



Economic and Social Commission for Western Asia

Toolkit for Energy Efficiency Financing Instruments for Buildings in the Arab Region



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Economic and Social Commission for Western Asia

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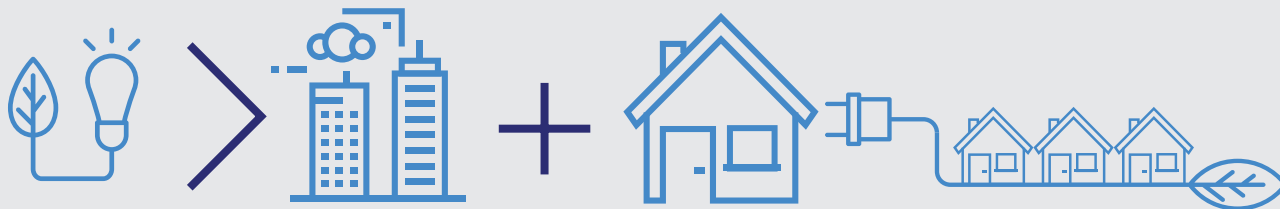
AUTHORSHIP

The report was developed by the Energy Section in the Climate Change and Natural Sustainability Cluster of ESCWA. Lead author was Dr. Steven Fawkes, Managing Partner at EnergyPro Ltd. and ESCWA consultant, under the supervision of Ms. Radia Sedaoui, Chief Energy Section, with contributions from Mr. Mongi Bida, First Economic Affairs Officer, and Mr. Mohamed Zied Gannar, Economic Affairs Officer at the Energy Section of the Climate Change and Natural Sustainability Cluster, ESCWA. Support was also provided by Mr. Mohamed Alsayed, Manager, and Mr. Hussain Mugaibel, Global Lead Energy Specialist, at the Public Private Partnership Division and Economic Infrastructure Division respectively, at IsDB.

REVIEW AND CONSULTATION

The public consultation and peer review processes were coordinated by ESCWA and included the expert workshop on “Financing the Upscaling of Building Energy Efficiency Programmes for Climate Change Mitigation and Sustainable Development in the Arab Region”, organized by ESCWA in Beirut in December 2020. Substantive comments and inputs were provided by international experts from regional and international organizations as follows: Mr. Scott Foster, Director of Sustainable Energy Division, Economic Commission for Europe (ECE); Mr. Ashok Sarkar, Senior Energy Specialist, Energy and Extractives Global Practice, The World Bank; Ms. Helen Naser, Advisor, Programme for Energy Efficiency in Buildings (PEEB), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); Mr. Nicholas Howarth, Research Fellow III, Climate and Environment Programme, King Abdullah Petroleum Studies and Research Center (KAPSARC); Mr. Rafik Missaoui, Sustainable Energy Economist, Chief Executive Officer, Alcor; and Ms. Kawther Lihidheb, Senior Energy Efficiency Specialist, ECONOLER.

KEY FINDINGS



Scaling up energy efficiency in the building sector will free up energy resources that can be used to extend services to other potential end users.

Scaling up energy efficiency in the residential sector can enable access to additional energy services by vulnerable segments of society and reduce the risk of energy vulnerability.



Energy efficiency can reduce costs for consumers and bring many other benefits to them, the electricity system and society as a whole, benefits which can include lower levels of air pollution, reduced need for capital expenditure in the electricity system, reduced need to import fuels, and increased energy system and economic resilience.



CARBON EMISSIONS



**INVESTMENT IN
ENERGY EFFICIENCY**



FINANCING INSTRUMENTS

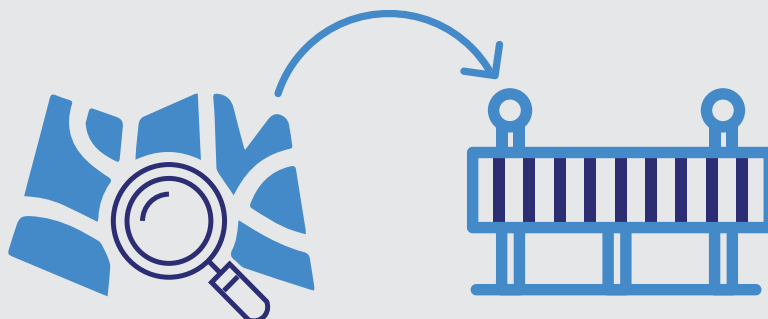
Given the importance of the building sector in terms of carbon emissions, there is a need to upscale investment into building energy efficiency within the region and, consequently, a need to develop and implement new financing instruments.

1,450 TWh
by 2030



2,000 TWh
by 2050

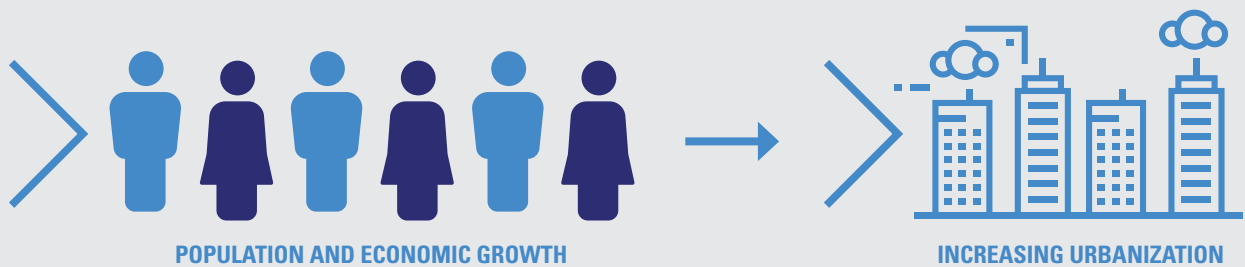
If current trends remain unchanged, buildings in the Arab region would consume 1,450 terawatt-hours (TWh) by 2030, a doubling compared to the 2005 consumption, and reach 2,000 TWh by 2050, a doubling of the 2015 consumption.



There are a number of regional specific barriers such as the need to address energy vulnerability. These barriers, including the variations between subregions, need to be addressed in the design of any energy efficiency financing instrument for the region.



This Toolkit provides information on a number of financing instruments for building energy efficiency taken from around the world utilising both public and private, as well as blended, finance which can be used to guide the design and development of specific instruments in the Arab region.



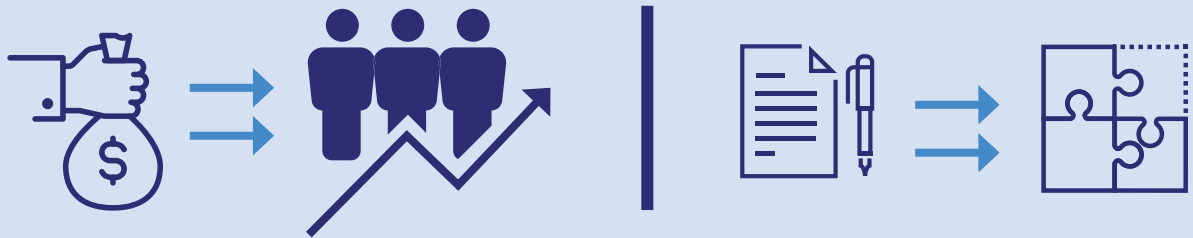
Given the population and economic growth of the Arab region, and increasing urbanization, there is a need to ensure that new buildings are highly efficient, and a number of financing instruments designed for new buildings are discussed.



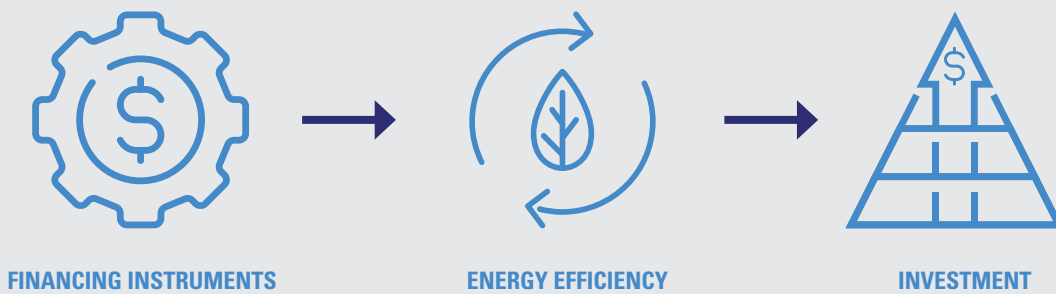
A major lesson from international experience is that an integrated approach to the design of financial instruments is required. Policy instruments can encourage the demand for energy efficiency projects and programmes that can utilize the various financing mechanisms that are available, including purpose-designed energy efficiency financial instruments.



Energy efficiency projects, like any other project, have real risks, and these risks need to be recognized and assessed as part of investment decisions. The problems of real and perceived risk can be addressed by utilizing a number of risk mitigators, or derisking tools.



Although public funding has a clear role to play in financing energy efficiency, the scale of the task ultimately requires mobilizing private capital in self-sustaining market-driven solutions. The report proposes instruments that can lead to the development of smart market solutions.



Well-designed financing instruments can overcome the barriers to improving energy efficiency and begin to scale up investment.



There is an opportunity for the region to learn from global experience and systematically develop a flourishing ecosystem of financing instruments that address different market segments and are adapted to local conditions.

EXECUTIVE SUMMARY

Improving energy efficiency, particularly within the building sector, is recognized as a major contributor to climate change mitigation and an area where current efforts must be increased. Improving energy efficiency is in line with Sustainable Development Goal (SDG) 7, “Ensure access to affordable, reliable, sustainable and modern energy for all”, and in particular target 7.3, “By 2030, double the global rate of improvement in energy efficiency”, but also target 7.1, “By 2030, ensure universal access to affordable, reliable and modern energy services”, since scaling up energy efficiency in the building sector will free up energy resources that can be used to extend services to other potential end users. Furthermore, scaling up energy efficiency in the residential sector can enable access to additional energy services by vulnerable segments of society and reduce the risk of energy vulnerability. The non-energy benefits associated with energy efficiency projects can also contribute directly to other SDGs, including Goals 1, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15.¹

The Arab region has historically had low levels of energy efficiency, with high levels of energy use per capita, partly because of fossil fuel and electricity subsidies. Population and economic growth will further increase energy demand over the coming years. Over the last few years, energy markets have opened up for private-sector investment, and fossil fuel and electricity subsidies have been reduced across the region, leading to increased costs for consumers and industry. These changes have made improving energy efficiency more economically attractive and necessary as energy efficiency can reduce costs for consumers and bring many other benefits to them, the electricity system and society as a whole, benefits which can include lower levels of air pollution, reduced need for capital expenditure in the electricity system, reduced need to import fuels, and increased energy system and economic resilience.

Regional energy intensity in the Arab region rose during the 1990s – contrary to most other regions of the world – and has only declined since the beginning of the 2010s. In 2016, the aggregate regional energy intensity stood at about 4.7 megajoules (MJ) per 2011 purchasing power parity

(PPP) US dollar, a decline of about 3 per cent over the six-year period. The conclusion is that the Arab region is not on track with global energy efficiency targets.

As a result of lagging behind the energy efficiency growth rate for SDG target 7.3 of -2.6 per cent, progress towards the 2030 targets now needs to improve to an average of -2.7 per cent energy intensity improvement globally, and the Arab region needs to reach a regional, aggregate, average annual improvement of 3.4 per cent compound annual growth rate (CAGR) in order to meet the global 2030 target.

To achieve such an increase in the average annual improvement of energy efficiency, it will be necessary to significantly increase the level of investment going into energy efficiency, and dedicated financing instruments can have a major role to play in this. Given the importance of the building sector in terms of carbon emissions, there is a need to upscale investment into building energy efficiency within the region and, consequently, a need to develop and implement new financing instruments. This Toolkit is designed as a resource for policymakers and other stakeholders developing financing instruments for the building sector.

The building sector is critically important for addressing energy use and carbon emissions. In 2018, the buildings and construction sector globally accounted for 38 per cent of final energy use and 39 per cent of energy and process-related carbon dioxide emissions, 11 per cent of which resulted from manufacturing building materials and products.² Within the Arab region, the proportion of total final energy consumption associated with the building sector varies significantly among the subregions, namely, 13 per cent in the Gulf Cooperation Council (GCC), 27 per cent for the Mashreq, 28 per cent for the Maghreb, and 42 per cent for least developed countries (LDCs). If current trends remain unchanged, buildings in the Arab region would consume 1,450 terawatt-hours (TWh) by 2030, a doubling compared to the 2005 consumption, and reach 2,000 TWh by 2050, a doubling of the 2015 consumption.

¹ See <https://sdgs.un.org/goals>.

² United Nations Environment Programme (UNEP), 2020. 2020 Global Status Report for Buildings and Construction. Towards a zero-emissions, efficiency and resilient buildings and construction sector. Global Alliance for Buildings and Construction.

Within the Arab region, there is a high need and growing demand for cooling services as economies and populations grow, a growth that will also be driven by increasing average temperatures resulting from climate change. If this growing demand is met simply by conventional means such as standard air conditioning technologies, this will lead to significant increases in power demand and peak loads with consequent strains on the electricity system as well as additional emissions. Addressing more efficient and sustainable cooling is a key imperative for the region.

There are a number of barriers to investing in building energy efficiency which are universal, such as small project size and the difficulties of measuring results, and barriers specific to the building sector including the split incentive between landlords and tenants. There are also a number of regional specific barriers such as the need to address energy vulnerability. These barriers, including the variations between subregions, need to be addressed in the design of any energy efficiency financing instrument for the region. Energy efficiency finance everywhere is an emerging, and still relatively small, speciality compared to energy supply financing, but there are clear lessons to be learned from international experience.

This Toolkit provides information on a number of financing instruments for building energy efficiency taken from around the world utilising both public and private, as well as blended, finance which can be used to guide the design and development of specific instruments in the Arab region. It illustrates the various structures that can be used in the design of such financing instruments and best practice in their design.

The different types of financing instruments for building energy efficiency include specialized funds and dedicated credit lines. Examples of funds include the KredEx Revolving Fund for Apartments in Estonia, the London Energy Efficiency Fund in the United Kingdom and the Lithuania Multi-apartment Modernization Fund. Examples of credit lines include the European Investment Bank's Private Finance for Energy Efficiency Facility and the European Bank for Reconstruction and Development (EBRD) Residential Energy Efficiency Credit Line in Bulgaria. Examples of financial instruments within the Arab region include the Morocco Sustainable Energy Financing Facility and the Tunisian Energy

Transition Fund. In addition to funds and credit lines, there are a number of hybrid instruments that utilize finance in combination with other key elements such as project development resources and standards to increase the flow of energy efficiency investments. These include super energy service companies (Super ESCOs) in various forms, such as Etihad Super ESCO and Tarshid, and the use of high efficiency building standards and labels to support green loans or mortgages. Given the population and economic growth of the Arab region, and increasing urbanization, there is a need to also ensure that new buildings are highly efficient, and a number of financing instruments designed for new buildings such as EcoCasa in Mexico are discussed in the report.

A major lesson from international experience is that an integrated approach to the design of financial instruments is required. Policy instruments can encourage the demand for energy efficiency projects and programmes that can utilize the various financing mechanisms that are available, including purpose-designed energy efficiency financial instruments, but the specific problem of bridging the gap between potential projects and fully developed, bankable projects must be addressed. Failure to do so risks creating financing instruments with insufficient deal flow for the available financing. Bridging the development gap can be addressed by a variety of transaction enablers, including procurement frameworks, providing project development assistance in the form of both finance and skills, and Super ESCOs.

Another factor inhibiting the flow of capital into energy efficiency project is the perception of risk amongst both project hosts and financiers. There are a number of reasons for this, which include the following: there is often a 'performance gap' between design performance and actual performance of energy efficiency projects, meaning that they do not produce the anticipated savings; in buildings, improved comfort may counteract energy savings, particularly where residents have previously been experiencing uncomfortable conditions and energy vulnerability; the technical and financial performance of energy efficiency projects has not generally been measured, meaning that there are insufficient data on actual performance, leading to uncertainty amongst project hosts and investors; and, finally, there is limited experience in financing energy efficiency projects in buildings within the

financial sector. These factors mean that energy efficiency projects, rightly or wrongly, are often considered high-risk or uncertain by project hosts and providers of finance. It goes without saying that energy efficiency projects, like any other project, have real risks, and these risks need to be recognized and assessed as part of investment decisions. The problems of real and perceived risk can be addressed by utilizing a number of risk mitigators, or derisking tools, including the following: various types of guarantees; loan loss reserves; the use of performance insurance; the use of performance contracting; the use of standards; and lower risk repayment mechanisms such as additions to energy bills or property taxes. The report discusses the various types of risk and potential derisking tools at both the project and the economy levels.

Although public funding has a clear role to play in financing energy efficiency, the scale of the task ultimately requires mobilizing private capital in self-sustaining market-driven solutions. The report proposes instruments that can lead to the development of smart market solutions.

One additional problem in energy efficiency finance is that various actors, including potential project hosts, project developers, technical specialists, and finance professionals, use different languages when discussing energy efficiency projects, programmes or policies. Technical specialists and project developers are not familiar with the language of finance, and finance

professionals are not familiar with the language of energy efficiency. The report defines common terms used in the financing of energy efficiency projects as a way of providing a language which can reduce misunderstanding, build capacity and help accelerate investment into energy efficiency.

Despite the many barriers, it is clear that increasing the flow of finance into building energy efficiency is critical in the Arab region as it is in the rest of the world. In addition to being a major weapon in the fight against climate change, accelerating investment into building energy efficiency can bring many benefits, including increased comfort, improved local air quality, improved health outcomes, reduced need for investment into energy supply, and job creation. Experience from around the world, some of which is outlined in this report, shows that well-designed financing instruments can overcome the barriers to improving energy efficiency and begin to scale up investment.

Although the Arab region has provided some world-leading examples, notably the Super ESCOs in the United Arab Emirates and Saudi Arabia, there is an opportunity for the region to learn from global experience and systematically develop a flourishing ecosystem of financing instruments that address different market segments and are adapted to local conditions. It is hoped that this report can provide assistance on the journey towards that end and help scale up investment into building energy efficiency across the region.

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Cryptocurrency	Price (USD)	% Change
Bitcoin	22,712.4	+2.1%
Ethereum	599.08	+1.5%
Cardano	0.45873	+0.8%
Bitcoin Cash	0.9984	+0.2%
Bitcoin SV	103.121	-9.2%
Bitcoin Gold	307.84	-12.5%
Bitcoin Classic	12.06	-5.75%
Bitcoin Unlimited	115017	-3.97%
Bitcoin Core		-7.24%
Bitcoin Core (Testnet)		+4.8%
Bitcoin Core (Regtest)		-1.3%

ABBREVIATIONS AND ACRONYMS

BEDES	Building Energy Data Exchange Specification	ELENA	European Local Energy Assistance
BEEC	building energy efficiency certificate	ELM	external lending mandate
CAGR	compound annual growth rate	EPC	energy performance contract
CEB	Council of Europe Development Bank	ERDF	European Regional Development Fund
CO₂	carbon dioxide	ESA	energy services agreement
CVDB	Cities and Villages Development Bank	ESCO	energy service company
DEEP	Derisking Energy Efficiency Platform	ESCWA	Economic and Social Commission for Western Asia
DER	distributed energy resource	ESPC	energy savings performance contract
DEWA	Dubai Water and Electricity Authority	GCC	Gulf Cooperation Council
DNMF	Multi-apartment Modernization Fund	GDP	gross domestic product
DR	demand response	GFCF	gross fixed capital formation
DSRF	debt service reserve fund	GHG	greenhouse gas
EBRD	European Bank for Reconstruction and Development	GIZ	German Corporation for International Cooperation
ECE	Economic Commission for Europe	GWh	gigawatt-hour
ECM	energy conservation measure	HVAC	heating, ventilation and air conditioning
EEEF	European Energy Efficiency Fund	ICP	Investor Confidence Project
EEFIG	Energy Efficiency Financial Institutions Group	IEA	International Energy Agency
EEM	energy efficiency measure	IPMVP	International Performance Measurement and Verification Protocol
EEN	energy efficiency network	IREE	Investor Ready Energy Efficiency
EERSF	Energy Efficiency and Renewable Sources Fund	IsDB	Islamic Development Bank
EIB	European Investment Bank		

JESSICA	Joint European Support for Sustainable Investment in City Areas	OECD	Organisation for Economic Co-operation and Development
KAPSARC	King Abdullah Petroleum Studies and Research Center	OSER	Regional Energy Services Operator
KIDSF	Kozloduy International Decommissioning Support Fund	PACE	property assessed clean energy
LaaS	light as a service	PDA	project development assistance
LABEEF	Latvian Baltic Energy Efficiency Facility	PDU	project development unit
LDC	least developed country	PEEB	Programme for Energy Efficiency in Buildings
LEEF	London Energy Efficiency Fund	PF4EE	Private Finance for Energy Efficiency
LLR	loan loss reserve	PPA	power purchase agreement
M&V	measurement and verification	PPP	purchasing power parity
MEEF	Mayor's Energy Efficiency Fund	RBF	results-based financing
MEETS	metered energy efficiency transaction structure	REECL	Residential Energy Efficiency Credit Line
MEPS	minimum energy performance standard	RoGBC	Romanian Green Building Council
MESA	managed energy services agreement	SDG	Sustainable Development Goal
MJ	megajoules	SDPD	Sustainable Development and Policies Division
MorSEFF	Morocco Sustainable Energy Financing Facility	SEED	Standard Energy Efficiency Data
MWh	megawatt-hour	SHF	Sociedad Hipotecaria Federal
NAMA	National Appropriate Mitigation Action	SME	small and medium-sized enterprise
NEB	non-energy benefit	SPV	special-purpose vehicle
NGO	non-governmental organization	TWh	terawatt-hour
NZEB	nearly zero energy building net zero energy building	VAR	value at risk
OBF	on bill financing	VIPA	Public Investment Development Agency
OBR	on bill repayment	WHEEL	Warehouse for Energy Efficiency Loans





SCALING UP BUILDING ENERGY EFFICIENCY FINANCING IN THE ARAB REGION

This chapter reviews the situation with regard to energy efficiency in the Arab region and the potential for improvement. It also examines barriers to scaling up investment into energy efficiency in buildings, some of which are universal and some of which are specific to the region.

