower down the list of priorities because of its inherent uncertainties and its impact as a cost saving, rather than increased revenue, making it less attractive.

Unsecured lending, or lending secured only against the returns of a project (or assets purchased as part of the project), can be helpful for generating demand for energy efficiency because it removes the need to secure limited assets to unlock investment.

However, commercial banks are unlikely to ever offer such finance under normal market conditions, at least for energy efficiency<sup>121</sup>. This is due to the high perceived risk that financiers associate with lending without collateral, even if the supposed returns could be attractive. A primary factor in this high perception of risk is that energy efficiency projects themselves do not generate top-line returns through additional sales, but rather reduce costs relative to an alternative counter-factual. Without an identifiable and trusted revenue stream, such promises are perceived as too risky.

A related argument put forward by financiers is that, if energy efficiency investments are so attractive for a company, they should have no trouble posting security against loans for this purpose. This issue serves to illustrate how the mechanics of unsecured lending can actually increase the perceived risk for financiers. This is the case despite the historical experience of low default rates across the case studies, such as the Carbon Trust's 0% unsecured loan programme.

Therefore, if unsecured lending is to work, it has to be administered by a body that is prepared and able to take the losses itself. Given that it is unlikely that a bank, or similar, will undertake this in the current market, this suggests that only a publicly administered or funded body can implement this form of project finance.

### Leasing (operating and capital)

**Purpose:** Allow end-users to access energy efficiency capital equipment without needing to make a capital investment.

**Target barriers:** The high upfront costs of energy efficient equipment; a lack of awareness/trust from end-users in energy efficient technology; and an unwillingness/inability of end-users to secure finance against their limited collateral.

**Method:** The leasing party will lend equipment as part of a service, possibly including maintenance (operating), or until the end-user pays off the cost and owns it outright (capital).

**Key insights:** As with unsecured lending, leasing avoids the need for businesses to secure external finance against limited assets. In the case where a business funds its assets internally without external finance, leasing avoids tying up large amounts upfront.

For operating leases, the leasing company owns the equipment and provides it to the end-user for a rental fee, which can also include maintenance costs. As well as avoiding tying up capital, operating leases can be classed as operating expenditure, with decisions often able to be made by lower level managers rather than needing senior sign-off. Under capital leasing, the equipment can eventually be owned by the end-user at the end of a contract, whereas suppliers always retain ownership under operating leasing.

The CSEF programme has leveraged three leasing companies in Turkey who purchase energy efficient equipment for customers, usually SMEs, using loans from the IFC that are blended with concessional finance from the CTF. This blended finance is more attractive in interest rate and tenor than that offered commercially, overcoming the liquidity problem for leasing companies.

Leasing requires a mature leasing market, which end-users are familiar with and generally works best for technologies that can be easily standardised and/or have widespread applicability. Where these factors are not in place, then a leasing programme may be challenging to implement as securing the sales sufficient to offset the cost of equipment may be hard to secure over a fragmented market.

### Insurance

**Purpose:** Mitigate the risk of the technology not performing as expected.

**Target barriers:** The market for energy efficiency upgrades is often limited to those technologies with very short payback periods. Perceived high technology risk discourages lenders from financing energy efficiency projects. Energy efficiency is not a top business priority for end-users, and they can be sceptical about saving potential.

**Method:** Premium paid for by the end-user or supplier in return for coverage of any shortfall in projected savings reduces the perception of high risk, and possibly the cost of capital if financiers concur.

**Key insights:** This is an innovative concept in energy efficiency finance, though similar to the idea of insuring the performance of a building in the construction industry, which could provide a marker for how it might work in practice.

Using an insurance product for energy efficiency savings can increase the confidence in these investments and therefore demand from end-users. Insurance could also decrease the perceived risk of lending to finance energy efficiency projects from financiers, hence increasing the supply, and reducing the cost of capital for energy efficiency investments. In theory this reduced cost of capital would help offset the necessary premium that would pay for the coverage if taken out by the recipient.