A. INTRODUCTION

Improving energy efficiency is recognized as an essential, but as yet underexploited, part of efforts to mitigate climate change. To improve efficiency levels, there is an unmet investment need globally, and the immediate need is to scale up investment into projects and programmes that increase efficiency across all sectors.

The Arab region has historically had low levels of energy efficiency, with high levels of energy use per capita, partly because of fossil fuel and electricity subsidies. Population and economic growth will further increase energy demand over the coming years. Over the last few years, energy markets have opened up for private-sector investment, and fossil fuel and electricity subsidies have been reduced across the region, leading to increased costs for consumers and industry. These changes have made improving energy efficiency more economically attractive and necessary as energy efficiency can reduce costs for consumers and bring many other benefits to consumers, the electricity system and society as a whole, benefits of which can include lower levels of air pollution, reduced need for capital expenditure in the electricity system and reduced need to import fuels.

Improving energy efficiency is in line with Sustainable Development Goal (SDG) 7, “Ensure access to affordable, reliable, sustainable and modern energy for all”, and in particular target 7.3, “By 2030, double the global rate of improvement in energy efficiency”, but also target 7.1, “By 2030,

ensure universal access to affordable, reliable and modern energy services”, since scaling up energy efficiency in the building sector will free up energy resources that can be used to extend services to other potential end users. Furthermore, scaling up energy efficiency in the residential sector will result in substantially lower energy consumption, thus lowering energy bills, allowing access to additional energy services by vulnerable segments of society and reducing the risk of energy vulnerability in these segments. The non-energy benefits associated with energy efficiency projects can also contribute directly to other SDGs, including Goals 1, 3, 5, 6, 8, 9, 10, 11, 12, 14, and 15.

There are a number of barriers to investing in energy efficiency which are universal, such as small project size and the difficulties of measuring results, and these are discussed in detail later in the report. There are also a number of region-specific barriers which will need to be addressed in the design of any energy efficiency financing instrument. Energy efficiency finance is emerging and still relatively small compared to energy supply financing, and there are lessons to be learned from international experience. This report sets out a number of international examples of energy efficiency financing instruments which can be used to guide the design and development of specific financing instruments for building energy efficiency in the Arab region.

B. PROGRESS ON ENERGY EFFICIENCY IN THE ARAB REGION

The Tracking SDG 7: Energy Progress Report 2019 reported that in the Arab region “average energy intensity rates remain all but unchanged at 4.7 megajoules (MJ) per 2011 purchasing power parity (PPP) US dollar.”³ Within the subregions, the Maghreb without Libya, the Mashreq and Arab least developed countries (LDCs) have seen a long-term trend in falling energy intensity since the 1990s, which was around the 4 MJ/\$2011 PPP range by 2016. Conflict and instability have significantly affected the energy intensity rates, particularly in Iraq, Libya, the State of Palestine, and the Syrian Arab Republic. In the Gulf Cooperation Council (GCC), overall energy intensity has been rising since the 1990s, albeit with a gradual decline in more recent years to about 6 MJ/\$2011 PPP in 2016. Bahrain and Qatar’s energy intensity is far above the rest of the GCC, though with a downward trend.

Investment into energy efficiency in the Arab region is estimated to be \$17 billion, only 2.7 per cent of the regional gross fixed capital formation (GFCF) of \$623 billion. This is below the energy efficiency investment rate levels of about 5 to 15 per cent identified in countries with developed energy efficiency policies in the International Energy Agency (IEA) Energy Efficiency Market Report 2015.⁴

Modest positive progress could be recorded over the tracking period. The recent energy intensity trend for the region is a drop of -2.2 per cent CAGR from 2014 to 2016, which is in contrast to an increase of 0.8 per cent from 2012 to 2014. There is, however, considerable variation across the region. Half of the countries in the Arab region are reducing their energy intensity while demand and output continue to grow.

The conclusion is that the Arab region is not on track with global energy efficiency targets. Regional energy intensity rose during the 1990s – contrary to most other regions of the world – and has only started to decline since the beginning of the 2010s. In 2016, the aggregate regional energy intensity stood at about 4.7 MJ/USD 2011 PPP, a decline of about 3 per cent over the six-year period.

As a result of lagging behind the energy efficiency growth rate for SDG 7.3 of -2.6 per cent, progress towards 2030 targets now needs to improve to an average of -2.7 per cent energy intensity improvement globally, and the Arab region needs to reach a regional, aggregate, average annual improvement of 3.4 per cent CAGR in order to meet the global 2030 target.

To achieve such an increase in the average annual improvement of energy efficiency, it will be necessary to significantly increase the level of investment going into energy efficiency, and financial instruments have a major role to play in this.

Achieving higher levels of energy efficiency in the Arab region is complicated by the issue of energy vulnerability which “results from a State’s inability to safeguard the universal access to affordable, reliable and modern energy services for current and future generations.”⁵ Energy vulnerability, “the absence of adequate safeguards to ensure a country’s energy demand and supply patterns are sustainable to support socioeconomic growth and development in the long run,”⁶ is a result of several challenges, including the following: (a) the lack of checks on energy demand through effective mitigation; (b) an undiversified, carbon-intensive energy mix; and (c) incomplete access to affordable, reliable, sustainable, and modern energy, or the high risk thereof.

C. OPPORTUNITY FOR ENERGY EFFICIENCY IN BUILDINGS

IEA has estimated that global investment into energy efficiency in 2018 was \$240 billion,⁷ approximately 13 per cent of total investment into the energy sector. Global energy intensity improved by 2 per cent in 2019, but only by

1.6 per cent when adjusted for weather,⁸ a figure well below the rate of 3.6 per cent between 2020 and 2040 required to achieve the IEA Sustainable Development Scenario. In order to meet the IEA’s Sustainable Development Scenario, it is estimated

3 ESCWA and Islamic Development Bank, 2019. *Tracking SDG 7: Energy Progress Report 2019 Arab Region* (E/ESCWA/SDPD/2019/3). Beirut.

4 Ibid.

5 ESCWA, 2019a. *Energy Vulnerability in the Arab Region*. E/ESCWA/SDPD/2019/1. Beirut.

6 Ibid.

that investment into energy efficiency would need to reach \$825 billion between 2019 and 2050, a multiple of 3.4 times the current rate of investment.⁹

To increase the rate of investment into energy efficiency, all countries and regions need to develop effective financing instruments for all sectors. For a range of reasons, some of which are explored below, progress on improving energy efficiency in the Arab region has been lagging, and to overcome this, it will be necessary to significantly increase the rate of investment into energy efficiency. Financing instruments are one tool that can be used to increase the rate of investment into energy efficiency, and this report focuses on the use of financing instruments for building energy efficiency in the Arab region.

An assessment by the United Nations Economic and Social Commission for Western Asia (ESCWA) from the year 2018¹⁰ reported that, in 2015, 28 per cent of total primary energy supply in the Arab region was used for buildings, amounting to 21 per cent of total final energy consumption, with wide variations between subregions, namely, ranging from 15 per cent of total final energy consumption for GCC countries, 29 per cent for the Mashreq, 28 per cent for the Maghreb, and 53 per cent for Arab LDCs.

Building energy intensity has been growing in the region, starting from a comparably low starting point – about 96 kWh/m²/year in 2012, 40 per cent lower than the world average of 165 kWh/m²/year.¹¹ Energy consumption in both the residential and commercial sectors is likely to increase over the coming decades. Past low rates of energy intensity are mainly due to low heating requirements in areas with mild-to-hot climates and suppressed demand for air conditioning, a demand that increases with economic development. The GCC is a no table exception to this as it has very high levels of air conditioning. If current trends remain unchanged, buildings in the Arab region would consume 1,450 TWh by 2030, a doubling compared to the 2005 consumption, and reach 2,000 TWh by

2050, a doubling of the 2015 consumption.¹²

The potential for energy efficiency in the building sector in the Arab region has not been as comprehensively studied as in other regions but there is clearly significant potential, with significant variations between countries which reflect the inequities between them. Analysis shows that retrofitting existing building stock is a large opportunity, and even a basic retrofit programme with no significant capital investments could save 85 TWh/year by 2030. A more aggressive retrofit programme could save up to 470 TWh/year, approximately one third of the building sector energy consumption after 2030.¹³ ESCWA's assessment from the year 2018 concluded that “large-scale retrofits of existing building stocks can reduce the building sector's final energy consumption by over 30 per cent by 2050, and by almost 50 per cent when combined with comprehensive minimum energy performance standards (MEPSs) and building energy efficiency certificates (BEECs) if energy efficiency programmes targeting the entire building stocks are implemented over a 10-year period, starting in 2030”.

In addition to the energy and economic benefits, improving energy efficiency brings multiple non-energy benefits, including the following, inter alia: impact on economic growth, impact on work productivity, avoided costs of investment into electricity transmission and distribution, increased safety and comfort, increased resilience that improved energy efficiency can bring to the energy sector, and job creation. One study for the GCC¹⁴ estimated that the payback period for a deep energy efficiency retrofit programme in buildings would be reduced from 11-70 years to 7-23 years by incorporating the wider system benefits into the economic analysis.

Retrofits, however, are only part of the story in the Arab region. A major challenge with sustained demographic and economic growth, and increasing urbanization, is ensuring that new buildings are constructed with very high levels of

7 Ibid.

8 International Energy Agency, 2020. Global World Review 2019.

9 IEA, 2019b. World Energy Model: Sustainable Development Scenario.

10 ESCWA, 2018. Report on Addressing Energy Sustainability Issues in the Buildings Sector in the Arab Region. Available at <https://www.unescwa.org/publications/addressing-energy-sustainability-issues-buildings-sectori-arab-region>.

11 IEA, 2019b. World Energy Model: Sustainable Development Scenario.

12 Krarti, Moncef, 2019. Evaluation of Energy Efficiency Potential for the Building Sector in the Arab Region.

13 Ibid.

14 King Abdullah Petroleum Studies and Research Center (KAPSARC), 2019. Estimating the Multiple Benefits of Building Energy Efficiency in GCC Countries Using an Energy Productivity Framework.

energy efficiency to avoid locking in high energy consumption over the lifetime of the buildings, which can be several decades at least.

Another concern is the growing demand for cooling which is essential in much of the region. In the Maghreb, current air conditioning penetration rates are between 40 and 50 per cent and expected to exceed 80 per cent by 2030.¹⁵ If this demand

for cooling services is met by conventional air conditioning systems, there will be a major strain on the electricity system and a requirement for extra investment into generation capacity as both energy demand and peak power demand are driven higher by cooling loads. Finding more efficient, and sustainable, cooling solutions is an imperative for the region.

D. BARRIERS TO FINANCING BUILDING ENERGY EFFICIENCY

Financing energy efficiency generally, and specifically in buildings, has a number of barriers compared to financing energy supply projects. These barriers, some of which are outlined in box 1, are universal in nature. They are exacerbated by issues of lack of capacity in the following three areas: energy consumers' ability to understand and make decisions about energy efficiency upgrades; the supply chain needed to design, develop and deliver building energy efficiency projects at scale; and the ability of financial institutions to originate, value and risk-assess energy efficiency projects.

Certainly, the challenges and barriers faced by Arab countries in terms of financing energy efficiency are not unique to the Arab region. They are replicated in many countries of the

world and, according to the IEA,¹⁶ global growth in energy efficiency investment stalled in 2018. The IEA's investment figures, which are based on incremental spending by consumers and businesses on technologies that are more efficient than alternatives available on the market, show that buildings still receive the largest share of global investments in efficiency – approximately \$139 billion in 2018 – compared to other sectors but investment fell by 2 per cent compared to 2017.¹⁷ However, these investments do not appear to be increasing year-on-year, and this level is still well below the efficiency investment potential of the building sector, which is responsible for 39 per cent of global carbon emissions.¹⁸

E. SPECIFIC BARRIERS TO FINANCING BUILDING ENERGY EFFICIENCY IN THE ARAB REGION

Barriers to financing energy efficiency in buildings exist that are specific to the Arab region. Energy subsidies remain a feature in many Arab energy markets for different user groups, although their size has been decreasing with reform progress in some countries. Recent changes in end-user fuel price subsidies and structure of electricity prices in the Arab region are reported in *Addressing Energy Sustainability Issues in The Building Sector in The Arab Region*.¹⁹ Energy price reform plays an important enabling role for driving investment into energy efficiency.

Although subsidies have been reduced, energy prices (fuel and electricity) remain low, which means that incentives to invest in improving energy efficiency are weak. Regulations on energy

efficiency such as MEPS are piecemeal and relatively new in many Arab countries. Even when regulations exist, compliance mechanisms can be patchy due to lack of existing institutional capacity, capacity-building and enforcement of regulations.

In lower-middle-income Arab countries and the Arab LDCs, information about energy saving and access to financial markets is almost non-existent. There is also the aspect that priority is given to increasing energy access, even with traditional fuels, without consideration of how to address efficiency, access and the need for clean energy altogether. Even in the higher income Arab countries, national variations exist, and the historical priority has been fast development and quick improvements in living standards which have

¹⁵ Krarti, 2019.

¹⁶ IEA, 2019a.

¹⁷ Ibid.

¹⁸ IEA and UNEP, 2019. 2019 Global Status Report for Buildings and Construction.

¹⁹ ESCWA, 2018. Addressing Energy Sustainability Issues in the Buildings Sector in The Arab Region (E/ESCWA/SDPD/2018/TP.5). Beirut.

ignored the need for higher levels of efficiency. Revision to building energy efficiency codes has been relatively recent.

Another factor in the region is the typical market structure for the energy and electricity industries. Structures with monopolistic, State-owned utilities with bundled generation, transmission, distribution, and retail sales hinder investment in energy efficiency as the costs of not investing are typically hidden. The lack of competition also means that energy suppliers are not driven to differentiate through the provision of energy services such as energy efficiency upgrades happening in many other countries outside the region.

Finally, conflict zones in the region must not be neglected as a major challenge hampering initiatives towards energy efficiency and other development-focused actions.



Box 1. Specific barriers to financing building energy efficiency projects

Financing energy efficiency, specifically in buildings, faces a number of specific barriers. These barriers make the financing of energy efficiency more difficult than, for example, financing renewable energy and include the following:

- **Project size:** Typical projects, even within large commercial and public-sector buildings, tend to be small by the standards of capital providers. This means that they have high transaction costs relative to the amount of capital deployed. It also means that to deploy significant amounts of capital, there is a need to aggregate multiple projects, which requires a high degree of standardization.
- **Lack of a revenue stream:** Unlike with energy generation projects, the output is not energy production which can be metred and then monetized, but energy savings which are counterfactual. This makes ring-fencing benefits difficult.
- **The performance gap:** Energy efficiency projects have a 'performance gap', namely, the difference between the designed results and the actual results. This gap can occur because of several reasons, some of which are outside the developer's control, such as weather conditions, and others which can be controlled or influenced, for instance, by using international standards for project design and development.
- **Split incentives:** In rented buildings, the tenant typically pays the energy bills. The landlord has no incentive to install energy efficiency measures as not he will see the benefits, but the tenant.
- **Distributed decision-making:** In some situations, for instance, in the case of condominium apartments, local regulations require every tenant to agree to energy efficiency measures that impact the whole building. This can make getting approval difficult.
- **Low energy costs:** The financial benefits of energy efficiency come from saved expenditure on energy, and low energy costs, due to energy subsidies, reduce the savings, thus affecting the financial attractiveness of energy saving projects.



2

ENERGY EFFICIENCY POLICY IMPLEMENTATION INSTRUMENTS FOR THE ARAB REGION AND THE ROLE OF FINANCING INSTRUMENTS

This chapter briefly sets out the main policy implementation instruments available to promote energy efficiency in the building sector. The instruments discussed in the GIZ MENA report are used as a framework. The chapter also addresses the need to link financing instruments to policy instruments and sets out possible financing instruments for each policy instrument. Policy instruments are mechanisms to increase the demand for improving energy efficiency, and it is important to ensure that sufficient financing is in place to meet the investment needs resulting from that increased demand. Direct linking of policy instruments to financing instruments can increase the effectiveness of both.

Energy efficiency financing instruments need to be directly linked to energy efficiency policy implementation instruments as successful policy instruments will lead to a pipeline of investments that need to be financed in some manner.

A. ENERGY EFFICIENCY POLICY INSTRUMENTS FOR THE ARAB REGION

The report of the German Corporation for International Cooperation (GIZ), *“Innovative Energy Efficiency Instruments for the MENA Region”*,²⁰ identifies ten policy instruments that could be utilized to help improve energy efficiency in the region. Although the instruments described are not specific to the building sector, many of the policy instruments can be applied or have relevance to the sector. The instruments are described below.

Auction systems for energy efficiency

Energy efficiency auctions are a policy instrument aimed at achieving energy savings at highly attractive prices. There are two main auction mechanisms allowing market actors to submit bids, namely, through competitive tenders whereby the lowest priced bid wins; and within a framework that sets the price for each unit of energy savings

and invites market actors to submit proposals for generating savings at a given unitary price.

Mandatory energy efficiency targets

Mandatory energy efficiency targets for specific sectors are one of the energy efficiency instruments that can be applied to translate the national targets into local and sectoral targets. Although this instrument can be applied to major sectors such as industry, commerce and transportation, large energy-intensive industrial sectors are the most commonly targeted by this instrument, including the electricity and oil-refining sectors.

Utility-managed energy efficiency programmes

Utility-managed energy efficiency programmes

²⁰ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 2020. Innovative Energy Efficiency Instruments for the MENA Region.

require regulations that mandate electricity distributors or retailers to reduce the energy consumption of their customers by supporting the implementation of energy efficiency measures. Targets can be mandatory or voluntary, and the design of programmes to achieve the targets can vary.

Energy efficiency networks with voluntary goals

Energy efficiency networks (EENs) are platforms and mechanisms that bring energy consumers together to share experiences, collaborate on increasing their energy efficiency knowhow and undertake joined steps to improve efficiency. EENs can be formed across sectors or be sector-specific. They are on a voluntary basis.

Dynamic electricity prices

Dynamic electricity pricing can establish a link between the retail price of electricity and the marginal costs of producing electricity. Dynamic pricing approaches can use time of use, critical peak pricing or real-time pricing. Dynamic pricing passes onto the customer more of the real cost of using electricity on a time basis and can encourage efficiency, demand response and energy storage.