However, the mechanics of an insurance product can increase the complexity of a programme. By bringing in extra participants to the supply chain, along with extra costs and hassle, this added complexity could deter potential customers. Moreover, there needs to be sufficient scale to convince insurers to expand their business into the energy efficiency market.

To be successful, an insurance scheme would need to address the following questions:

- Is there enough of a pipeline/scale to make it worthwhile for insurers?
- Are the insurers willing to expand their business into a relatively unknown market?
- Are customers willing to sacrifice some of the projected energy savings of potential investments to pay a premium for coverage?
- Are the customers prepared to deal with the extra hassle of interacting with another potential actor?
- Do banks and suppliers recognise the value of insurance and will it reduce the cost of capital sufficiently to drive a net increase in investment?

If these issues can be positively addressed by the programme, then the potential market could stand anywhere between \$10-100 billion<sup>122</sup>. However, it is too early to deduce whether the obstacles discussed above can be overcome.

### Guarantee

**Purpose:** To encourage financiers to expand into new markets perceived as too risky under normal conditions.

**Target barriers:** Poor creditworthiness of clients requiring finance, who often lack the collateral or revenue streams to secure a loan. Financial institutions may be reluctant to finance energy efficiency projects that are unfamiliar to them and especially so if the lending is to a higher credit risk group such as SMEs, which often lack a track-record of successful borrowing and repayment and/or lack collateral. If guarantees help encourage financial institutions to offer unsecured lending, they may tackle the lack of energy efficiency project financing available.

**Method:** Programme will cover a fixed percentage of the losses incurred by financiers if their loans do not perform.

**Key insights:** A guarantee is intended to reduce the perceived risk to financiers and encourage investment in energy efficiency projects they would usually avoid. For example, a development bank providing a guarantee to local banks.

In some instances, the guarantee did not change perceptions of high risk. For the PROESCO case, banks continued to be risk averse even in the presence of high guarantees. Even if a guarantee increases the availability of finance by encouraging banks to enter a market, banks could include the fee for the guarantee in the cost of capital offered to customers, dampening demand for investment from end-users.

In other cases, guarantees have helped drive greater lending for energy efficiency projects, but not always in the target market. For CHUEE, although one of the banks increased its energy efficiency portfolio extensively, it did not branch out beyond large, energy-intensive clients. As a result, the traditionally difficult to reach SME target market was largely neglected. This highlights how the guarantee was perhaps effective in reducing the perceived performance risk of energy efficient technologies, but not the credit risk associated with clients who have less cash flows and collateral.

This implies that guarantees may provide impetus to fund some projects that may not have received finance before. However, these are often not the most risky or market-changing investments. The additionality of guarantees is therefore questionable, and potentially limited to providing demonstration effects of relatively safer energy efficiency investments.

Finally, guarantees struggle to create self-sustaining markets. To be attractive enough to encourage investment from financiers, they must depart significantly from normal market conditions. Therefore, similarly to other financial incentives, if they are deployed they should be gradually phased out to support sustainability once they expire.

### Credit line

**Purpose:** Addresses limited liquidity in financial institutions, increasing their willingness to use funds for energy efficiency.

**Target barriers:** Financial institutions lack liquidity (short and long-term) and/or inclination to invest in energy efficiency projects.

**Method:** Injection of government, MDB or other donor funds for on-lending, with specified terms attached to ensure funding goes to eligible projects.

**Key insights:** Credit lines are one of the most common instruments found in energy efficiency finance programmes that try to address a lack of liquidity in a market. Often they can be provided at rates that are more favourable than found in local markets due to the strong credit rating of the financial institutions that provide them.

In instances where local financial institutions have issues with long-term liquidity – particularly in developing economies – credit lines can be useful for providing a stable source of additional funds that can be on-lent. Furthermore, credit lines can be supplemented with incentives (as discussed above) to generate greater demand for energy efficiency finance further downstream. However, it is imperative to recognise that beyond providing additional liquidity, their utility is limited. Their ability to address the fundamental risk-return profile of energy efficiency investments is inadequate unless they are combined with substantial concessions. It is therefore crucial to be aware of what is preventing the lack of financial flows in an energy efficiency market. If it is not the lack of liquidity, but an unattractive business case, then a credit line is not sufficient to overcome the key barriers in a market.

### Aggregation (including green bonds)

**Purpose:** Increase supply of capital into the market by reducing relative transaction costs for investors through scale.

**Target barriers:** High transaction costs associated with individual investors dealing with different scales and types of technologies and customers and a lack of liquidity to fund energy efficiency projects.

**Method:** Either ‘pooling’ capital and then investing this in projects that meet eligibility requirements or ‘bundling’ already sourced projects and securing finance for these, freeing up the capital of the project originators to re-invest in new projects.

**Key insights:** ‘Pooling’ is a top-down method for aggregating energy efficiency projects. The most visible method currently is the use of green bonds. They have historically been issued by development banks, but in the last few years commercial banks have taken an increasing interest<sup>123</sup>. Green bonds enable capital to be raised by financiers for specifically environmentally-friendly projects that are selected once sufficient capital is raised. Although this may appear to provide a route for generating extra finance for energy efficiency projects, in actual fact they do not address the fundamental downstream problems. Similarly to credit lines, they can address an absence of liquidity, but they will not help develop financeable projects. This perhaps goes some way to explaining why only around 15% of the IFC’s green bonds end up financing energy efficiency.

‘Bundling’ could be closer to bridging this gap between the supply of finance and the generation of projects. It is very uncommon for green bonds, but can be performed by ESCOs or other SPCs who can combine their technical knowledge of project identification and assessment with an ability to leverage financing for a group of projects simultaneously.

Beyond having strong connections across target markets, suppliers and financiers, these entities would need to be trusted and creditworthy to succeed in securing substantial financing. Indeed, they would face some of the same challenges as traditional ESCOs since they simply do not have the assets or cash flows to make them safe investments for financiers. They would also necessitate third party verification of their proposed projects to ensure they provide the returns promised.

## Conclusion

When designing an energy efficiency finance programme, answering every one of these six key questions is essential. Doing so necessitates a comprehensive understanding of a local context, an appreciation of both the possibilities and the limitations of the tools available, and keen attention to detail throughout. Across the preceding sections, the information under each question highlights the most pertinent concerns for realising this.

In addition to these key questions, programme designers can take on board a number of practical lessons for targeting the major barriers of energy efficiency and leveraging sustainable private sector investment. They are the product of analysing the efficacy of a wide range of historical programmes. For each of the three overarching challenges outlined earlier, we have identified five key lessons to address them most effectively, and sustainably.



## Awareness and commitment

When combining incentives with awareness-raising and pipeline generation, a comprehensive package should generate significant demand and commitment. But without a favourable and stable policy environment, the business case for energy efficiency will consistently face an uphill struggle for sustained private sector activity and long-term demand.

**1. Programmes should not focus solely on the supply of finance, they need to concurrently stimulate and scale-up demand.** Investment will not flow unless there are bankable projects. The essential first step is effective demand generation through significant awareness-raising and pipeline generation activities.

**2. To link supply and demand, projects must be identified, prepared and delivered to financiers in a commercially viable way.** Financiers will not independently search out energy efficiency projects, so leveraging existing networks within target markets and suppliers is crucial. However, third parties need careful quality control to avoid poor project proposals and maximise efficiency.

**3. Timing and synchronisation with the other components of a programme is paramount for using awareness-raising and pipeline generation tools effectively.** A plan before implementation can fulfil part of this need. But executing it requires regular monitoring of flows of finance, tracking potential customers, and investing in repeated pushes to build awareness and commitment.

**4. There should be a mutually reinforcing relationship between policy development and action on the ground.** Market distortions (such as energy subsidies) and externalities (such as carbon) need to be priced appropriately to incentivise energy efficiency and lead to transformative and lasting change in the private sector. Convincing policymakers to take potentially difficult decisions can be supported by demonstrating the benefits of energy efficiency.