Mechanism for accelerating replacement of the stock of energy using equipment and appliances

This mechanism provides incentives to encourage consumers to replace and properly dispose of older, less efficient equipment and appliances with new high-efficiency equivalents. The mechanism complements mandatory standards and labelling policies by accelerating the market penetration of products that are above the standard requirements and by preparing the market for increased future mandatory requirements.

Energy savings insurance mechanisms of an energy performance contract

Energy savings insurance is intended to stimulate investments in energy efficiency by mitigating the risks associated with the possibility that the investments do not pay for themselves due to energy savings being less than anticipated. The insurance provides assurance to investors that they will achieve their targeted returns and passes the performance risk to the insurance provider.

Voluntary agreement

A voluntary agreement is a negotiated covenant between public authorities and a firm or group of firms, for instance in a specific sector, that includes targets and timetables for taking actions to improve energy efficiency or reduce greenhouse gas (GHG) emissions, but also outlines rewards and penalties. IEA defines a voluntary agreement as “essentially a contract between the government and industry, or negotiated targets with commitments and time schedules on the part of all participating parties.”²¹ Voluntary agreements may also include support to help build national and international industry associations which can help build the market, and be a partner to regulators to ensure regulations are balanced.

Energy efficiency tax-based instrument

Energy efficiency tax incentives encourage practices and/or investments that improve energy efficiency. The incentive can take the form of a tax credit or a rebate.

Super ESCO

A Super ESCO is an entity that is designed to grow the market for energy efficiency investments, usually using the energy performance contract (EPC) approach. Super ESCOs can take different forms. The leading examples, which are in the Arab region, namely, the Etihad Super ESCO and Tarshid, aggregate demand, carry out development work, procure project implementation from private-sector ESCOs, and source investment finance. They also work to build capacity amongst building owners and the supply chain.

This report shows Super ESCOs as having multiple functions: they are a transaction enabler as they develop projects, they are a financing instrument as they bring capital to project development (and possibly project financing depending on their mandate and structure), and they are a policy instrument when established by Governments.

Table 1 summarizes the policy instruments, their use within the Arab region, simplicity of implementation, transferability and replicability, and their capacity for market transformation.

²¹ IEA, 1997. Voluntary Actions for Energy-Related CO₂ Abatement.

Table 1. Overview of energy efficiency policy instruments in the Arab region

INSTRUMENT	PRESENCE IN THE REGION	SIMPLICITY OF IMPLEMENTATION	TRANSFERABILITY AND REPLICABILITY	CAPACITY OF MARKET TRANSFORMATION
Auction systems for EE	Practically non-existent	Some barriers	Rather easily transferable	Rather large capacity
Mandatory EE targets	Practically non-existent	Rather easy to put in place	Easily transferable	Rather large capacity
Utility-managed EE programmes	Practically non-existent	Rather complex to put in place	Some barriers	Rather large capacity
EE network with voluntary goals	Only few examples	Rather easy to put in place	Rather easily transferable	Medium capacity
DSM electricity pricing or dynamic electricity prices	Only few examples	Rather complex to put in place	Rather context-specific circumstances	Rather large capacity
Mechanism for accelerating replacement of the stock of energy using equipment and appliances	Only few examples	Some barriers	Some barriers	Rather large capacity
Energy savings insurance mechanism of an energy performance contract	Practically non-existent	Some barriers	Rather easily transferable	Medium capacity
Voluntary agreement	In some countries	Some barriers	Rather easily transferable	Medium capacity
EE tax based instrument	Practically non-existent	Some barriers	Rather context-specific circumstances	Rather large capacity
Super ESCO	In some countries	Some barriers	Rather easily transferable	Rather large capacity

Source: GIZ, 2020. Innovative Energy Efficiency Instruments for the MENA Region.

Note: EE stands for energy efficiency.

B. THE LINK BETWEEN POLICY INSTRUMENTS AND FINANCING INSTRUMENTS

The aim of energy efficiency policy implementation instruments is to ensure or accelerate the enactment of energy efficiency policies through a variety of means, including encouraging behaviours and stimulating investment into energy efficiency, whether as retrofits to improve efficiency or as investments into new, highly efficient buildings, systems or appliances. Therefore, there needs to be a direct

link between all policy implementation instruments and appropriate financing instruments, and the question of how to finance investment opportunities arising from the effect of policy instruments should be an essential part of designing any such instrument.

The instruments identified above, when functioning well, should lead to more demand

for energy efficiency and a pipeline of energy efficiency investment opportunities that have to be financed in some way, whether directly by the end user (organization or individual consumer) or by a third-party instrument. Without putting in place suitable financial instruments to ensure that the project pipeline, or at least a larger proportion of it, is financed and implemented, energy efficiency will rather remain a potential resource than a utilized one. In designing policy instruments, it is important that the actors affected are at least pointed towards appropriate means of financing the projects that are developed as a result of the policy instrument. Policymakers should aim to create an ecosystem of financing instruments appropriate to different market segments and local conditions and to build explicit links between policy instruments and financing instruments.

The impact of policy instruments and financing instruments on the project development and implementation cycle is illustrated in Figure 1. All projects, however small or whatever their nature, effectively go through a common cycle of development, underwriting, financing, and operation. A number of projects that enter the development cycle do not proceed to financing and implementation, and this process can be thought of as a development funnel. Although this model primarily applies to large projects developed by organizations, individual consumers deciding to purchase energy efficiency equipment also seem to be able to go through this process even though it is not as formalized as it is for large projects. Policy instruments are designed to impact the volume of projects being developed, namely, customer demand, and financing instruments can impact both demand and the volume of projects actually being financed and implemented. Later sections of this report will examine the mechanisms by which demand can be increased. Policy instruments and financing instruments can overlap.

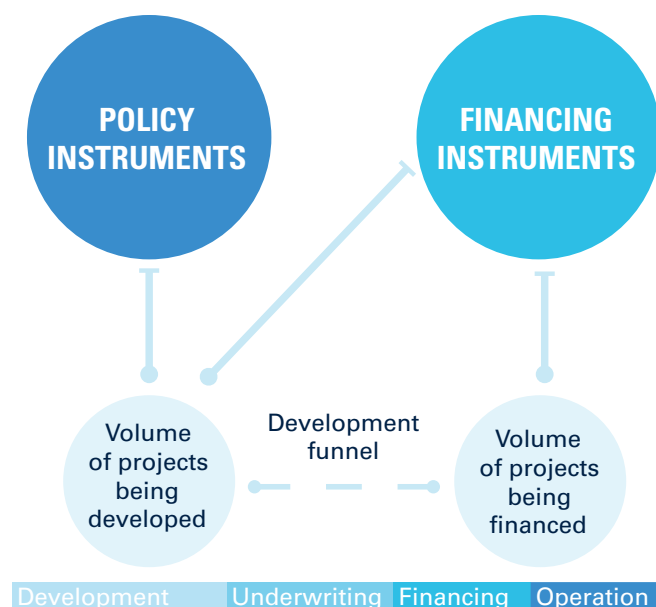
Energy efficiency financing instruments play several important roles in supporting policy and upscaling investment into energy efficiency, which are as follows:

- Provide capital specifically allocated to energy efficiency which can fund projects which would not have found support from general financing facilities.
- Provide a financing channel for projects developed in response to specific energy efficiency policy instruments.

- Act as a demand driver, pulling through development of more projects than would have otherwise emerged.
- Prove the demand for, and performance of, energy efficiency projects.
- Act as exemplars to the financial sector that can attract additional private-sector capital into the sector.
- Help build capacity in project development and financing which will enable a more efficient and active market in energy efficiency financing.

Energy efficiency financing instruments should be considered alongside, and closely aligned with, energy efficiency policy instruments to ensure upscaling of investment into efficiency projects.

Figure 1. The impact of policy instruments and financing instruments on the project development and implementation cycle



Source: Author, ESCWA.





3

THE DESIGN OF ENERGY EFFICIENCY FINANCING INSTRUMENTS

This chapter examines the fundamental aspects of designing energy efficiency financing instruments. It starts with the need for a systems-based view and then examines each of the five basic components of any financing instrument, which are the following: sources of capital, type of financial intermediary, type of capital provided, derisking tools, and transaction enablers. The different types of derisking tools and transaction enablers available to designers of financing instruments are described and illustrated with short examples from around the world.

A. THE IMPORTANCE OF A SYSTEMS VIEW

Energy efficiency financing instruments are designed to increase the flow of capital into energy efficiency. To design more effective instruments, it is important to take a systems view of the problem of scaling up investment into energy efficiency and consider the wider context which includes energy prices, energy efficiency policy and energy efficiency policy instruments. A systems view is illustrated in Figure 1 and described below.

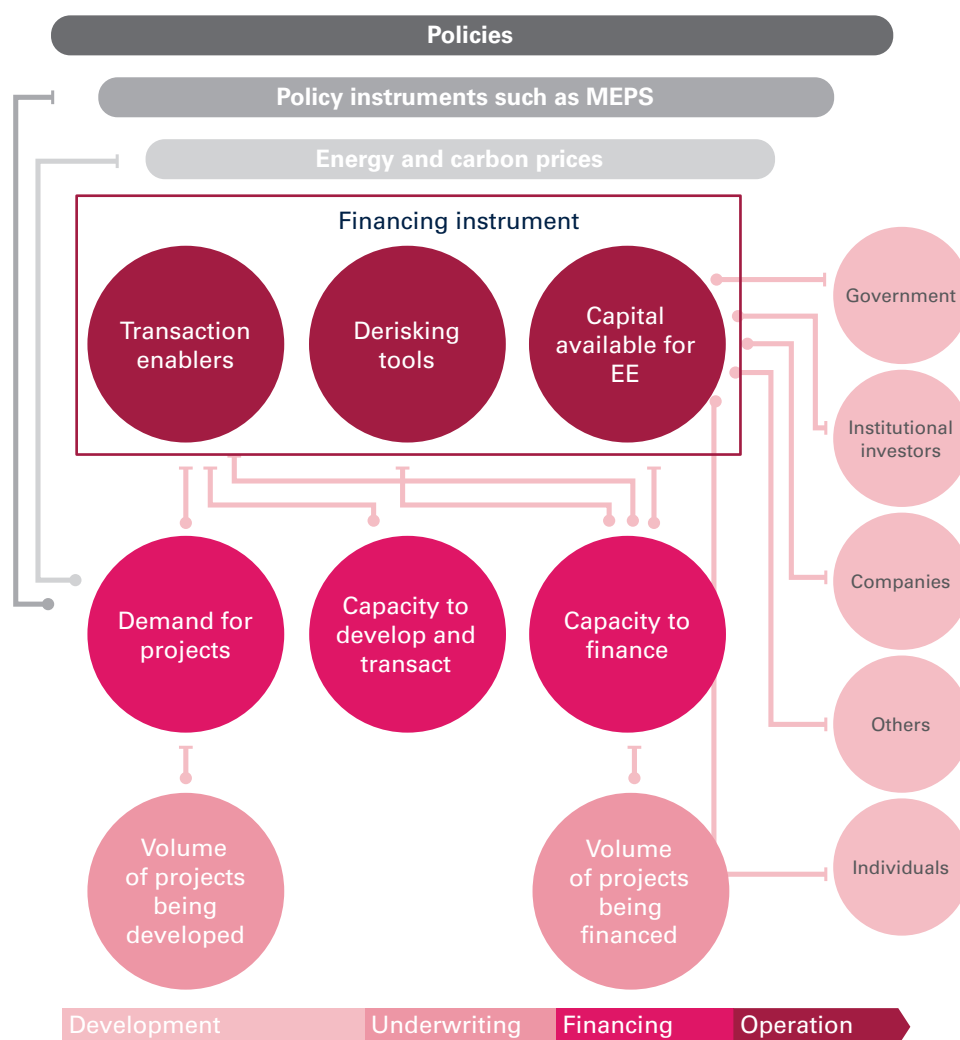
In order to increase the flow of capital into energy efficiency it is necessary to increase the following: (a) the volume of projects being developed; (b) the capacity to develop, transact and finance projects; and (c) the volume of capital made available for energy efficiency. This applies equally to the retrofit market, which improves the efficiency of existing buildings, but also to the new building market, which is particularly important in the Arab region. Several of the financing instruments described here are designed for the retrofit market but there are examples such as EcoCasa, the Romania Green Homes and Green Mortgages Program, and the programmes of the German development bank KfW, which are designed for new buildings. The new building market can also be addressed by intervening in the investment processes of existing real estate funding sources, whether public or private, to ensure that energy efficiency measures are incorporated into building designs.

The demand for energy efficiency projects can be influenced by the following factors: energy prices; energy efficiency policy instruments such as minimum energy performance standards that motivate decision makers to improve energy efficiency of their building or facility or develop a highly efficient building; exogenous factors including demographic growth and consumer tastes and attitudes; the capacity to develop projects inherent in the sector, for instance in the energy efficiency supply chain; and the existence of transaction enablers such as project development assistance or procurement frameworks.

The capacity to finance projects is primarily driven by the availability of capital for energy efficiency; however, the provision of capital by itself is not sufficient. The existence of derisking tools can build the capacity to finance and help increase the capital available for energy efficiency. Capital can come from the following sources: Governments, multilateral banks, institutional investors, companies, individuals, and other, for instance, philanthropic, sources.

Well-designed financing instruments consider all of these elements as a system rather than just individual elements and address the critical drivers of demand, transaction enablers, derisking tools, and available capital.

Figure 2. A systems view of the drivers needed to upscale energy efficiency



Source: Compiled by author, ESCWA.

B. THE FIVE COMPONENTS OF ENERGY EFFICIENCY FINANCING INSTRUMENTS

The Organisation for Economic Co-operation and Development (OECD) provides a framework for understanding how institutional investors can make sustainable energy investments (in projects or companies) through financing instruments.²² This section provides a description of the fundamental components of energy efficiency financing instruments based on that framework.

Financial instruments bring one, or more than one, type of finance, sometimes together with supporting mechanisms such as risk mitigation

or derisking tools, such as guarantees, into one package that leads to a flow of investment into energy efficiency projects. They can also use transaction enablers such as project development assistance to increase the flow of transactions. The five components that come into designing financing instruments are the following:

- Sources of capital.
- Type of financial intermediary delivering the instrument.
- Type of capital provided (capital instrument).

- Use of derisking tools for risk mitigation.
- Use of transaction enablers.

different forms to create financing instruments. They are shown in Figure 3 and are discussed below with short examples.

These five components can be combined in

Figure 3. The components of financing instruments

Sources of Capital	Financial Intermediary	Capital Instruments		Derisking Tools	Transaction Enablers	
Government	Credit lines	Debt	Senior secured loan	Lower risk payment mechanism	Standardised development processes and documentation	
Public sector agencies	Dedicated EE funds		Senior unsecured loan	Performance contracting		
Multi- lateral Development Banks	Public capital		Retrofit focused funds	Subordinated loan	Insurance	Project Development Assistance
Banks	Blended capital		New build focused funds	Lease	Loan Loss Reserves	Project Development Unit
Non-Banking Financial Institutions			Property purchase and renovation funds	Mortgage	Subordination	Procurement framework
Institutional Investors	Private capital			Quasi equity	Mezzanine loan	
		Convertible loan				
Corporates	Other	Equity			Aggregation	
Individuals			Grant			Warehousing

Source: Adapted from OECD, 2015. Mapping Channels to Mobilise Institutional Investment in Sustainable Energy: Green Finance and Investment. OECD Publishing, Paris.

1. Sources of capital

The sources of capital which can be used in financial instruments are as follows:

- Governments.
- Public-sector agencies (including regional/local authorities).
- Multilateral development banks.
- Banks and non-banking financial institutions, which can include corporates offering vendor financing.
- Institutional investors.
- Corporates (including utilities).
- Individual investors.

The scale of the energy efficiency opportunity is too large to be addressed through public funding alone. To reach even 10 per cent of GFCF (the middle of the range for countries with developed energy efficiency policies), investment into energy efficiency in the Arab region would need to increase 3.7 times to \$62 billion per annum. Many of the energy efficiency financing instruments globally, to date, have been based almost largely on funds from Governments and multilateral development banks, but if the Arab region, and indeed the rest of the world, is to achieve the full potential of energy efficiency, it is necessary to scale up private-sector investment. Public capital

should be used to catalyse, or crowd in, private-sector investment and some of the financing instruments described in the following section using this approach. Specifically, public funding should be used to fund transaction enablers and derisking tools such as those described below, and to establish specialized vehicles such as Super ESCOs. The blending of public capital with private capital can reduce the cost of capital to customers, which can increase the level of cost-effective energy saving and be an incentive to action, enabling transactions that would not happen otherwise. The public-private partnership or blended capital model, when properly designed, holds significant promise for helping to increase investment into energy efficiency, particularly

as private-sector institutional investors are becoming increasingly interested in investing in energy efficiency but lack experience and confidence in the asset class. It does, however, require aligning private-sector incentives with public-impact objectives such as specific targets to reduce emissions. The approach has been used successfully in Europe, for instance by the London Energy Efficiency Fund and the European Energy Efficiency Fund (see case studies in a later section). These funds, which are managed by private-sector fund managers, have specific emissions reductions per unit of capital incorporated into their investment mandates and incentive structures for the fund manager.

2. Types of financial intermediaries: funds and credit lines

The two main types of financial intermediaries are credit lines, delivered through banks or potentially non-banking financial institutions, and dedicated funds. Credit lines often sit within existing financial institutions whereas funds are separate entities, usually with independent managers as required by local financial regulations. An important consideration for policymakers and other stakeholders in designing energy efficiency financing instruments is that existing financial institutions have existing customer bases and lending facilities, some of which could be modified to encourage greater levels of efficiency. This will be considered in a later section. Credit lines can be stand-alone or incorporated into existing lending facilities; most of the ones described in this report are stand-alone dedicated energy efficiency credit lines.

This section provides short descriptions of each type of intermediary simply as examples whilst more comprehensive case studies of selected financing instruments are included in the next chapter. Global experience shows that simple provision of capital is insufficient to build a functioning energy efficiency financing market, and a range of derisking tools and transaction enablers also have to be present. These can be provided via different mechanisms and examples as discussed below. Other types of specific energy efficiency financing vehicles such as Super ESCOs and local authority-formed vehicles that develop projects and can secure financing from sources, including funds and credit lines, will also be considered separately.

(a) Credit lines

Credit lines are lending facilities made available for specific purposes, which can be energy efficiency projects in general or specific technologies and types of projects. Credit lines for energy efficiency lending can be, and often are, in the nascent energy efficiency financing market, backed by credit lines from multilateral banks. As markets evolve, local banks need to be encouraged to establish dedicated energy efficiency credit lines or products similar to car or home loans. This will require proving that a market exists or creating a market, addressing real and perceived risks, and building capacity within the local banks to originate and underwrite energy efficiency loans.

(b) Funds

Funds can be debt funds, equity funds or mixed debt-and-equity funds. More specialized guarantee funds may exist, but this section focuses on debt and equity funds as the use of guarantees will be discussed below. Most energy efficiency funds are primarily debt funds. They can be private funds or publicly quoted at the stock exchange, and they can be entirely private-capital, entirely public-capital or public-private partnerships. Each fund will have a specific investment focus or purpose written into its governance structure, which will include the following factors:

- Specific target sector, such as residential, commercial or public-sector buildings.
- Investment mandate, such as retrofit projects, building acquisition and refurbishment, new build, and forfailing.

- Type of instrument, such as debt or equity, or acceptable split between them.
- Target returns.
- Any specified non-financial target such as tons of carbon dioxide (CO₂) saved per amount invested.

Examples of energy efficiency funds with different mandates are briefly described below.

Box 2. The Bulgaria Residential Energy Efficiency Credit Line

The Bulgaria Residential Energy Efficiency Credit Line was established in 2005 as a €50 million credit line of the European Bank for Reconstruction and Development (EBRD) advanced to two commercial banks, namely, the United Bulgaria Bank and Piraeus Bank. In addition to funding by the EBRD credit line, €10 million of grant funding came from the Kozloduy International Decommissioning Support Fund (KIDSF), an international fund established to help Bulgaria shut down the Kozloduy nuclear reactor. The credit line was used for loans to households and associations to finance energy efficiency improvement. KIDSF funding provided grants for technical assistance and administration fees. The credit line was extended in 2011 by an additional €40 million (plus €14.6 million KDSF grant) and again in 2016 by €20 million (plus a €4.4 million KIDSF grant).

Until August 2019, the programme had deployed a total of €90 million and funded more than 55,000 building retrofits, resulting in energy savings of c.200 gigawatt-hours (GWh) and a reduction in greenhouse gas (GHG) emissions of circa 300,000 tons of carbon dioxide per year.

Source: Residential Energy Efficiency Credit Line, 2020. Welcome to the Residential Energy Efficiency Credit Line (REECL).

Box 3. The European Investment Bank's Private Finance for Energy Efficiency credit lines

The Private Finance for Energy Efficiency (PF4EE) was established in 2014 by the European Investment Bank and the European Commission to address the limited access to adequate and affordable commercial financing for energy efficiency investments. PF4EE provides credit lines to commercial banks in several European Union member countries. Once agreed, the PF4EE facilities provide loans for up to 75 per cent of the capital cost of eligible energy efficiency measures with a maximum loan amount of €5 million. Loans are available over a 3-to-20-year term. PF4EE also provides a risk-sharing facility which is capped at 16 per cent of each bank's energy efficiency loan portfolio. It also provides expert assistance to the banks to build local capacity in the financial sector.

More information can be found in the section on example financing instruments.

Source: Private Finance for Energy Efficiency, 2019. Why PF4EE?



The European Energy Efficiency Fund (EEEF) is a public-private partnership focused on financing energy efficiency, small-scale renewable energy and clean urban transport projects at market rates. It is aimed at municipal, local and regional authorities and public and private entities aimed at serving those authorities. It was capitalized in 2011 with €265 million with investments from the European Commission, the European Investment Bank, Deutsche Bank and Cassa Depositi e Prestiti SpA. The fund is managed by Deutsche Bank. It provides technical assistance to potential investees to develop projects through a dedicated technical assistance facility. EEEF invests in the range of €5-25 million through a range of instruments including equity, senior debt, mezzanine debt, leasing, and forfaiting loans. Typical loan terms are between 12 and 15 years.

The fund has a wide mandate which allows investment into energy efficiency and renewable energy in buildings as well as transport projects. By the end of 2019, 71 per cent of the total investment was made into energy efficiency and 29 per cent into renewable energy. Of the total investment, 55 per cent was deployed as senior debt, 17 per cent as subordinated debt and 28 per cent as equity. Funding can go directly to public authorities or through intermediaries such as energy service companies.

- €200 million cumulative invested capital.
- €145 million committed capital.
- 17 investments made, two of which matured.
- 15 active investments in nine European Union member States.
- 921,369 megawatt-hours (MWh) cumulative primary energy savings.
- 530,454 tons cumulative carbon dioxide savings.

The Carbon Neutral Real Estate Fund was established in 2010 as the Low Carbon Workplace Trust and is now part of the portfolio of a large institutional asset management company. It acquires commercial buildings that require refurbishment to bring them to a higher standard of energy performance, and plans, executes and finances the work. The improvement in energy performance adds value to the buildings, which are then either resold or held to produce investment income. The fund has outperformed the benchmark index for balanced property funds.

In addition to credit lines and funds, there are some financing instruments which are harder to classify. They use a mixture of financing types and are heavily focused on project development and implementation and are referred to as 'other financing instruments' in this report. They include Super ESCOs of various types which are discussed below.



Box 6. The Latvian Building Energy Efficiency Fund

The Latvian Baltic Energy Efficiency Facility (LABEEF) is a forfaiting fund which was set up to purchase the cash flows from energy performance contracts established to finance the upgrade of Soviet era housing blocks. The process is as follows:

- An energy service company (ESCO) signs a 20-year contract with the home owner association that manages the apartment block.
- ESCO takes on a loan from a financial institution.
- ESCO renovates the building, typically achieving energy savings of 45-65 per cent, subcontracting construction companies and equipment suppliers.
- The house maintenance company maintaining the block bills the same amount as before the renovation works and pays ESCO an agreed percentage of those bills, based on realized savings.
- The housing maintenance company pays the reduced energy bill to the heat providers (usually a district heating company).
- Once the project is implemented and savings are proved, an assignment agreement is signed between ESCO and LABEEF. ESCO receives discounted cash flow for the future receivables, minus an amount for operations and maintenance and a performance guarantee.
- The cash flows from the home owners, via the home maintenance company, to LABEEF, which keeps paying ESCO for operations and maintenance.
- More information can be found in the section on example financing instruments.

Source: Accelerate SUNShINE Project (2020). Sustainable financing solution for renovation of buildings! For Energy Service Companies (ESCOs) LABEEF ensures the necessary financing for building renovation projects.



3. Types of capital (capital instruments)

There are essentially three types of capital or capital instruments, namely, debt, equity and grants, which are described in Table 2.

Although all three types of capital have a role to play at any stage of market development, they can play different relative roles at different stages in the maturity of energy efficiency financing markets. Grants can be most useful in

the early stages of building a market as a tool to catalyse early action and investment. Equity and mezzanine are particularly critical as the market emerges as private equity providers take risks on energy efficiency projects. Debt is needed to scale the market once it is mature enough to have demonstrated stable cash flows and scale.

Table 2. Types of capital

TYPES OF CAPITAL	DESCRIPTION
DEBT	Borrowers commit to pay to the lender the principal and interest (cost of funding) following an agreed schedule. Borrowers use assets as collateral as reassurance to the lender. Debt instruments include loans, mortgages, leasing, convertible loans, and bonds. Loans can use blended capital, namely, from subsidized loans and private capital to reduce borrower costs.
EQUITY	Equity financing means taking an ownership stake in a company or project in return for a share of the profits of the company/project and the investment stake appreciation. Quasi-equity instruments have debt-like properties and equity-type functionality. It is less expensive than straight equity but can provide virtually the same level of value as a straight equity investment. Specifically, quasi-equity financing can be in the form of mezzanine debt, venture debt, convertible debt, structured equity, and preferred equity.
GRANTS	Grants are non-repayable contributions (cash or in-kind) bestowed by a granter (often a Government agency, corporation, foundation, or trust) to a recipient for a specified purpose. Grants are usually conditional upon specific objectives on use or benefit and might require a proportional contribution by the recipient or other grantors.

Source: OECD, 2015.

4. Derisking (risk mitigation) tools

In this analysis, derisking tools refer primarily to the financial derisking of an investment. Demand for energy efficiency projects of all types (retrofit and new build) is heavily influenced by policy; and from an investor's, or decision maker's, perspective, policy clarity and stability are important. In addition to the financial risks addressed by the derisking tools described here, there are policy risks which need to be considered and mitigated, whenever possible. Policymakers need to ensure that policies are clear and have a clear direction of travel over an extended period, such as a known trajectory in improving building or appliance energy codes, and not be subject to sudden stops and starts. If policies are started but then stopped, as was the case with solar feed-in tariffs or the United Kingdom's residential energy efficiency programmes, the supply industry and

investors build capacity which is then unused, leading to waste, business failures and erosion of confidence in the market potential.

Derisking tools can derisk a project for the financier, the customer, or both. Tools such as loan loss reserves derisk the provider of finance. Using an EPC derisks the outcome of the project for the customer by guaranteeing a set minimum level of energy savings.

A number of derisking tools (risk mitigation tools) can be used as part of financing instruments. These can be divided into credit enhancements and others and will be explored below with examples. It should be noted, of course, that using derisking tools within financing instruments comes with a cost which needs to be considered in the overall



cost of establishing and operating the instrument, although this cost may be covered by public funds. The cost, however, needs to be offset against the cost of not including derisking measures which may include the costs of failure to deploy capital at the intended scale and consequentially a less resilient market.

Credit enhancements

Credit enhancements of various types can deliver several benefits for energy efficiency financing instruments.

They can be used to attract private capital and make it more attractive by lowering the interest rate and potentially increasing the term. These benefits reduce the size of periodic repayments, which can be better aligned with resulting energy savings. Credit enhancements can also expand customer access to capital by enabling the financing instrument to offer loans to customers who would not pass the normal credit criteria of private-sector lenders.

By offering credit enhancements, the financing instruments can attract new capital into participating in energy efficiency financing instruments which helps build capacity and experience within the finance sector.

The range of potential credit enhancements available to developers of financing instruments include the following:

- Loan loss reserves (LLRs).
- Loan guarantees.
- Debt service reserve funds (DSRF).
- Subordinated capital.

These are explained below and illustrated by examples.

(a) Loan loss reserve

LLRs set aside a proportion of the capital to cover potential losses and help reduce repayment risk. If a borrower defaults, the lender is repaid using the reserve fund. For example, a 5 per cent LLR on a \$60 million loan portfolio would cover up to \$3 million of a capital provider's losses on that loan portfolio.

(b) Loan guarantees

Loan guarantees, which can take various forms, are provided either by Government agencies or specialized guarantee institutions, namely, financial specialists that provide credit risk mitigation instruments to lenders. A guarantee can be full or partial; if it is full, it covers the entire amount of a capital provider's losses on a portfolio of loans.

Box 7. New York State Energy Research and Development Agency Loan Loss Reserve Program

An example of the use of loan loss reserves in the financing of energy efficiency in buildings is their use by the New York State Energy Research and Development Agency (NYSERDA). The NYSERDA Loan Loss Reserve Program provides loan loss portfolio coverage to qualified financing lenders, including local and regional banks, community-based lenders, and other financial firms to finance energy efficiency and renewable energy projects. The loan loss reserve is a credit enhancement that controls the risk that some loans may not be repaid. If a borrower defaults on a loan, the loan loss reserve will reimburse the lender, up to an agreed amount of risk sharing, for the defined loss on individual transactions, subject to an aggregate portfolio limit amount, to mitigate their losses.

Source: New York State Energy Research and Development Agency, 2020. Loan Loss Reserve Program.



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Box 8. Partial Risk Guarantee Fund for Energy Efficiency

The Partial Risk Guarantee Fund for Energy Efficiency is a risk-sharing scheme initiated by the Bureau of Energy Efficiency in India. The Fund covers loans for energy efficiency projects in Government buildings, municipalities, small- and medium-scale enterprises, and industries. It provides private financial institutions that have been accepted into the scheme by the Bureau of Energy Efficiency with a guarantee of up to 50 per cent of the loan amount, or a pre-set amount, whichever is lower. In the event of a default by the borrower, the guarantee will cover the first loss subject to a maximum of 10 per cent of the total guaranteed amount and cover the remaining outstanding principal on a pari-passu basis up to the maximum guaranteed amount. The guarantee can be in place for up to five years.

Source: Bureau of Energy Efficiency, n.d. Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE).

Although subordinated capital can be a valuable instrument, the fact that it needs to earn a return means that it can be an expensive solution, particularly in markets where the risk-free rate is already quite expensive.

The key considerations around credit enhancement tools are shown in Table 3.

Box 9. California financing for affordable multifamily energy efficiency projects

The Multifamily Financing Program targets multifamily properties where 50 per cent of the units are occupied by low-income families. It is available to customers of four utilities and can provide loans for between \$10,000 and \$250,000 covering 100 per cent of the costs of qualifying energy efficiency installations, or 100 per cent of energy service agreements with a capital expenditure of between \$250,000 and \$10 million.

To mitigate credit risk, the participating finance companies can access a loan loss reserve fund to recover up to 90 per cent of any losses.

Source: Gogreen Financing, 2020. Affordable multifamily housing. Financing for affordable multifamily energy.

(c) Debt service reserve fund

A DSRF sets aside a limited pool of funds from which lenders or investors can recover overdue debt service payments. Like LLRs, DSRFs typically include a total size and coverage ratio, but they do not include a loss-share ratio. In the event that overdue debt service payments lead to a customer default, the lender or investor can keep funds it has received from the DSRF to offset the loss.

(d) Subordinated capital

Subordinated capital absorbs any losses until all of the subordinated capital has been exhausted. Senior capital does not experience any losses until all of the subordinated capital has been exhausted. The subordinated capital takes on the majority of customer default risk and acts as a credit enhancement for senior capital. Unlike LLR funds, which are typically held separately from the underlying investment, subordinated capital is invested in loans or pools of loans and typically earns interest from the performing loans. Structured appropriately, subordinated capital can earn sufficient interest to offset losses on customer defaults, making it available for reinvestment in the future. An LLR, however, should be expected to be exhausted as customer defaults accumulate.

Box 10. Warehouse for Energy Efficiency Loans

Launched in 2013 in Pennsylvania and Kentucky, the Warehouse for Energy Efficiency Loans (WHEEL) is an unsecured residential loan programme through which the programme sponsors contributed subordinated capital to fund approximately 20 per cent of issued loans. This subordinated capital earns the same return of approximately 6 per cent as senior capital, but absorbs all losses from customer defaults. If successful, securities backed by WHEEL loan pools will earn an investment-grade rating from credit agencies and attract institutional investors, a holy grail of sorts due to the large amount of capital these investors can potentially deliver to energy efficiency financing markets. If customer defaults are in line with past trends, WHEEL administrators anticipate that the interest earnings on the subordinated capital stake will be sufficient to offset customer defaults and enable programme sponsor capital to support additional loans in the future.

Source: State and Local Energy Efficiency Action Network, 2014. Credit Enhancement Overview Guide.

Table 3. Key credit enhancement considerations

CREDIT ENHANCEMENT TOOL	LIKELIHOOD OF DEPLETION OVER TIME	STRENGTH OF PROTECTION TO LENDERS	COMMON USES
LOAN LOSS RESERVE (LLR)	High; defaults reduce LLR size	Low; lenders share each loss, coverage capped at a percentage of loan pool	Small loans, partnerships with individual lenders
LOAN GUARANTEE	N/A; guarantees often do not have a maximum amount	High; lenders shielded from all exposure to losses	Large pools of loans, very flexible
DEBT SERVICE RESERVE FUND (DRSF)	High; defaults reduce DRSF size	Medium; lenders protected from cash flow uncertainty and 100 per cent of individual losses, but coverage capped	Large loans for which timing of payment receipt is essential
SUBORDINATED CAPITAL	Low; interest earned can offset defaults	Medium; lenders covered from all individual losses, but coverage capped	Large pools of small loans or large loans

Source: State and Local Energy Efficiency Action Network, 2014.

5. Other derisking tools

(a) Insurance

Various types of insurance can be available, including project performance insurance which mitigates some of the technical performance risks that can lead to projects underperforming financially and leading to losses.

Performance insurance can be expensive, particularly in those markets with limited experience with energy efficiency projects and their performance, and which lack a well-developed and mature vendor base that inherently reduces the risk to the insurance company. Performance insurance may not be available at all in some markets.

(b) The use of performance contracting through ESCOs and Super ESCOs, using energy performance contracts to guarantee results

Energy service companies deliver energy efficiency projects with a guaranteed level of performance

through EPCs. The use of ESCOs and EPCs can reduce the financial risk of projects for both the customer and the provider of finance. The value of any guarantee, however, depends on the status of the entity providing it. In markets where ESCO activity is only emerging, the value of a guarantee from local ESCOs, which can often be undercapitalized, will be limited. Super ESCOs, which help develop and finance projects and may be established by Government or utility agencies, can provide an overarching guarantee that provides more derisking than guarantees from the ESCO delivering a specific project.

(c) Securitization

Securitization is the process whereby illiquid or small-scale assets, such as cash flows from a portfolio of energy efficiency loans, are transformed into a standardized and tradable asset. Before it can be sold, the resulting instrument, for instance, an asset-backed security or collateralized debt obligation, generally needs to be assessed by a credit rating agency. Securitization requires

sufficient asset quality and scale, something that has not been widely achieved for energy efficiency as yet, apart from property-assessed clean energy (PACE) loans in the United States. Securitization has occurred in the off-grid solar market which has some issues similar to energy efficiency such as variable asset quality and so has relevance to the energy efficiency market.²³

Box 11. The energy savings insurance business model

The energy savings insurance model was created by the Basel Agency for Sustainable Energy with the support of the Inter-American Development Bank and the Danish Government. The model consists of risk-mitigation instruments including insurance, standardized contracts and a simplified validation process, which together help to mobilize financing. The energy savings insurance model is being planned, developed or rolled out with different partners in various countries across Latin America, Africa, Asia, and Europe.

Source: Basel Agency for Sustainable Energy, 2020. Scaling up investments in energy efficiency and addressing the untapped market potential.

Box 12. Epsom and St. Helier Hospital Energy Performance Contract

In 2018, Epsom and St. Helier Hospital, a large acute hospital south of London, signed an energy performance contract with Breathe Energy, an energy service company. The project included GBP10 million of investment in upgrading energy infrastructure, including heating, ventilation and air-condition systems, LED lighting, control systems, and an 800 kilowatt-electrical (kWe) combined heat and power unit and three times 2.2 megawatt-thermal (MWth) gas boilers to replace existing steam boilers. Under the energy performance contract, Breathe guarantees the hospital annual savings of GBP0.65 million per annum. Energy savings are projected to be 26 per cent. The capital was funded by the London Energy Efficiency Fund, a dedicated energy efficiency fund using blended finance.

Source: Amber Infrastructure, 2021. Epsom & St Helier Hospital Tranche I – MEEF & LEEF.

Box 13. Securitizations of energy efficiency loans by Renew Financial

Renew Financial, a clean energy finance company based in the United States, has securitized a number of portfolios of property-assessed clean energy (PACE) efficiency loans.

On April 28, 2016, Renew Financial announced that it had completed its third securitization transaction, a \$115 million securitization backed by more than 4,226 PACE loans that had financed home energy efficiency improvement projects. The securitization was given a credit rating of AA(sf) by the Kroll Bond Rating Agency and has a coupon of 3.15 per cent.

On April 28, 2017, Renew Financial completed an asset-backed securitization of \$223 million backed by residential PACE loans. There were two tranches of notes in the transaction, namely, \$189.1 million of Class A notes rated AA(sf) by Kroll and DBRS, and \$34.1 million of Class B notes rated BBB(sf) by DBRS. Both tranches were given a Green Bond Assessment of GB1 (excellent).

Source: Renew Financial, 2016. \$115 Million PACE Bond Part of Growing Asset Class Attracting Real Money Investors; and Renew Financial, 2017. Renew Financial's \$223M ABS Securitization Receives Highest Green Bond Rating.

Note: (sf) is added to ratings for structured obligations such as these bonds.

(d) Use of lower-risk repayment mechanisms

Two main examples of lower-risk repayment mechanisms exist, namely, on-bill finance (OBF) and PACE finance. Both have primarily been used in the United States but examples are found in other countries. PACE, in particular, is tied to the fairly unique system of property tax in the United States but there has been some replication, or adaptation, to other markets, notably Canada (where the property tax system is similar to that in the United States) and Australia, and a project supported by the European Commission is currently underway to trial a PACE-like mechanism in Europe.

In OBF, periodic payments to repay a loan used to fund an energy efficiency project are added to the beneficiary's utility bill. OBF can be lower

risk as consumers have a higher tendency to pay their electricity bills than other debts due to the threat of disconnection. This may not be true in all jurisdictions, especially those where defaults on electricity bill arrears are common.

Box 14. The energy efficiency improvement loan programme by Butler Rural Electric Cooperative

Since 1982, Butler Rural Electric Cooperative in south-western Ohio has offered their 11,000 residential members on-bill loans to finance whole home energy efficiency measures. Participants can finance 100 per cent of project costs (up to \$25,000) at a 3.5 per cent fixed interest rate for up to 10 years. Qualification for a loan depends on traditional credit scores and bill payment history. The programme has issued more than 500 loans for \$7.5 million (average loan is \$15,000) with defaults under 1 per cent. Participants can also take advantage of generous rebates. For example, in 2014, Butler introduced a \$1,200 rebate for geothermal systems and made more than \$350,000 in loans, all for geothermal systems.

Source: Leventis, Greg, and others, 2016. *Current Practices in Energy Efficiency Financing: An Overview for State and Local Governments*. Ernest Orlando Lawrence Berkeley National Laboratory. and others, 2016.