**5. Incentives (such as concessional finance) can temporarily create an attractive business case, but they are more suited to realising short-term energy demand reduction than sustainably transforming markets.** To address the latter, an exit strategy needs to aim for, or come close to, commercial conditions by the end of their lifetime. For demonstration effects, incentives should be intelligently tied to energy savings.



## Technical solutions & expertise

Delivering energy efficiency to a target market requires three indispensable principles: trust, skills and simplicity. When acting in concert, these factors can form the foundation for a credible and integrated supply chain that reduces both costs and hassle.

- 1. Trust is the essential glue that binds together any supply chain, performing a crucial de-risking function for unfamiliar energy efficiency investments.** What it requires is extensive, credible and visible proof of profitable energy efficiency projects.
- 2. Properly assessing, monitoring and verifying projects provides the raw data for achieving trust; but this requires standardisation** of procedures, contracts, decisions and technologies to aid the process of aggregating and scaling credible data.
- 3. Formal accreditation completes the process.** The final step of accreditation for technologies and suppliers can centralise and formalise this process, providing a trusted and credible standard – and an accessible pathway to end-users.
- 4. To implement all, or even some, of the above requires skills and investment in the local supply chain.** For sustainable change, the transfer of skills to local agents is vital. The selection of appropriate organisations, according to their strategies and structures, requires careful consideration. If they are not suitably equipped, without work to address deficiencies in the supply chain, the market will stagnate.
- 5. As a general rule, simplicity must be maintained wherever possible.** Every additional organisation needs to represent a measurable benefit to deserve its inclusion. Financiers, suppliers and end-users will prefer interactions that represent minimal hassle.



## Financial resources

The majority of the solutions to this challenge try to unlock the shortage of finance dedicated to energy efficiency. This is often achieved by making energy efficiency capital more attractive to financiers or their recipients depending on the mechanism. But finance is only one dimension of the energy efficiency problem.

- 1. Financial solutions should not be used to address non-financial barriers.** Although a market may display a lack of investment, the major barriers might not be related to the availability and affordability of capital. Thorough investigation is required to assess whether its absence is a symptom of problems downstream that require technical solutions.
- 2. Financial solutions are often limited to addressing one financial problem at a time, and their shortcomings should be well-understood.** For instance, credit lines can inject liquidity but, unless combined with implicit incentives, that is all they can do.
- 3. Again, simplicity is a fundamental principle.** Parcelling up and dividing risks across different entities can be effective, but excessive hassle and transaction costs can be counterintuitive when convincing financiers to invest in new markets.
- 4. To nurture a self-sufficient private sector market, any financial programme needs to exit the scene with its conditions as close as possible to commercial.** This mitigates against over-reliance on its existence, and builds local capacity and confidence in working commercially.
- 5. Implementing energy efficiency finance demands a close connection between the financial and technical support to sell energy savings to justify investment.** The needs, abilities and limits of the supply chain and the target market will define the parameters of any package; and these parameters need to be stress-tested before implementation, and monitored throughout, incorporating a degree of flexibility to changing market conditions. The more effectively financial and technical support are constructed, timed and implemented together, the higher the chances are of creating a robust, trusted and successful supply chain that can inspire confidence in a new market.

# Recommendations

There are three indispensable recommendations to re-orient the focus of programmes and thereby drive transformational and sustainable change:

**1. Energy efficiency finance schemes will not be enough to change markets. Business cases need to be strengthened by strong policy frameworks with the right economic and regulatory drivers to incentivise and bring about change. Therefore, influencing such frameworks must be a key objective of future programmes.**

**2. Programmes should devote more resources to technical assistance than has been the case historically. Activities such as awareness-raising, pipeline generation and de-risking are essential to create sufficient demand and commitment to act. Adequate attention and resourcing must also be complemented by carefully synchronising technical and financial elements.**

**3. Upskilling and equipping suppliers and technical advisors, connecting the financial and technical aspects of energy efficiency, is also critical to creating a sustainable, scalable and bankable pipeline. Across the supply chain, they have the greatest inherent incentive in their business model to identify, appraise and deliver viable projects ready for financing.**

These recommendations are essential for unlocking the manifold benefits of energy efficiency and keeping the door to 2°C open.