In PACE, repayments of loans for energy efficiency improvements are added to property taxes over a long term. In the United States, property taxes are superior to other debts including mortgage payments and, therefore, have very low default rates. The capital can be from the public or private sector. PACE finance has the following advantages: it can offer up to 100 per cent financing of project costs; the term of the loan can be long (up to 25 years); the interest rates can be low due to the low risk; it can be accessed by customers with low credit scores; repayments can be lower than the savings; and the loan is tied to the property and not the tenant or owner.

6. Transaction enablers

A number of transaction enablers can be used to increase the flow of transactions through

Box 15. The property-assessed clean energy programme of the City of Los Angeles, 2016-2019

In 2015, the Council of the City of Los Angeles approved a property-assessed clean energy programme covering residential buildings; the programme commenced in 2016. In addition to energy efficiency measures, the programme finances roof-top solar and water conservation measures. Between 2016 and the end of 2019, the programme achieved the following:

- Completion of 15,010 individual projects.
- Total investment of \$633.202 million.
- Estimated output from roof-top solar installations: 53 megawatt (MW).
- Estimated jobs created: 7,300.
- Estimated lifetime energy saved: 3,624,000,000 kWh.
- Estimated lifetime water saved: 2,280,000,000 gallons (863,074 m³).
- Estimated lifetime utility bill savings: \$745.149 million.
- Estimated lifetime total carbon abated: 827,000 tons.

Source: PACENation, 2020a. PACE Case Studies.

Other models of lower-risk repayment mechanisms that have been applied in other sectors may be viable for energy efficiency financing instruments. These include triangulated lending, in which repayments are deducted from payments to the producers by offtakers. This could be applied, for instance, in situations when a large offtaker wants to promote energy efficiency within its supply chain. This requires more complex contractual arrangements and may need policy interventions in microfinance, fintech and consumer protection. In the off-grid, solar market systems can be turned off if payments are not made, and smart technology could enable a similar approach in efficient appliances, for instance.

a financing instrument. These include nine mechanisms which are explained hereunder.

(a) Project development assistance

Project development assistance (PDA) facilities are specific funds set aside, either as risk capital or grants, that can be used by project developers and/or hosts to develop projects to the point at which they can be financed. Some PDA programmes, notably those run by the European Commission's Horizon 2020 programme, require the achievement of a certain investment leverage ratio. In other words, if the project development being supported does not achieve investment into the project at a set level, for instance, 20 times the amount of PDA assistance, funds can be recovered from the implementing agency.

(b) Project development units

Project development units (PDUs) are specialized teams established to assist project hosts to develop projects to the point at which they can be financed. As such, they go beyond the provision of PDA funding and also provide technical and financial expertise, usually through a combination of internal and external skills and resources. PDUs are often supported by PDA funds.

(c) Procurement frameworks

A procurement framework is a standardized way of procuring project services such as engineering, but also equipment and project delivery services. Procurement frameworks are particularly helpful in the public sector if public-sector agencies looking to implement projects do not have the capacity to establish their own procurement system and have to follow strict procurement procedures.

(d) Super energy service companies

As part of the multiple functions of Super ESCOs, they are transaction enablers as they act as project developers, usually for portfolios of projects, and can connect projects to finance. The implementation of projects is usually procured from private-sector ESCOs operating under the Super ESCO.

In addition to being transaction enablers (and the GIZ report classified them as a policy instrument), they are more properly classified as a financing instrument as they bring finance to projects. Super ESCOs such as Etihad bring finance to project development in the shape of equity while the

actual project finance is sourced from third-party financial institutions.

Energy Efficiency Services Ltd. of India represents another model of Super ESCO which both develops and finances projects from its own balance sheet. Using this classification of Super ESCOs, and given their importance – particularly in the Arab region, further examples will be discussed in the section describing financial instruments.

Box 16. European Local Energy Assistance

European Local Energy Assistance, ELENA, is a joint initiative by the European Commission and the European Investment Bank under the Horizon 2020 programme. ELENA provides grants to public authorities and private entities for technical assistance focused on the implementation of energy efficiency, building integrated renewable energy and innovative transport and mobility projects.

The ELENA technical assistance can be used to finance costs related to feasibility and market studies, energy audits, financial and programme restructuring, business plans, and the preparation of tendering procedures, contractual arrangements and project implementation units.

In 2019, ELENA reached ten years of operation. At that point, it had supported the development of 85 projects across the European Union with grants worth €150 million, and the total capital expenditure represented by these projects was €5.6 billion. Of the 30 projects completed at that time, 25 were related to energy efficiency and five to transport, and 44 out of the 55 ongoing projects were on energy efficiency, with the majority in buildings.

Sources: Covenant of Mayors, 2019. Project Development Assistance. Lessons learnt from the Covenant of Mayors Community; and European Investment Bank, 2019c. 10 years of European Local Energy Assistance (ELENA).

Box 17. London's Retrofit Accelerators

Following experience with implementing several energy efficiency retrofit programmes, the Mayor of London, in 2020, established two Retrofit Accelerators, one for homes and one for workplaces. The accelerator for homes provides London's boroughs (local councils) and housing associations (social landlords) with the technical expertise needed to kick-start 'whole-house' retrofit projects across London. It will also help build the supply chain and business case to accelerate the uptake of retrofits.

The programme is funded with £3.6 million on a 50:50 basis by the Mayor of London and the European Regional Development Fund (ERDF). Although it is too early to report progress, the accelerators build upon the successes of the Re:fit programme which used a project development unit with technical and commercial expertise to develop energy efficiency projects in over 500 buildings across London.

Source: Greater London Authority, 2020. Retrofit Accelerator – Homes.

Box 18. Re:fit in England and Wales

Re:fit is a national programme in England and Wales that was developed in 2009 from London's successful Re:fit programme. The Re:fit programme provides technical and commercial assistance through a project development unit but also includes an energy performance contract procurement framework that is compliant with procurement rules of the European Union. This means that any local authority or public-sector body can develop and procure an energy performance contract without necessarily having in-house technical, commercial or legal expertise.

Over a period of ten years, more than 250 organizations have engaged Re:fit. Over £180 million of capital expenditure has been procured across 1,000 buildings, saving 52,000 tons of carbon dioxide and £10 million in energy costs each year.

The procurement framework, which is re-let periodically, currently includes 16 energy services contracts. It is expected that this framework will lead to contracts worth £500 million over the next four years.

Source: Local Partnerships, 2020. RE:FIT.



Box 19. Etihad Energy Services

The Etihad Super ESCO, Etihad Energy Services, was established in 2013 by the Dubai Energy and Water Authority with the aim to catalyse the creation of a viable energy performance contracting market in Dubai. Its target is to develop energy efficiency projects in more than 30,000 buildings, in addition to undertaking project development, it builds capacity of local ESCOs and facilitates access to project finance.

By the second quarter of 2020, Etihad Energy Services had retrofitted 7,646 buildings, resulting in savings of 304.9 gigawatt-hours of electricity and 442.2 million gallons of water, with a reduction in annual carbon dioxide emissions of 136,829 tons.

Source: Etihad Energy Services, 2020. About Etihad ESCO. Newsletter for Q2 2020.

Box 20. Bundling school projects in Hungary

In 2006, the Ministry of Education issued a tender for energy service companies (ESCOs) to renovate all schools in the country. Országos Takarékpénztár Bank (OTP) and Caminus, a local ESCO, signed a 20-year agreement. The programme called Szemünk Fénye, which means ‘the light of our eyes’ in Hungarian, was designed as a national programme to improve lighting and heating systems in schools. One contractor was selected by the Ministry, who any municipality in the country could work with to implement energy efficiency measures using the energy performance contracting approach. This meant that the municipality did not have to go through a competitive bidding process for each individual project.

The programme was financed by a European Union grant that provided 20 per cent of the capital cost; some low-interest funds supplied to OTP by the Hungarian National Development Bank; and 10 per cent equity provided by Caminus. OTP obtained a partial credit guarantee (50 per cent risk sharing) from the International Finance Corporation and the Global Environment Facility.

When the programme ended in December 2012, a total of 354 projects had been completed with a total investment of 13 billion Hungarian forint (Ft) (about \$65 million). Approximately 85 per cent of the installed measures were efficient lighting in schools and municipal buildings, with some heating system improvements. Estimated energy savings were 126,667 megawatt-hours per annum with estimated annual cost savings of Ft1.67 billion (about \$8.9 million).

Source: World Bank, 2014. Energy Services Market Development. Guidance Note. May 2014.

return projects are combined with more complex, lower-return projects to produce a thematic portfolio (bundle) above a certain threshold, which can be procured, administered and financed under the same structural framework.

(f) Warehousing

Warehousing is the process of pooling projects within one vehicle in order to reach a size where the aggregated asset becomes attractive either for an outright sale to large investors or securitization through bond issuance.

The Warehouse for Energy Efficiency Loans, WHEEL, referenced above is an example of warehousing.

Box 21. The Investor Confidence Project

The Investor Confidence Project (ICP) is an international initiative to standardize the development of energy efficiency projects. It originated in the United States but has also been deployed in Canada and the European Union with assistance from Horizon 2020 funding. The ICP presents a clear roadmap to develop energy efficiency projects using best practices in a series of protocols for different types of projects in the non-residential building space. Projects that are developed and documented using the protocols by qualified project developers, who have taken the ICP training, and are then checked by an ICP quality assurance professional, can be awarded the certification of Investor Ready Energy Efficiency™. Using the ICP protocols has proven to reduce transaction costs and performance risks.

Source: Investor Confidence Project, 2020. Unlocking Capital for Energy Efficiency Projects.

(e) Aggregation or bundling

Aggregating multiple projects helps reduce transaction costs and limits risk exposure as the financier is exposed to the risk of a portfolio of projects rather than a single project. Aggregation can be either the aggregation of a number of projects using the same technologies and business model or bundling, meaning that simple, high-

(g) Standardization tools

In order to scale investment in any asset class, the finance industry requires standardization. Energy efficiency is not yet a recognizable asset class, partly because it is very heterogeneous and far from standardized. In 2015, Michael Eckhart, Managing Director and Global Head of Finance and Sustainability at Citi Bank said: “energy efficiency

projects do not yet meet the requirements of capital markets. The industry is just too disaggregated. No two projects or contracts are alike.”²⁴ This lack of standardization applies right through the entire process from developing a project technically, through to contracts, implementation and ongoing performance. The statement is still essentially true but some improvements could be seen since 2015. Tools such as the Investor Confidence Project (box 21) have been developed and are gaining traction amongst project developers. There have also been several initiatives in various countries and regions to standardize EPCs.

(h) Grants and beneficial payment terms or costs

The provision of grants or beneficial payment terms to the customer can also be considered transaction enabler as they encourage customers to transact. Programmes such as the KfW promotion programme include grants as an important component. Beneficial payment terms can also include the following: grace periods to cover the construction period, as in the Lithuanian

Multi-apartment Modernization Fund; a lower cost of finance, as in the Romania Green Homes and Green Mortgages Programme; long repayment periods; and sculpting repayments to match the profile of energy cost savings.

(i) Results-based financing

Results-based financing (RBF) is defined as “any programme that rewards the delivery of one or more outputs or outcomes by one or more incentives, financial or otherwise, upon verification that the agreed-upon result has actually been delivered.”²⁵ RBF has been applied in the health-care and other sectors. In the energy sector, it has been used to stimulate the delivery of efficient cooking solutions to schools and off-grid lighting in Africa, with an emphasis on facilitating the emergence of a commercial market at scale.²⁶ RBF would seem to be well aligned with promoting the growth of energy efficiency financing although, to date, it appears not to have been used in this specific application.

C. SUMMARY

Financing instruments have the following five fundamental design elements:

- Sources of capital: essentially public or private in various forms.
- Type of financial intermediary delivering the instrument: banks, non-banking financial institutions or funds.
- Type of capital provided to customers: debt or equity or a combination of both.
- Use of derisking tools that reduce risks for the capital provider and potentially for the customer.
- Use of transaction enablers that help increase the flow of transactions through the instrument.

The next chapter provides case studies on how these design elements have been combined in practice in different countries and different market sectors, and then reviews important factors for success. The nascent nature of energy efficiency financing markets in all geographies means that attention must be paid to incorporating appropriate derisking tools and transaction enablers, including capacity-building measures. Simply providing capital is insufficient for success.



²⁴ Greenbiz, 2015. Citigroup: Energy efficiency industry needs to talk securitization.

²⁵ Musgrove, Philip, 2011. Rewards for good performance or results: a short glossary.

²⁶ World Bank, 2012. Results-based Financing in the Energy Sector, Case Studies. November 2012.



4

EXAMPLES OF EXISTING ENERGY EFFICIENCY FINANCING INSTRUMENTS

This chapter summarizes data on some examples of existing energy efficiency financing instruments from around the world. Brief case studies are presented for each selected instrument in the following chapters on funds, credit lines and other financing instruments.

A. OVERVIEW OF EXAMPLE FINANCIAL INSTRUMENTS

Table 4. Selected energy efficiency financing instruments

COUNTRY	FINANCING INSTRUMENT	TYPE	CAPITAL ALLOCATED/ DEPLOYED TO DATE	TARGET SECTORS	SOURCES OF CAPITAL	TYPES OF CAPITAL	TRANSACTION ENABLERS	DERISKING TOOLS
BULGARIA	Energy Efficiency and Renewable Sources Fund	Fund	92.8 million Bulgarian lev (\$57.6 million)	Municipalities, corporates	Global Environment Facility, Government, Government of Austria, private sector	Loans	Technical assistance	Credit guarantees, energy performance contracts
BULGARIA	EBRD Residential Energy Efficiency Credit Line	Credit line	€144 million	Residential buildings	ERDF, KIDSF	Loans	Project development assistance	-
DUBAI	Etihad Energy Services	Super ESCO	Initial equity unknown but accesses private and public finance for projects	Buildings, street lighting	DEWA – equity into Etihad Energy Services, public and private project financing	Loans	Develops projects using internal resources	Energy performance contracts
ESTONIA	KredEx Revolving Fund and Loans for Apartment Buildings	Fund	€72 million	Apartment buildings	ERDF grant, CEB loan, Government, KredEx Foundation) (a financing institution established by Government	Low interest-rate loans	Project development assistance	Guarantees
EUROPEAN UNION	European Energy Efficiency Fund	Fund	€265 million	Energy efficiency in buildings, renewables and clean transport	European Commission, EIB, commercial banks	Loans, equity, mezzanine debt, leasing, forfeiting	Project development unit	Energy performance contracts

EUROPEAN UNION	Private Finance for Energy Efficiency	Credit line	€480 million	Energy efficiency	EIB	Loans	Project development assistance	Risk-sharing facility
FRANCE	SPL OSER	Public ESCO	€6.3 million initial equity into SPL OSER	Public buildings	Commercial banks for projects	Loans	Project development assistance	Energy performance contracts
GERMANY	KfW energy efficiency loans	Credit line	€300 billion	Buildings	KfW	Purchase of loans from commercial banks	Marketing through local banks	Use of standards and standard modelling tools
JORDAN	CVDB municipal energy efficiency programme	Credit line	€45 million	Municipal projects including energy efficiency, renewables, buildings, streetlighting	EIB	Loan	Project development assistance	Guarantee under European Union's external lending mandate
LATVIA	Latvian Baltic Energy Efficiency Facility	Fund	-	Apartment buildings	EBRD, private financing	Forfaiting – purchase of receivables	-	Purchasing operational energy performance contracts
LITHUANIA	Lithuania Energy Efficiency Fund	Fund	€79.5 million for buildings, €14.49 million for street lighting	Municipal buildings and street lighting	Government, European Union structural funds	Soft loans, guarantees	Project development assistance	Energy performance contract for buildings, guarantee for street lighting
LITHUANIA	Lithuania Multi-apartment Modernization Fund	Fund	€300 million	Apartment buildings	ERDF (€150 million), commercial banks (€150 million)	Loans, loan guarantees, grants	Project development assistance	-
LITHUANIA	New Energy Efficiency Financing Platform	Credit line	€250 million (target)	Solar, renovation of apartments, efficient lighting	EIB, European Union Structural Funds, VIPA, commercial banks	Loans	-	First loss layer covered by European Union Structural Funds; junior debt layer financed by IFIs to provide credit enhancement for senior debt from commercial banks
MEXICO	EcoCasa	Credit line	\$396 million	Residential	KfW, Clean Technology Fund, IDB, LAIF, NAMA Facility	Green mortgages, soft loans to developers	Project development assistance	Use of standard simulation tools and set levels of performance
MOROCCO	Morocco Sustainable Energy Efficiency Financing Facility	Credit line	€150 million	Energy efficiency, renewables, existing and new buildings	EBRD, AFD, KfW	Loans, leases, grants	Project development assistance	Guarantee
ROMANIA	Green Homes and Green Mortgages Programme	Credit line	-	Residential	European Union funding for pilot, commercial banks	Green mortgages	Technical assistance	Certification programme

SAUDI ARABIA	Tarshid	Super ESCO	1.9 billion Saudi riyal (\$507 million) capitalization	Public buildings, street lighting	Public Investment Fund	Loans	Develops projects using internal resources	Energy performance contracts
TUNISIA	Energy Transition Fund	Fund	€70 million, €450 million mobilized	Energy efficiency, renewable energy	Tax revenues	Loans, equity, grants	Project development assistance	-
UNITED KINGDOM	London Energy Efficiency Fund	Fund	£100 million	Built environment in London	ERDF, private sector	Loans	None; internal fund manager resources; project development assistance added to successor fund	Energy performance contracts
UNITED STATES	Property Assessed Clean Energy	Credit lines	No specific capital allocation; some States and counties have used their own funds but most capital comes from private sector; capital deployed: \$1.5 billion for commercial PACE, \$6 billion for residential PACE	Energy efficiency in commercial and residential buildings; can include (in some areas) additional measures including rooftop solar, water conservation measures, earthquake proofing	Commercial banks and financial institutions	Loans	-	Repayments are added to property taxes that are superior to other loans and mortgages, and transferable upon sale of property

Source: Compiled by author, ESCWA.

Notes: ERDF stands for European Regional Development Fund; CEB stands for Council of Europe Development Bank; EBRD stands for European Bank for Reconstruction and Development; EIB stands for European Investment Bank; KIDSF stands for Kozloduy International Decommissioning Support Fund; CVDB stands for Cities and Villages Development Bank; VIPA stands for Public Investment Development Agency; IFI stands for international financial institution; AFD stands for Agence française de développement; IDB stands for International Development Bank; LAIF stands for Latin American Investment Facility; NAMA stands for National Appropriate Mitigation Action; PACE stands for property assessed clean energy; DEWA stands for Dubai Water and Electricity Authority; and OSER stands for Regional Energy Services Operator.





ENERGY EFFICIENCY FUNDS

A. BULGARIA: ENERGY EFFICIENCY AND RENEWABLE SOURCES FUND

The Bulgarian Energy Efficiency and Renewable Sources Fund (EERSF) was established in 2005 as the Bulgarian Energy Efficiency Fund with funding from the Global Environment Facility through the World Bank, the Government of Bulgaria, the Government of Austria, and local private-sector companies.²⁷ The creation of the fund was included in the 2004 Energy Efficiency Act, which was part of the legislation designed to bring Bulgaria into alignment with European Union policy prior to its accession into the European Union on January 1, 2007.

Similar to other countries in Central and Eastern Europe, energy efficiency levels in Bulgaria were low, and the potential for cost-effective energy savings in buildings was estimated at about 40 per cent. Between 2005 and 2008, the Fund received 219 million Bulgarian lev (BGN) (\$13.6 million) to cover start-up costs, capacity-building and the first investment capital. The Fund was aimed at providing revolving energy efficiency project finance and technical assistance for the public and private sectors. Since 2011, the mandate has been expanded, with the passing of the Energy from Renewable Sources Act, to include funding demand-side renewable energy projects.

In 2013, the fund secured a €5 million grant from EBRD and the Bulgarian Ministry of Economy and Energy to finance further partial credit guarantees for ESCO projects in public buildings. In 2014, an additional €5 million was secured from KIDSF. The latter amount was earmarked to assist municipalities to reduce energy demand in public buildings.

The fund does not distribute profits and operates as a commercially orientated public-private finance facility serving three major roles, namely, as a lending institution, a credit guarantee facility and a provider of technical assistance. The fund is managed by Econoler-EnEffect-Elana, a specialized, private-sector fund manager, which is itself a consortium of Econoler International, a Canadian energy efficiency consultancy, the Center for Energy Efficiency EnEffect, a non-profit non-governmental organization (NGO), and Elana Holding, a non-banking financial institution. The fund manager can provide a limited amount of technical assistance but its main role is the evaluation and approval of projects.

The initial structure of the Fund is illustrated in Figure 4.

The Fund provides loans to municipalities, corporate clients, individuals, municipal projects, ESCO projects, and renewable energy projects. The prevailing interest rates, volume and terms are shown in Table 5. The interest rates are fixed for the term of the loan. The average weighted interest of the funds granted in 2019 was at 4.37 per cent. Interest rates are set in line with the creditworthiness of the particular client and to maintain competitiveness with commercial banks.

The Fund is used to finance a wide range of projects including rehabilitation of buildings in all sectors including industrial, commercial, multifamily residential, single-family residential, and all types of public buildings including health-care facilities, schools, universities, and cultural facilities. The Fund can also be used to improve the heat source, which is often district heating,

²⁷ Energy Efficiency and Renewable Sources Fund (EERSF), 2020a. About Us. Energy Efficiency and Renewable Sources Fund (EERSF).

street lighting and industrial facilities such as air compressors.

For partial credit guarantees, or portfolio credit guarantees, the Fund charges a fee of between 0.5 and 2 per cent for a term of up to seven years. Guarantees have been granted to several commercial banks.

Up until the end of 2019, the Fund had deployed BGN92,843,084 (\$57.6 million) across 210 projects. The share of projects and capital deployed across municipalities, corporates and other clients is shown in Table 6.

In 2019, the Fund signed six new contracts for funding with a combined value of BGN6,058,685 (\$3.756 million).

As of the end of 2019, the Fund reported that 3.48 per cent of loans had overdue payments of 90 days or more, down from 3.92 per cent at the end of 2018.

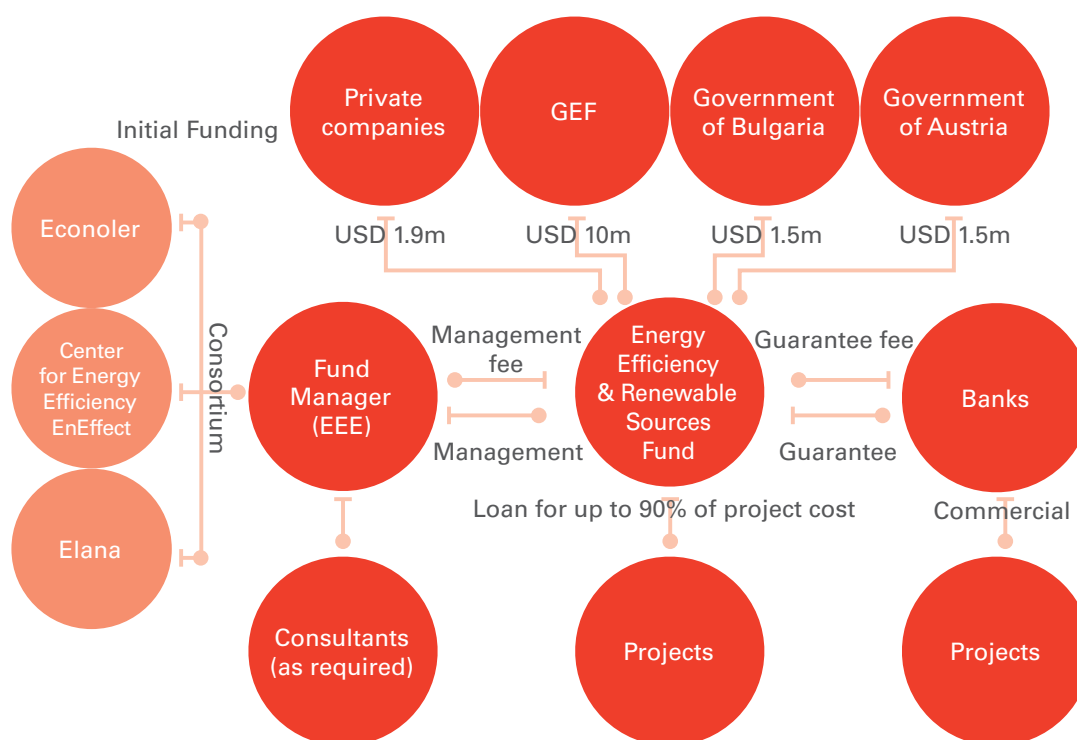
The Fund reported continued good interest levels from municipalities. It targets hospitals, universities and dormitories, which represent about 12 per cent of the project portfolio. They are, however, considered more risky than

municipalities because their legal frameworks of operation lack clarity.

The market for energy efficiency financing in Bulgaria is now competitive with several interest-free facilities and commercial lending. EERSF has started to move into bridge funding to assist municipalities in developing projects to the point at which they can be fully financed. The Fund is considering the financing opportunities provided by the National Nearly Zero-energy Building Plan, which requires all public buildings constructed after 31 December, 2018, to be nearly zero-energy and all other new buildings to be nearly net-zero energy after December 31, 2020, and the opportunities presented by legislation to speed up the adoption of electric vehicles.

EERSF has been predominantly backed by Government and multilateral funds, and most funds have gone into project deployment which has helped develop the market for energy efficiency retrofits in Bulgaria. The Fund also supports technical assistance, but not sufficiently to meet the probable need. EERSF is now considering future options, which reflects the need of all financing instruments to have sufficient flexibility to react to changing markets.

Figure 4. Initial structure of the Bulgaria Energy Efficiency and Renewable Sources Fund



Source: Energy Efficiency and Renewable Sources Fund (EERS), 2020a.

Table 5. Terms of Bulgaria Energy Efficiency and Renewable Sources fund loans

TYPE OF BENEFICIARY	FIXED ANNUAL INTEREST RATE (PERCENTAGE)	EERSF FINANCING VOLUME (BGN)	TERM	MINIMUM CONTRIBUTION FROM THE BENEFICIARY (PERCENTAGE)
MUNICIPALITIES, CORPORATE CLIENTS, INDIVIDUALS	4-7	27,000 - 800,000 (\$16,700 - 496,000)		
MUNICIPAL PROJECTS ESCO PROJECTS RENEWABLE PROJECTS	3.5-5.5	800,000 - 2,700,000 (\$496,000 - 1,674,000)	Up to 7 years	10 per cent

Source: EERS, 2020b.

B. ESTONIA: KREDEX REVOLVING FUND AND RENOVATION LOANS FOR APARTMENT BUILDINGS

In Estonia, 75 per cent of the population lives in multi-apartment buildings, 95 per cent of which are privately owned. There are approximately 20,000 apartment blocks, about 60 per cent of which were built between 1960 and 1990, and 30 per cent before 1960. Apartment blocks are managed by block associations.

The concept for the KredEx Revolving Fund was devised in 2007 by the Estonian Ministry of Economic Affairs and Communications, the KredEx Foundation and the German development bank KfW. The goal was to move the support by the Estonian Government for energy efficiency away from a grant-driven approach, which was prevalent from 2003 to 2007, towards an approach that could

leverage private capital through a combination of loans, guarantees and grants. The ambition was to finance renovations in 1,000 apartment buildings.²⁸

The Fund was fully aligned with national and European policies in place at the time, including the following:

- National Housing Development Policy, adopted in 2008.
- Energy Conservation Target Plan, 2007-2013.
- National Development Plan for the Energy Sector until 2020.
- European Union climate and energy package.

The Fund was established in 2009, with €72 million of funding from the following sources:

Table 6. Number of projects, capital value and capital deployed by the Bulgaria Energy Efficiency and Renewable Sources Fund

TYPE OF CLIENT	NUMBER OF PROJECTS	SHARE (PERCENTAGE)	CAPITAL VALUE OF PROJECTS (BGN)	SHARE (PERCENTAGE)	EERSF CAPITAL DEPLOYED (BGN)	SHARE (PERCENTAGE)
MUNICIPALITIES	106	50.5	41,660,928	44.9	28,277,512	42.2
CORPORATES	79	37.6	33,332,207	35.9	25,336,999	37.8
OTHERS	25	11.9	17,849,949	19.2	13,450,598	20.1
TOTAL	210	100	92,843,084	100	67,065,109	100

Source: EERS, 2020b. Energy Efficiency and Renewable Sources Fund. Financial Statement. 31 December 2019.

28 Cityinvest, 2019. KredEx Revolving Fund for energy efficiency in apartment buildings Estonia.

- €17 million grant from the European Regional Development Fund (ERDF).
- €28.8 million loan from the Council of Europe Development Bank (CEB) guaranteed by the Government of Estonia.
- €16 million loan from the Government of Estonia.
- €9.5 million from the KredEx Foundation (a financing institution established by the Ministry of Economic Affairs and Communication in 2001 to help Estonian enterprises offering a range of financial products.)

Figure 5 shows the initial structure and funding of the KredEx Revolving Fund.

In 2013, the Fund received an additional €16 million loan from the Estonian Government and additional €7 million from KredEx.

The KredEx Fund only supports the renovation and reconstruction projects of multi-apartment buildings if at least three apartment owners want to make use of the loan, represented by an apartment association. A minimum commitment of 20 per cent of energy savings is required in buildings up to 2,000 m², while in larger buildings, this requirement increases to 30 per cent.

The Loan is primarily directed towards apartment associations that have received a negative response to their renovation loan application from a bank or an offer with unreasonable terms, including a very short term and an interest rate that is significantly higher than usual. Therefore, it does not crowd out private capital but rather supports projects which cannot attract private capital.

The Fund is able to provide loans with below-market interest rates because it receives zero-cost grants from ERDF and favourable interest rates from CEB. Loans are over 20 years and originally had a 10-year fixed rate with an average interest rate of 4 per cent. Loans can generally be repaid out of the savings in energy costs. The total acceptable loan amount was between EUR 15,000 up to EUR 3 million per apartment association.

Loan guarantees covering up to 75 per cent of the loan amount with no collateral requirement are provided for building apartments with higher-risk ratings, namely, number of debtors, rural area, low market value, and payment risk, and when reconstruction cost per square metre is higher due to complex reconstruction. Guarantee fee charges of between 1.2 and 1.7 per cent of the total loan amount apply.

Applicants were initially obliged to self-fund 15 per cent of the project costs although this could also come from grants administered by the Fund. Currently, there is an obligation to self-fund 5 per cent of the project. Grants can be provided for 15, 25 or 35 per cent of the total project costs depending on the level of energy savings achieved. Furthermore, housing associations can obtain technical assistance grants up to 50 per cent of the expenses for an energy audit, building expert evaluations and preparation of project design documents.

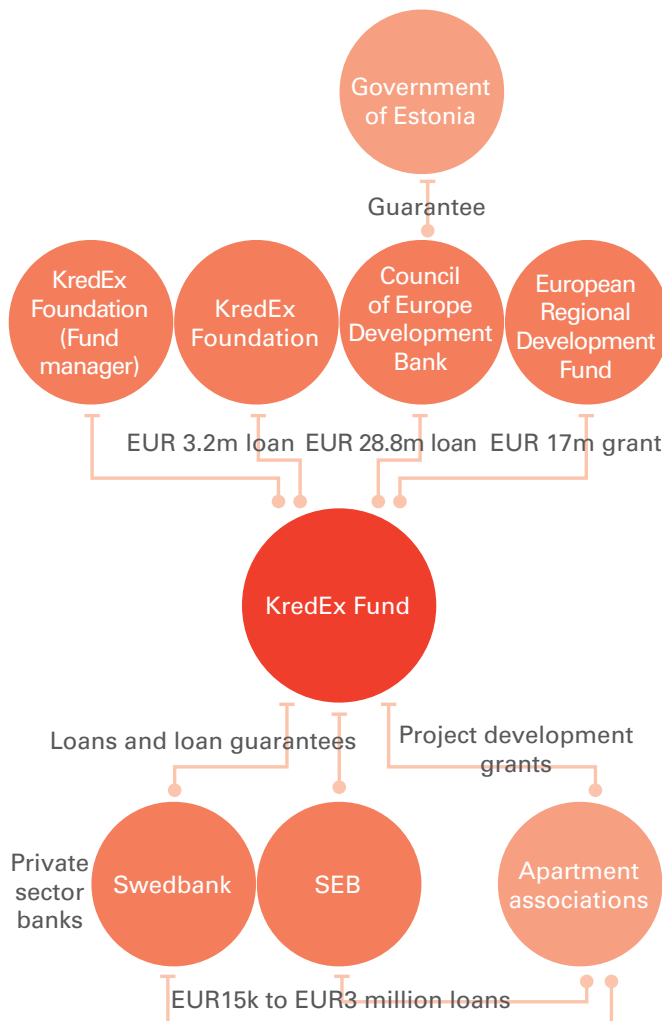
The Fund, in its early stages, was supported by numerous promotional activities to increase awareness of energy efficiency in Estonia, in particular amongst housing associations and financial institutions.

The KredEx Foundation was the manager of the KredEx Fund and operated the Programme Delivery Unit, which was responsible for disbursing grants for technical support services, such as audits and evaluation, and for project implementation.

The KredEx Fund served as the lending institution, providing preferential loans and loan guarantees through its private-sector financial intermediaries Swedbank (two thirds) and the Swedish financial group SEB (one third), which were chosen through public tendering to administer the loan scheme. The Fund itself only had two staff dedicated to the programme, a department head and a project manager. The running costs of the Fund were kept low as most of the work during the loan process is conducted by the intermediary banks; estimated running costs were only at about €100,000 per annum and set-up costs at €250,000.

The KredEx Foundation established a council that makes strategic decisions related to the Foundation's operations and the approval and amendment of documents most important for the operations, which include budget, strategy, activity goals, risk management, and cooperation principles with credit institutions. The council also had to approve all projects for which the individual total amount of the loan or guarantee issued by KredEx exceeds €1 million. The council consists of a maximum of seven members, including representatives from the Ministry of Economic Affairs and Communication and the Ministry of Finance.

Figure 5. Initial structure and funding of the KredEx Fund



Source: FI Compass, 2015. Renovation loan programme. Case study.

Between 2009 and 2014, the Fund achieved the following:

- It deployed €72 million.
- It carried out projects in 615 apartment buildings with a total programme investment value of almost €103 million.
- It saved about 75 GWh per year.
- Average predicted savings were about 40 per cent versus the initial targets of 20-30 per cent).
- It reduced GHG emissions by approximately 15,000 tons CO₂ per year.²⁹

The Fund fully disbursed the capital obtained from its original funders and has begun to operate as a revolving fund. Starting in 2015, loans have become available from private banks with a 15 to 20-year term and fixed interest rates of 2.5 per cent for the first five years. Grants of 15, 25 or 40 per cent of the capital are available through KredEx using European funds.

The KredEx Fund has helped move the market away from a grant-based culture and build a market for private banks to finance energy efficiency retrofits.



C. LATVIA: LATVIAN BALTIC ENERGY EFFICIENCY FACILITY

As in most of Central and Eastern Europe, approximately 70 per cent of the Latvian population lives in apartment blocks built in the Soviet era, typically supplied with district heating. In addition to their very low level of energy performance and comfort, these blocks, which were primarily built from prefabricated concrete panels, have major construction faults and, without major renovation works, are likely to have a very short lifetime, creating the possibility of a future housing crisis. It is estimated that, if all the blocks in Latvia were renovated, the country could

reduce its gas imports from Russia by roughly 50 per cent. Exceedingly high energy use and energy vulnerability represent massive social and economic problems, a situation which is similar across all countries of the former Soviet Union. The Latvian Baltic Energy Efficiency Facility (LABEEF) was created to address the limited funding and balance sheets of local ESCOs, which creates a barrier for ESCOs to take on deep renovation projects. LABEEF was established as a forfeiting fund which purchases the cash flows (up to 80 per cent of the future contracting revenues)

²⁹ KredEx, 2019. KredEx Revolving Fund: Financial Instruments for the low-carbon economy.

generated through EPCs from local ESCOs that finance housing upgrades.³⁰ The structure of LABEEF is shown in Figure 6.

The development of LABEEF was undertaken as part of the SUNShINE (short for Save Your Building by Saving Energy) programme and its successor programme Accelerate SUNShINE, which were projects funded by the European Union's Horizon 2020 programme.³¹ The SUNShINE project ran from 2015 to 2018, and built upon experience of a previous programme that was aimed at the deep retrofit of multifamily buildings in Latvia. A challenge in the previous project was that the balance sheets of ESCOs were insufficient to take on more than a few projects; therefore, it could not be scaled. To address this issue, LABEEF was established to purchase the future receivables from ESCOs following verification of measures and promised savings, thus allowing the ESCO to recycle its own funds and take out new loans to finance more projects.

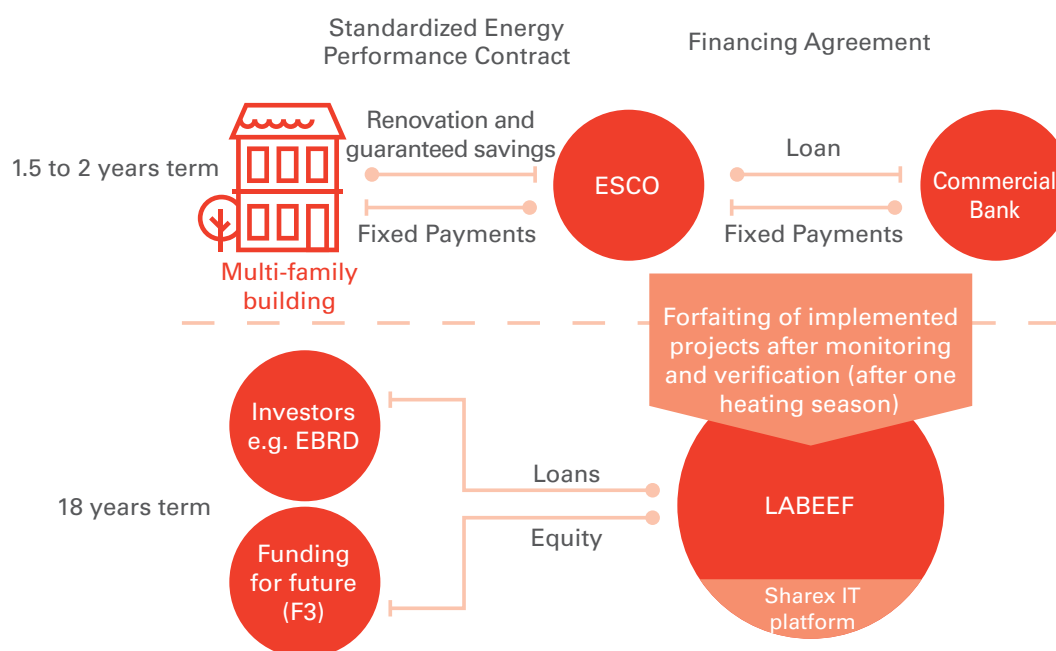
Funding for Future (F3), a private company, was the founding shareholder for LABEEF and invested €1 million. The fund initially received a €4 million loan from the EBRD and a €4 million soft loan facility. The SUNShINE project and Accelerate SUNShINE, its successor programme established in 2017, aim to generate about €50 million of renovation projects, acting as project catalysers

and as developers of the fund's underlying procedures and IT platform, which is designed to minimize transaction costs. The Sharex platform standardizes and centralizes all data on project design, contracting and ongoing performance. It also provides case studies on projects.

The process works as follows:

- An ESCO signs a 20-year EPC with the home owners' association which guarantees a certain level of energy savings.
- The ESCO takes on a loan from a financial institution (commercial bank) to fund the work.
- The ESCO renovates the building, typically achieving energy savings of 45-65 per cent, subcontracting to construction companies and equipment providers.
- The building maintenance company, which maintains the housing block and pays the heating bill to the heat provider, bills the apartment owners the same amount as before the renovation works and pays the ESCO a percentage of those bills, based on the realized savings.
- The maintenance company pays the reduced energy bill to the heat providers.
- Once the project is implemented and savings are proved, an assignment agreement is signed between the ESCO and LABEEF. The ESCO receives discounted cash flow for future receivables, minus an amount for operations and maintenance and a performance guarantee.