## Glossary of terms used in energy efficiency finance

The glossary below provides an explanation of some commonly used terms in energy efficiency finance. Where relevant, the mechanisms discussed are further separated into sub-categories (e.g. Credit line (1) and Credit line (2)). This glossary builds on similar glossaries available from other entities involved in climate and energy efficiency finance, for example from the Climate Bonds Initiative Glossary.<sup>124</sup>

**Accreditation:** Offers a formal, authoritative qualification as a mark of quality based on historical performance for suppliers, installers, auditors, or equipment.

**Aggregation (1) – debt aggregation:** Reduces transaction costs for investors by bundling together similar projects that use standard contracts and specifications.

**Aggregation (2) – top-down green bonds:** Top down green bonds are issued by banks and international financial institutions to 'pool' funding from investors that are then used for qualifying green projects. Proceeds are currently more commonly invested in renewable energy rather than energy efficiency projects.

**Aggregation (3) – bottom-up green bonds:** Bottom-up aggregation into green bonds involves collecting green projects that are aggregated or 'bundled' together, and then securitised to make up a bond, which is then sold to investors. The securitised assets, the green projects, provide the remuneration for the bondholders rather than having this guaranteed by the bond-issuer.

**Awareness-raising:** Involves advertising, marketing, educational events, or direct outreach to a target market to raise awareness of the benefits of energy efficiency. The most appropriate form will depend on the level of pre-existing awareness and the feasibility of reaching the target audience.

**Blended finance:** Involves combining public and private funding to mitigate investment risk and/or enhance returns for private investors, crowding in private sector capital to energy efficiency markets.

**Concessional rates:** Energy efficiency finance programmes very often involve the provision of a credit line with an interest concession, whereby a donor or government entity either directly offers a loan at below commercial rates or provides funding to a lending bank for the purpose of them offering a cheaper rate.

**Corporate finance:** On balance sheet finance typically secured against the assets of the entity taking out the loan and based primarily on an assessment of their creditworthiness rather than secured solely against the assets of the project the loan will be used to finance and an assessment of the merits of that project.

**Coupon:** The interest payment on a bond.

**Credit line (1) – senior debt:** Provides additional liquidity, often at concessional rates and tenors more favourable than those found in local markets, to simulate on-lending from local financial institutions. Usually available to the borrower on a revolving basis for as long as the credit line is extended.

**Credit line (2) – subordinated debt:** As with credit line (1) provides additional liquidity, often provided at concessional rates and tenors more favourable than those found in local markets, to simulate on-lending from local financial institutions. Holders of subordinated debt sit below senior debt in the order of precedence for repayment and so may be used to encourage providers of senior debt to invest. Unlike equity funding, the financier does not obtain a shareholding and thus any control of the project.

**Energy audit:** An assessment of the energy needs and efficiency potential of a given end-user, their premises, or their equipment.

**Energy Service Company (ESCO):** A company that sells energy efficiency projects or solutions and is remunerated based on the energy performance of those projects or solutions. Energy efficient equipment manufacturers often act as ESCOs by providing sales finance with repayments linked to the energy saving performance of their equipment.

**Equity funding:** Share capital in a firm or project, generally used to develop higher-risk companies or projects, and when provided externally (rather than by existing owners) is often followed by an exit once a target return is achieved. In the energy efficiency context equity funding involves the sale of an ownership interest in a business/company to raise funds for an energy efficiency project or set of projects e.g. could be used by an Energy Services Company.

**Guarantee (1) – credit risk:** Guarantees share project credit risks in loans provided by financial institutions, to encourage financiers to expand into markets perceived as too risky under normal conditions. Usually guarantees compensate losses incurred on corporate finance loans for energy efficiency projects at a fixed percentage. Typically cover 50-80% of an outstanding loan.