Figure 6. Structure of the Latvian Baltic Energy Efficiency Fund



Source: Accelerate SUNSHINE Project, 2020.

³⁰ Accelerate SUNSHINE Project, 2020. Sustainable financing solution for renovation of buildings! For Energy Service Companies (ESCOs) LABEEF ensures the necessary financing for building renovation projects.

³¹ CORDIS, 2017. Project Information: Accelerate SUNSHINE.

The cash flows from the homeowners via the house maintenance company to LABEEF, which keeps paying the ESCO for operations and maintenance.

The financing process between the ESCO, the commercial bank and LABEEF is divided into the following three stages:

- The ESCO develops projects using LABEEF technical standards and standard documentation including template EPCs.
- The ESCO arranges commercial bank financing for the capital works, and LABEEF signs a commitment to purchase future ESCO revenues from the project, after allowing an operations and maintenance fee. The lending commercial bank covers the first two to three years of operation.
- After the building has been renovated and one heating season has passed, LABEEF performs a construction work audit. If the project meets the pre-agreed standards, LABEEF will then buy the future revenues of the ESCO, allowing the ESCO to repay the commercial bank lending.

The forfeiting process transfers the risks between the parties at the various stages. During the 1.5-2 year period of implementation and verification, 100 per cent of the risk lies with the ESCO, with 30 per cent of the funding typically provided by the ESCO's equity and 70 per cent as debt from the commercial bank. After forfeiting to LABEEF, the commercial bank is repaid, allowing recycling of funds into new projects; LABEEF receives 80 per cent of the net receivables over the approximately 18 years of the contract whilst the ESCO receives 20 per cent for ongoing operations and maintenance and providing a performance guarantee. Once the performance contract ends, all risks and benefits pass to the building owners.

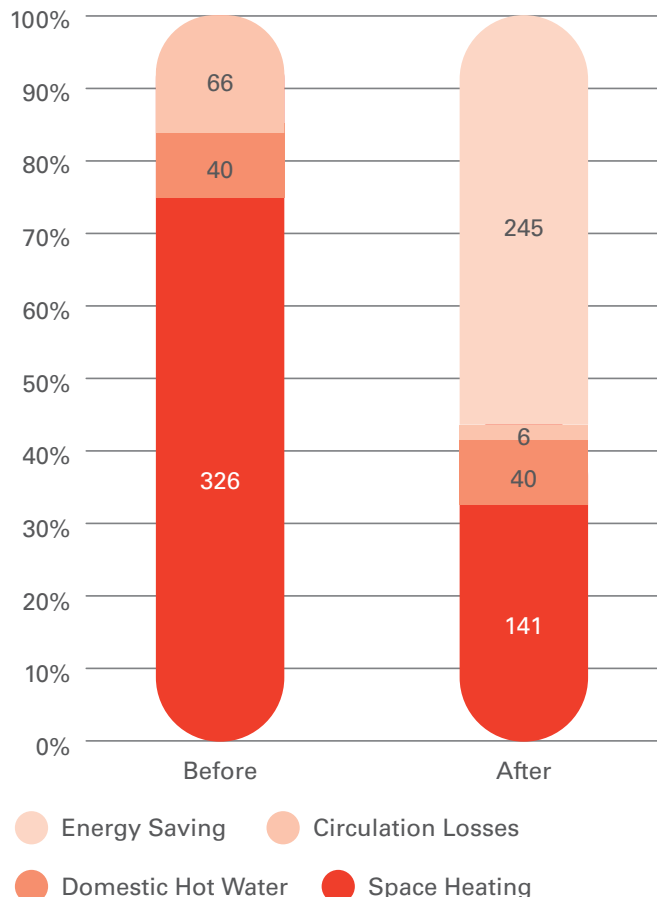
The projects completed to date show high levels of energy saving, with an average of 55-65 per cent. Annual energy consumption before and after completion taken from an actual project are shown in Figure 7. As part of the project, buildings are made visually attractive, and structural problems are dealt with. These improvements increase the value of apartments in the renovated blocks, sometimes by 20-30 per cent.

In order to include elements in the renovation that are not energy-related, LABEEF accepts three levels of EPC packages. The standard EPC package covers the energy efficiency measures identified and carried out by the ESCO. The EPC+ package includes additional measures specified by the building owners, for instance, installation of an elevator. Additional measures need to be financed by the owners of the building. The EPC++ package can include additional non-essential measures which also need to be financed by the owners.

Financing through purely private capital for energy efficiency in public or private buildings is still difficult. As of July 2020, LABEEF had developed a pipeline including more than 30 buildings with a projected investment need of €25 million. It had fully realized five renovation projects with an investment of more than €5 million and primary energy savings of 1.64 GWh/year. A further 26 projects are in the pipeline.

Figure 7. Annual energy consumption before and after a LABEEF project

Before and after annual energy use for Valmiera, Gaujas 13 project (MWh)



Source: Accelerate SUNSHINE Project, 2020.

Another European Union Horizon 2020 project, the Financing Scheme for Energy Efficiency and Renewable Energy Guaranteed in Deep Renovations of Building Stock (FinEERGo-Dom), was launched in June 2019 to replicate and expand the LABEEF model to Poland, Austria, Slovakia, Romania, and Bulgaria. Countries such as Macedonia, Georgia and Ukraine might replicate the scheme as well.

Although the facility is still in its early days, LABEEF already illustrates a number of important points. Firstly, building owners have many objectives other than energy saving. In the case of Latvia and much of the region, renovating buildings to stop them from decaying and to

overcome the very poor design is an essential human, economic and social need. Promoting the non-energy benefits of energy efficiency-related projects is important as these benefits are often more important to householders and commercial property owners than simple energy cost savings. It also illustrates the need to bring together numerous stakeholders to gain their acceptance of the project and overall programme. Moreover, it is important to build capacity within both ESCOs and their supply chain. Finally, the issue of secondary financing, buying out the primary project finance, is an essential problem that needs to be solved if investment is to be upscaled into energy efficiency.

D. LITHUANIA: LITHUANIA ENERGY EFFICIENCY FUND

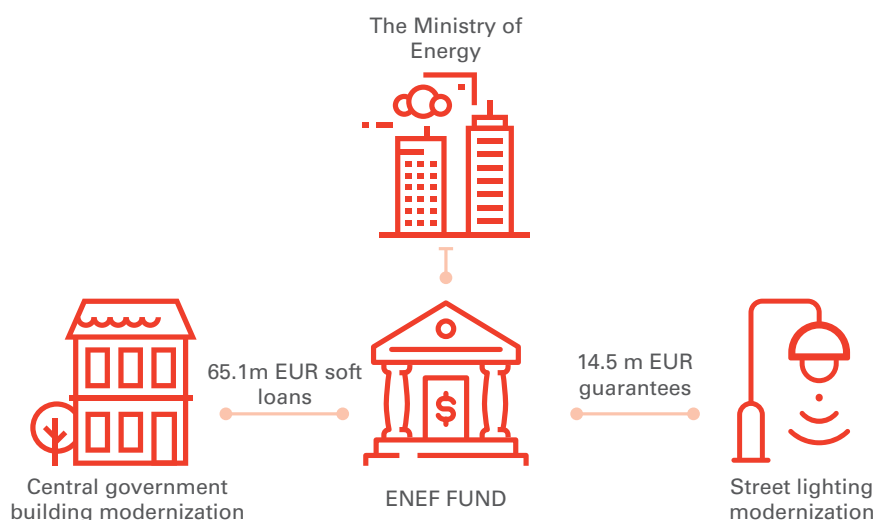
The Lithuania Energy Efficiency Fund (ENEF) was established in 2015 following a study on the potential for energy efficiency improvements across all sectors in the country.³² Public infrastructure was identified as a key potential area for improvement as central Government buildings were found to be very inefficient, and street lighting in most cities was in poor condition, which are the focus areas for this fund. A funding need, or gap, of €66.9 million was identified for the modernization of public buildings and €50.5 million for the modernization of street lighting. Other funds were set up to address other sectors, for instance, housing.

ENEF is one of three specialized energy efficiency funds managed by Lithuania's Public Investment Development Agency (VIPA).³³ These three funds are the following:

- JESSICA II (a fund of funds), worth €150 million.
- Multi-apartment Building Modernization Fund, worth €30 million.
- ENEF.

The first two funds were established to attract large private investments to increase the leverage of funds by the European Union. The Multi-apartment Building Modernization Fund is described below.

Figure 8. Allocation of funds within the Lithuania Energy Efficiency Fund



Source: VIPA, 2017. Lithuanian experience on financing instruments for energy efficiency.

³² Lithuania, Ministry of Energy of the Republic of Lithuania, 2015. Energy Efficiency Fund was established.

³³ VIPA, 2017. Lithuanian experience on financing instruments for energy efficiency.

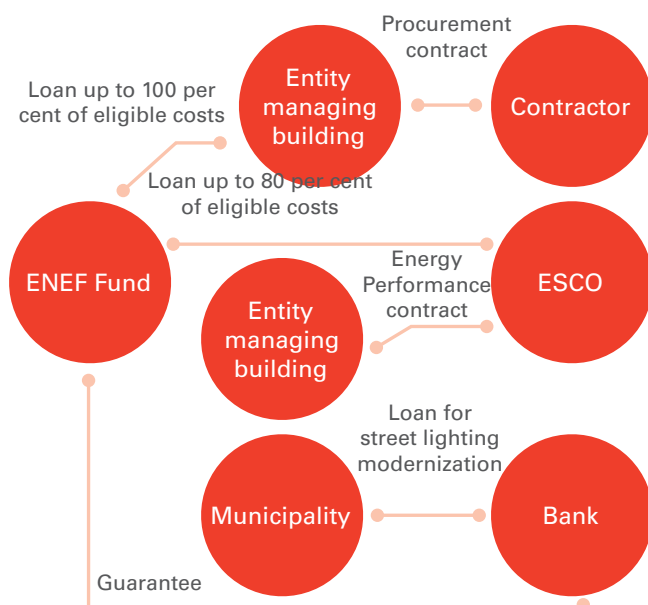
ENEF was established by the Ministry of Finance, the Ministry of Energy and VIPA utilizing funds from the 2014-2020 European Union Structural Funds. The day-to-day operation of the Fund is managed by staff from the Project Financing Division and the Financial Partnership Division of VIPA. Central Government buildings are subject to obligations to reduce energy consumption under the national adoption of the European Union energy efficiency directive. The allocation of funds within ENEF is shown in Figure 8.

The Fund offers soft loans and guarantees to entities managing State-owned buildings with the following characteristics:

- Applicants: entities managing State-owned buildings.
- Interest rate: up to 2 per cent + Euro Interbank Offered Rate (EURIBOR).
- Maturity: up to 20 years.
- Loan amount: up to 100 per cent of eligible costs in case the borrower is not an ESCO and 80 per cent in case the borrower is an ESCO.

When projects are undertaken by ESCOs, they must use standard ESCO documentation which was developed with technical assistance from the EBRD using funding by the European Local Energy Assistance (ELENA). Technical assistance to develop projects can also be funded from a €6 million ELENA facility.

Figure 9. Lithuanian Energy Efficiency Fund loan options for building modernization



Source: VIPA, 2017.

The following guarantees are available for street lighting upgrades funded by commercial banks:

- Applicants: municipalities and municipal enterprises.
- Guarantee amount: 50-80 per cent of total project cost.
- Warranty period: no more than 20 years.
- Projects should generate energy savings of at least 40 per cent.

Commercial banks pay a guarantee fee to VIPA. The total value of the fund was established at €79.65 million, including €65.16 million to modernize of central Government buildings and €14.49 million to modernize street lighting.

As of the end of 2019, the Fund had achieved the following results:³⁴

- Seventeen renovations received soft loans.
- Twenty-three agreements to support technical assistance were concluded.
- Eight projects received guarantees.
- Four projects were completed in 2019.
- One hundred fourteen applications totalling €83.5 million were received.

In November 2019, a new energy efficiency financing platform for the modernization of public buildings was announced which will combine disbursement from the ENEF and other funds. This is briefly described later in this report.

The role of VIPA as an institution is also evolving. It starting as a financial intermediary, transitioned to a fund manager and expanded its work to becoming an implementing authority. In 2018, it signed an agreement with the national Energy System Operator to establish an energy efficiency financing platform.



³⁴ VIPA, 2020. VIPA Annual Financial Statements of the private limited company Public Investment Development Agency.

E. LITHUANIA: LITHUANIA MULTI-APARTMENT MODERNIZATION FUND

Lithuania has a population of approximately 3 million and more than 38,000 multi-apartment buildings with more than 800,000 apartments, of which about 97 per cent are privately owned. About 68 per cent of the population lives in apartments built before 1993, during the Soviet era, and about 65 per cent use heat supplied from district heating systems.

During 2007-2013, the Buildings Modernization Programme was supported through funds from the Joint European Support for Sustainable Investment in City Areas (JESSICA) of the European Union, which were used in a revolving fund called JESSICA Holding Fund Lithuania or JESSICA I. Under this programme, €265 million were deployed in over 1,000 multi-apartment buildings, sourced from European Union structural funds, Lithuanian national funds, private funds, and recycling of repayments.

In 2015, following the successful JESSICA I, the Lithuania Multi-apartment Modernization Fund (DNMF), was established as one of three specialized energy efficiency funds under VIPA.

The following rationales were behind the establishment of DNMF:

- The housing infrastructure was very inefficient.
- It suffered from structural problems relating to the construction system used.
- Commercial banks had a very conservative approach to lending for apartment renovation.
- Initiative by apartment owners was lacking.
- In addition to an existing funding gap of about €1 billion an investment need of more than €10 billion between 2017 and 2023 was identified.
- Public funds were insufficient to bridge this funding gap.

The goals of the programme were the following:

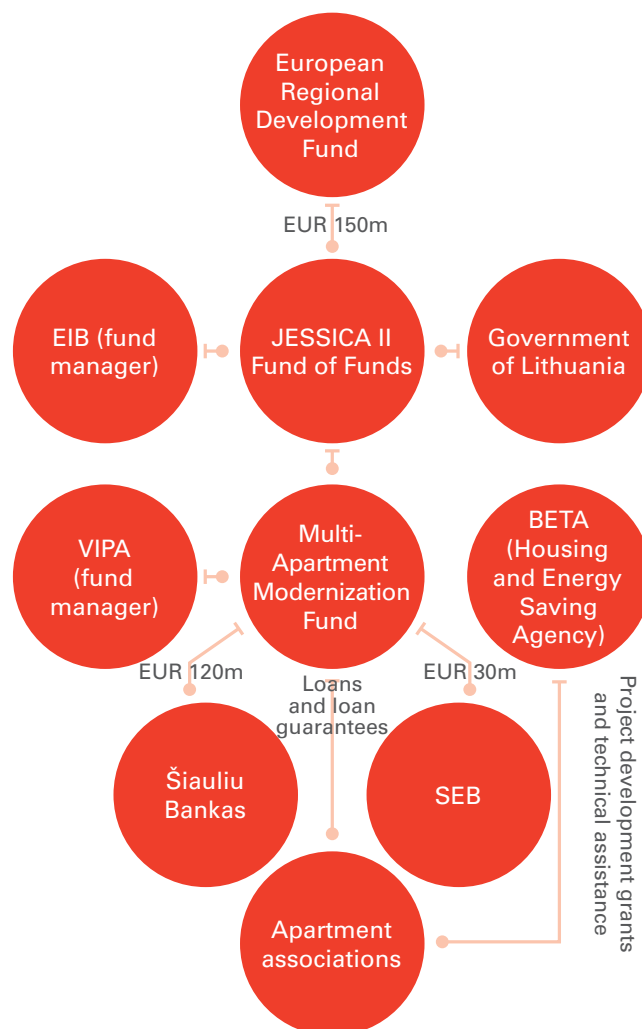
- Increase the energy efficiency of multi-apartment buildings.
- Ensure that heating costs plus repayments for the loan would not exceed the prerenovation heating costs.

In order to achieve these goals, DNMF utilized €150 million from the 2014-2020 European

Structural and Investment Funds. An important priority for DNMF was to leverage private finance and minimize national public investment. The European Investment Bank (EIB) created a pre-financing instrument which was secured by the future inflows from the portfolio. This guarantee instrument was used to attract €180 million of capital from commercial banks and VIPA.

The structure of DNMF from 2016 is shown in Figure 10.

Figure 10. Initial structure of the Lithuanian Multi-apartment Modernization Fund



Source: VIPA, 2017.

Loans are granted at an interest rate of 3 per cent fixed for five years with up to 20 years of loan maturity. Loans can cover up to 100 per cent of the energy efficiency investment, and there is a two-year grace period during construction. No collateral is required. Apartment blocks are managed by associations and, in order to proceed with a renovation, more than 50 per cent of the apartment owners have to agree to the proposed works. In 2020, the National Audit Office of Lithuania reported that, during 2013-2019, 35 per cent of the 2,389 identified projects in the lowest energy efficiency apartment blocks had not been implemented due to owners' objections and the renovation rate was still well below the rate needed to achieve the target of renovating all buildings by 2050.³⁵

The average loan granted was €311,800. Average energy savings were 63 per cent, and the average building was improved from an Energy Performance Certificate E to an Energy Performance Certificate C. Typical improvements included the following:

- Insulation of walls, roofs and floors.
- Replacement of windows and doors.
- Modernization of the heating system.
- Renewal of ventilation.
- Glazing in of balconies.
- Renewal of systems such as electrical wiring and elevators.

The standards for renovation work are set by BETA, the Housing Energy Efficiency Agency.

Up to 100 per cent of project development costs were reimbursed, and up to 100 per cent reimbursement of project costs is available to low-income families. Originally, up to 40 per cent of the value of the energy efficiency investment could be reimbursed through grants subject to the level of energy savings achieved, but this was phased out.

Municipalities, as borrowers on behalf and in favour of apartment owner, were appointed to be the renovation administrators and were instructed to draw up lists of the worst-performing buildings to develop a pipeline.

The Ministry of Environment reported that, between 2005 and 2018, 2,941 multi-apartment buildings were modernized and 10,869 energy saving measures were implemented, reducing thermal energy consumption by 857 GWh. By March 2018, nearly 700 multi-apartment buildings were successfully renovated while another 400 were expected to be financed with the funds available from DNMF.

In April 2018, Lithuania became the seventh country in the world and the first in the Baltic region to issue a sovereign green bond.³⁶ This ten-year bond is relatively small, at €68 million, raised in tranches, but the proceeds will be lent to VIPA specifically to finance 156 multi-apartment building renovation loans administered under DNMF.

In 2019, EIB put in place a guarantee agreement with Šiauliai Bankas, one of the private banks involved in the DNMF from the beginning, to continue funding of renovations in multi-apartment buildings. Under the agreement, EIB provides a €30 million guarantee from ERDF for a portfolio of €150 million in loans issued to homeowners by Šiauliai Bankas.

Lessons learned during the operation of the DNMF include the need for consistent and stable policies, to standardize and simplify, and to consult widely with stakeholders. Furthermore, it is important to ensure high-quality projects, and homeowners must be able to clearly see a return within a reasonable time scale. Prior to the reorganization of DNMF in 2016, the uptake was relatively low, partly because low-income households received a subsidy for heating and, therefore, were not incentivized to consider energy efficiency improvements. Once the subsidy was removed, the uptake increased, and low-income households could have the projects financed by the Fund subject to meeting the necessary criteria.

The 2018, the green bond was particularly significant as it represents a further step towards a fully funded private-capital model. Green bonds are in high demand and are a clear way for commercial banks to both recycle capital and raise new capital at low interest rates.

³⁵ National Audit Office of Lithuania, 2020. Multi-Apartment Building Renovation (Modernisation).

³⁶ Climate Bonds Initiative, 2018. Green Bond Fact Sheet.

F. TUNISIA: TUNISIAN ENERGY TRANSITION FUND

In 2014, the Energy Transition Fund replaced the National Energy Conservation Fund. Between 2005 and 2016, the funds received €100 million, 71 per cent from taxes on car registration, 19 per cent from taxes on air conditioners, 5 per cent from taxes on incandescent lamps, and another 5 per cent from other taxes.³⁷ In the same period, they deployed €70 million, split as follows:

- Energy substitution: 50 per cent.
- Renewable energy: 41 per cent.
- Energy efficiency: 9 per cent.