**Guarantee (2) – performance:** Guarantees the performance of energy efficiency solutions, thereby providing a visible source of value from the savings. The intervener (e.g. an ESCO) will cover a fixed percentage of the losses incurred by the financier or end user from performance failure.

**Incentives (1) – project development grants:** Provide pre-investment funding typically in developing countries/emerging markets. Grants can leverage private financing by supporting development of projects to a stage where private investors are willing to participate. One option is the use of loans that convert to grants to provide incentives to developers to complete projects in a timely fashion and capture higher returns. Alternatively, grants can convert to loans meaning developers are more willing to take on marginal projects, knowing the costs of pre-investment activities are covered if the project is unsuccessful.

**Incentives (2) – tax breaks:** Tax breaks give incentives to invest in energy efficiency projects or equipment through providing tax rebates related to the amount invested. Sometimes these operate as tax credits reducing the amount of tax liable and sometimes as depreciation allowances allowing faster write-down of qualifying capital equipment.

**Incentives (3) – performance subsidies:** Financial rewards or rebates claimed by end-users tied to the installation and/or performance of energy efficient technology. These effectively reduce the overall cost of the investment and make the business case more attractive.

**Innovation funding:** Businesses and research organisations can apply to funding sources to help them develop innovations that will lead to greater energy efficiency. Innovation can bring down the costs of energy efficient technology to indirectly enable greater deployment.

**Insurance:** Asset performance insurance covering customers, suppliers, or financiers against a shortfall in projected energy savings. The insurer receives a premium to cover a set amount of losses incurred due to the technology not performing, with the possibility of re-insuring a package of energy efficiency projects on the international market.

**Leasing (1) – operating:** Energy efficient equipment can be leased whereby the end-user makes lease payments to the equipment owner for the term of the lease, with no ownership of the asset ever transferring to the end-user.

**Leasing (2) – capital:** Capital or “lease-to-purchase” leases work similarly to operating leases whereby the end-user makes regular lease payments to the equipment owner, however the end-user purchases the equipment for a nominal fee at the end of the lease term. Using a capital lease allows the lessee to record the equipment as a capital asset and so gain access to tax and depreciation benefits.

**Mezzanine finance:** A form of non-conventional debt that is junior to senior debt and may be unsecured, but is senior to equity in terms of repayment. Typically will be much more expensive than other forms of debt but allows the shareholders to retain ownership of their company when undertaking risky activity e.g. expansion.

**On-bill financing:** Integrates the cost of investing in energy efficiency upgrades with pre-existing bills (such as energy bills), with the idea that energy savings will offset the additional cost that would otherwise appear over the payback period.

**Policy development:** Pro-energy efficiency policy advice includes advice on removing pricing distortions of energy and carbon, introducing tax breaks for energy efficient investment, promoting policy roadmaps, and developing energy efficient codes and standards.

**Project identification and pipeline generation:** Project identification and pipeline generation includes support for activities such as training suppliers, facilitating interactions across the supply chain, tracking potential customers, and demonstration projects that can all help markets scale up in different ways.

**Project loan facility:** Debt facilities often organised by entities other than commercial financial institutions providing direct financing on a project by project basis and only secured against assets relating to that project.

**Standardisation of decision-making:** Standardisation in this form can consist of creating simple and replicable contracts between parties, user-friendly interfaces, and fast decision-making processes.

**Project assessment, monitoring and verification:** Training local suppliers of energy efficient goods and services to be able to assess the case for installing equipment or providing services in a given situation (e.g. via an energy audit), or monitor the impact of the installation of energy equipment or change in behaviour on energy savings, or verifying the performance of equipment. The assistance may also take the form of installing entities staffed by external experts who are capable of transferring skills to local entities or of creating an institution that outlasts the support given by and energy efficiency programme.

**Tenor:** The length of time until full payment of a loan.

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