They also mobilized private investments worth €450 million and produced cumulative energy savings of 2.7 million tons of oil equivalent and avoided emissions of 6.3 metric tons of CO₂.

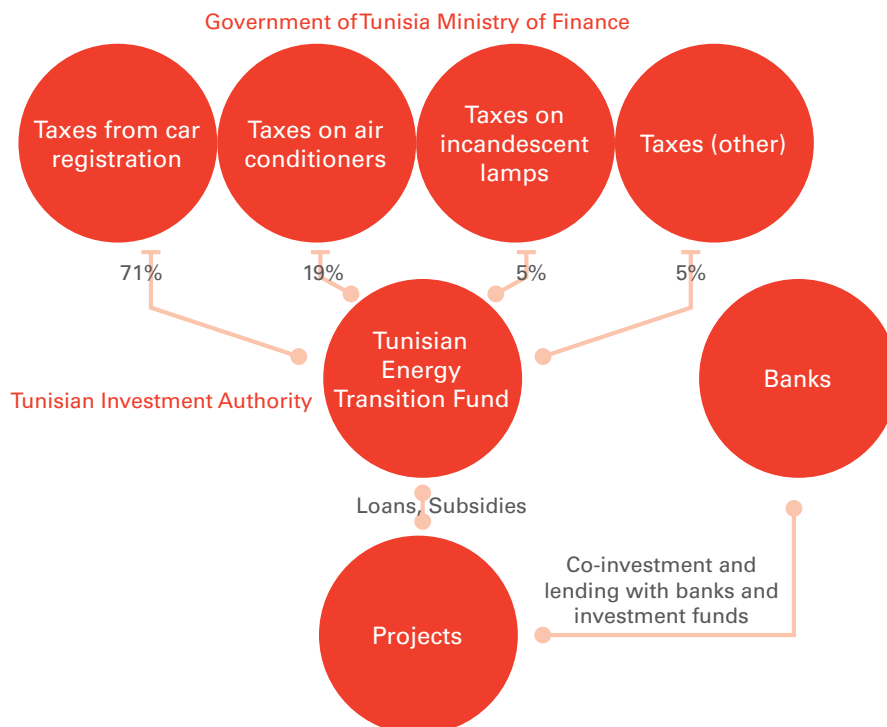
In 2017, the Fund was reformed to increase energy efficiency and renewable energy and included the following modes of intervention: subsidies, loans in cooperation with banks and equity investments in cooperation with investment funds. The fund is managed by the National Agency for Energy Conservation under the Ministry of Energy.

The structure of the fund is shown in Figure 11.

Subsidies are limited to measures which are cost-effective for the State but not profitable enough for the consumers and to mature technologies with high potential in Tunisia, which is still an imperfect market. Loans are directed to members of the population who face difficulties of accessing conventional loans and to new technologies which banks are reluctant to lend on. Equity investment aims at members of the population with low equity capacity but strong skills and at capital-intensive projects for small investors.

The Tunisian Energy Transition Fund utilizes a mechanism for repaying certain loans, specifically to install solar water heating and rooftop solar photovoltaic systems, through consumers' electricity bills. The financing of the Fund through hypothecated tax revenue is an interesting approach but one which may have legal and regulatory issues when transferred elsewhere as some countries specifically preclude hypothecated tax revenues for specified purposes.

Figure 11. Structure of the Tunisian Energy Transition Fund



Source: Missaoui, Rafik, 2017. Overview of the Tunisian “Energy Transition Fund” and presentation of its RE incentives. Presentation presented at the UNDA Project Closing Workshop: “Renewable Energy UNDA Project Conclusions and Way Forward”, Lancaster Plaza Hotel, Lebanon, 13-14 December 2017.

³⁷ Missaoui, Rafik, 2017. Overview of the Tunisian “Energy Transition Fund” and presentation of its RE incentives. Presentation presented at the UNDA Project Closing Workshop: “Renewable Energy UNDA Project Conclusions and Way Forward”, Lancaster Plaza Hotel, Lebanon, 13-14 December 2017.

G. UNITED KINGDOM: LONDON ENERGY EFFICIENCY FUND

In 2008, the Directorate-General for Regional and Urban Policy of the European Commission and EIB commissioned a feasibility study on using a financial instrument for energy efficiency in London. This led to the funding of the London Green Fund using ERDF funds, the Greater London Authority (the city-wide local government), the London Waste and Recycling Board, and private sources. The London Green Fund was managed by EIB and, in turn, established two urban development funds, one for waste projects and one for energy efficiency projects. The latter became LEEF, which was established in August 2011.³⁸

The initial £112 million of funding for LEEF came from the following sources:

- £60 million from the London Green Fund.
- £50 million loan facility from the Royal Bank of Scotland.
- £2 million from Amber Infrastructure, which was selected as fund manager in a competitive procurement exercise.

The structure of LEEF is shown in Figure 12.

The mandate of the Fund allowed lending to public or private-sector borrowers for projects that improve energy efficiency. It had the capacity to support larger projects including Combined Heat and Power and District Heating subject to minimum energy and carbon savings per pound

invested. As the Fund was supported by European Union and public money, it had to go through a standard process of identifying the need, the level of demand and the market failures that could justify public investment.

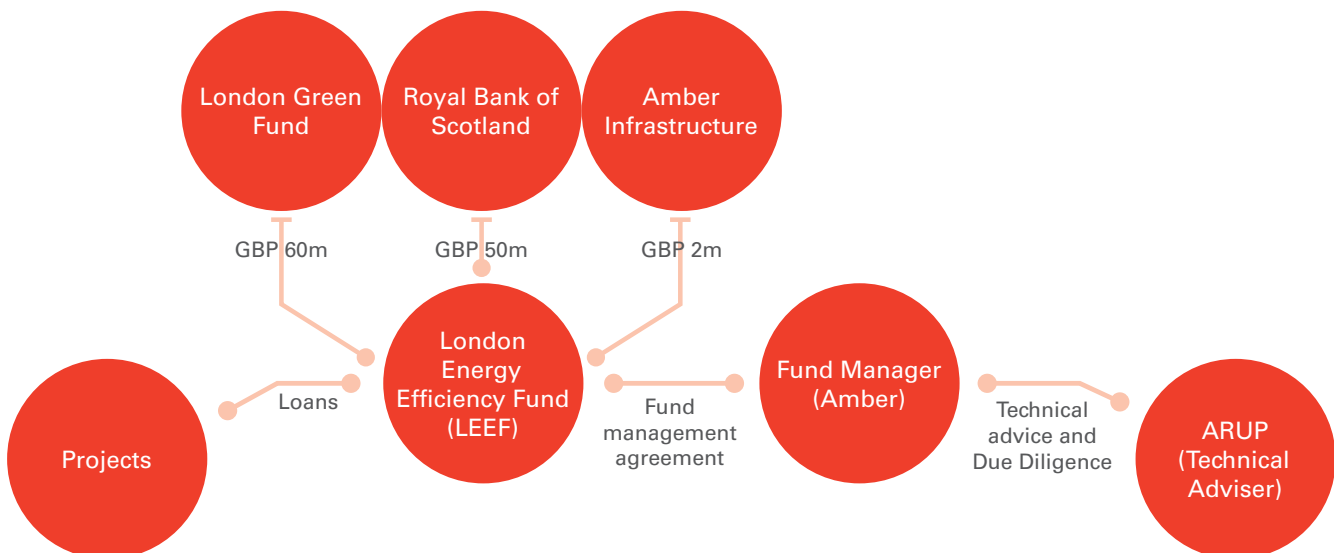
LEEF was directly linked to the Mayor of London's climate targets, and it was designed to invest in viable, but not commercially attractive, public and private-sector energy efficiency and decentralized energy projects in buildings across all of London's 32 boroughs (local authorities).

Loans could be repaid over up to 12 years, with a target investment from £3 million to £10 million per project with a potential of up to £20 million, although smaller projects starting from £1 million could be considered on a case-by-case basis. The following two types of repayment models existed :

- Payment of interest only, once the loan is drawn down with the repayment of capital at a later stage.
- Payment of capital and interest at the outset.

The cost of the finance was effectively subsidized by ERDF, with typical interest rates of 1.5-5 per cent per annum, depending on the credit rating of the borrower, which was below market rates. Mezzanine loans and equity were also available depending on the project financing structures and State-aid considerations.

Figure 12. Structure and funding of the London Energy Efficiency Fund



Source: Amber Infrastructure, n.d. London Energy Efficiency Fund.

³⁸ Amber Infrastructure, n.d. London Energy Efficiency Fund.

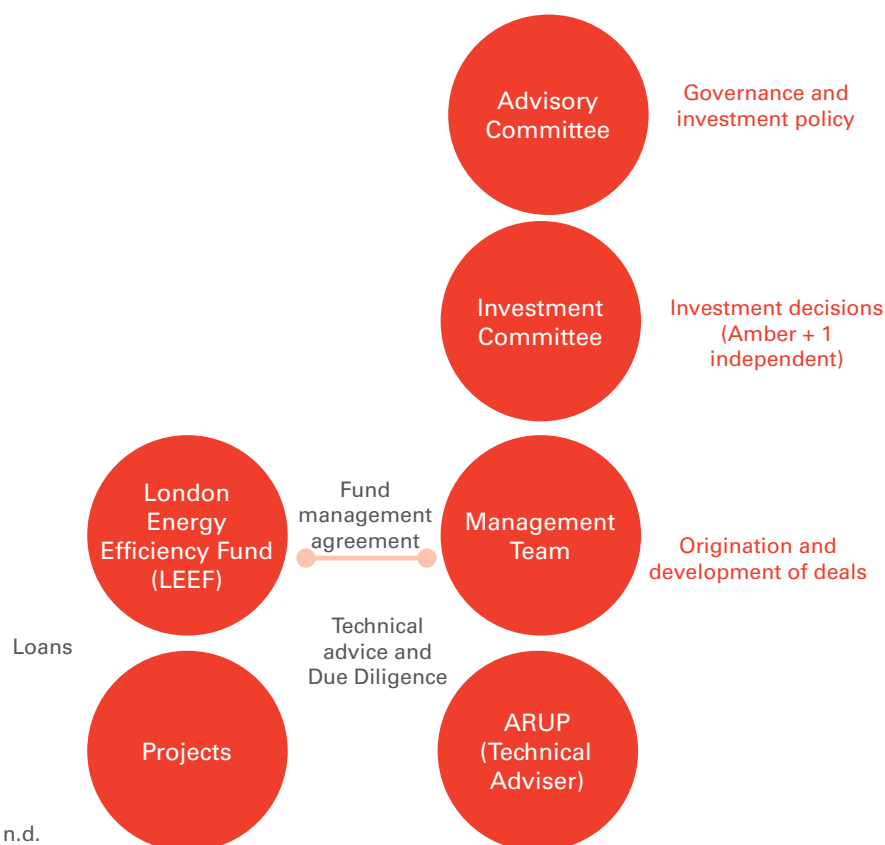
LEEF was open to the private sector as well as the public, voluntary and third-sector bodies including private-sector landlords, owner-occupiers, tenants, developers, energy service companies, and joint ventures/special purpose vehicles. In practice, the Fund was mainly deployed in the public sector and in line with its mandate to utilize debt funding. Much of the funding went to support energy performance contracting for hospitals within the National Health Service. The Fund had the mandate to lend to private-sector entities but only a small proportion of the total funds were deployed to private-sector bodies. A minimal amount (about 1 per cent) was invested as equity into a company developing an energy efficiency technology, which was still within the mandate of the fund.

The Fund was organized in a typical fund structure, with general partners and a limited partner, which is the fund manager (in this case Amber Infrastructure). The limited partner, a large infrastructure fund manager with a track record in public-private investments and the energy efficiency sector, was selected in a competitive process. As part of the selection

process, the limited partner had to demonstrate that it was introducing private-sector capital. The management team of the limited partner originated and developed investments which had to be approved by an investment committee made up of representatives of the limited partner and one independent member. Investments were offered to private-sector investors such as the Royal Bank of Scotland which did not have the right to invest at their discretion. The LEEF management structure is shown in Figure 13.

In addition to the fund manager, the British multinational professional services firm Arup, as technical adviser, supported projects interested in accessing the fund and undertook due-diligence and post-investment monitoring. Management of the Fund was done by a management team consisting of three staff members of the fund manager. Investment decisions were taken by an investment committee made up of five executives from the fund manager plus an independent member. The Fund was governed through an advisory committee consisting of two representatives from the Greater London Authority

Figure 13. Management structure of the London Energy Efficiency Fund



Source: Amber Infrastructure, n.d.

and an independent member. The advisory committee advised on policy matters, including requested changes to the investment policy.

During 2011-2015, the Fund invested its original capital of £112 million across 11 major projects and recycled capital during 2015-2018. LEEF is now closed to new projects but Amber will manage existing projects until 2021.

Achievements by LEEF include the following:

- Commitment of £89 million of capital.
- Eleven major projects in 80 buildings across nine London boroughs.
- 2,000 construction and operational jobs.
- Mobilization of more than £420 million of external investment.
- Reduction of CO₂ emissions by 40,000 tons.
- Energy savings of 34,000,000 kWh.

A sample project was St. George's Hospital, one of the largest teaching hospitals in the United Kingdom, where LEEF provided financing worth £13.3 million to install various energy efficiency technologies that were provided through an EPC, including a new energy centre with Combined Heat and Power that replaced a 40-year-old installation.³⁹ The project was designed to deliver the following outcomes:

- Energy savings of 25 per cent.
- Net savings of £1.3 million per annum during its 15-year life.

- Reduction in emissions of 6,000 tons CO₂ per annum.
- Energy savings of 6,500,000 kWh per annum.

One of the major lessons learned during the operation of LEEF was the need for sufficient resources so that project hosts and developers could develop projects that met the needs of the Fund. The fund manager, Amber Infrastructure, had to put more resources into this activity than originally planned.

In 2018, the successor to LEEF, the Mayor's Energy Efficiency Fund (MEEF), was launched. Following a competitive selection process, Amber Infrastructure was again selected to manage this Fund. The £500 million of the Fund were provided by Amber International, EIB and private investors.

Based on lessons learned from LEEF, MEEF was adapted as follows:

- Allows longer payback period with maximum loan terms of 20 years.
- Includes a £2 million project development facility which can be used to support the development of projects to their bankable stage.
- Can invest up to 10 per cent of funds into equity whereas LEEF could only invest a much smaller proportion into equity.
- Has additional private-sector funders to foster competition in financing projects.
- Has a wider mandate compared to that of LEEF and includes low carbon transportation.



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ENERGY EFFICIENCY CREDIT LINES

A. BULGARIA: EBRD RESIDENTIAL ENERGY EFFICIENCY CREDIT LINE

When Bulgaria began its European Union accession process, it was one of Europe's most energy-intensive economies. At the same time, Bulgaria began a programme to shut down the oldest units of the Kozloduy Nuclear Power Plant, which produced 40 per cent of the country's electricity. KIDSF was established to support this shutdown and energy efficiency projects in general, with the European Commission, Austria, Belgium, Denmark, France, Greece, Ireland, Netherlands, Spain, Switzerland, and the United Kingdom as contributors.

Bulgaria has about 3.1 million dwellings, of which 1.8 million are detached single family homes. More than 90 per cent of those were built before 2000, and 68 per cent were built during the Soviet era. These buildings have a very poor energy performance, with energy consumption at least twice as high as buildings that follow current standards, and are in a poor state of repair. In 2005, the Government launched the National Programme for Energy Efficiency in Multi-family Buildings with a budget of €1 billion.

To support Bulgaria's transition towards a less energy-intensive economy, EBRD created credit lines for Bulgarian banks, focusing on making businesses and households more energy efficient. In 2004, the Bulgarian Energy Efficiency and Renewable Energy Credit Line was launched, followed by the Residential Energy Efficiency Credit Line (REECL) one year later.

The original REECL established in 2005 was the first scheme to systematically address households, using the retail lending market to finance efficiency improvements and structuring the supply side with strict criteria for energy efficiency equipment. The programme ceased operations at the end of 2018. REECL provided financing, incentives and

technical assistance as a one-stop shop for energy improvements in residential buildings.

The partner banks were United Bulgarian Bank and Piraeus Bank Bulgaria.

Under the EBRD's supervision, a dedicated REECL project consultant team was responsible for the following:

- Facility management and administration (manuals, interactive web-based tools).
- Origination of new client opportunities/sales support.
- Comprehensive advisory services to potential borrowers.
- Technical eligibility checks.
- Loan product development support and training.
- Marketing support (website, case studies, templates, and guidelines).
- Verification of results.

The REECL project team also managed the project's web platform, which not only provides general information on the project, but also a list of partner banks, eligible installers and technologies in order to further streamline the loan application process. In other EBRD-funded projects, these are also called 'lists of eligible machinery and equipment', an effective tool in scaling up energy efficiency investments by reducing transaction cost.

EBRD funds are used for loans to households and associations, while the KIDSF grant funding covered the following:

- Technical assistance.
- Administration fees to be paid to the banks.
- Completion fees to sub-borrowers.

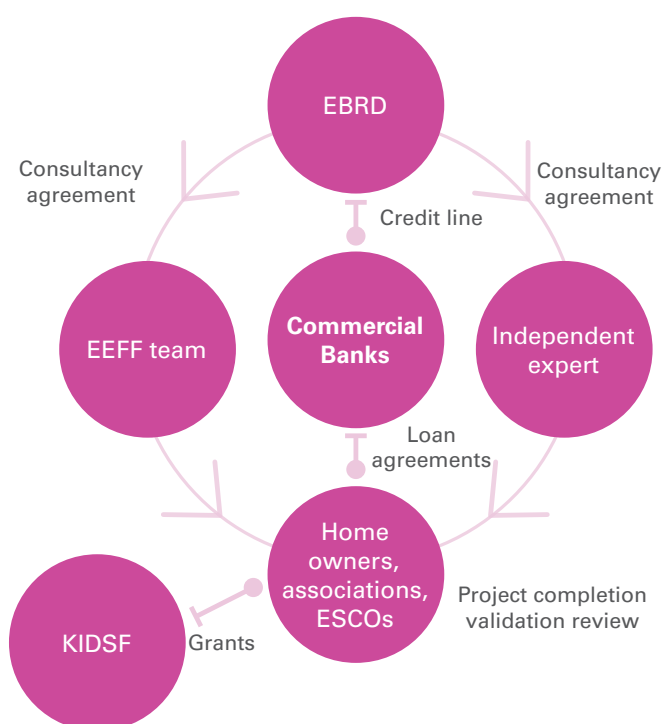
Table 7. Funding of the Residential Energy Efficiency Credit Line, 2005-2016 (Million euros)

YEAR	2005	2011	2016A	2016B
EBRD REECL	50	40	20	-
KIDSF GRANT	10	14.6	4.4	-
EBRD REECL EXTENSION TO UNITED BULGARIAN BANK	-	-	-	5
TOTAL	60	54.6	24.4	5

Sources: European Bank for Reconstruction and Development (EBRD), 2005. REECL Residential Energy Efficiency CL FW; EBRD, 2011. REECL (Bulgaria) Residential Energy Efficiency FW (ext.); EBRD, 2016a. REECL 3 (Bulgaria) Framework (2nd fwk extension); and EBRD, 2016b. REECL 3- United Bulgaria Bank.

In addition to the loan, any borrower could receive an incentive payment of up to 15 per cent of the loan upon successful completion of the energy saving project by submitting an Incentive Grant Application Form to their participating bank with the required supporting documents.

The success of REECL led to a second round of funds being raised in 2011 and a third round in 2016 to keep up the momentum. The tranches of funding received are shown in Table 7.

Figure 14. Structure of the Bulgarian Residential Energy Efficiency Credit Line

Source: European Bank for Reconstruction and Development, 2005.

The structure of REECL is shown in Figure 14.

The market focus of REECL was on small-scale residential energy efficiency projects, specifically including the following:

- Individual borrowers, including owners of houses and apartments, or tenants.
- Small and medium-scale enterprises (SMEs)/ corporate borrowers, including building owners, service providers such as developers/builders, utilities, housing management companies, and ESCOs.

Financed measures could be both for the renovation of existing building and for new builds and included the following:

- Generation of electricity, heating and cooling including solar thermal.
- Reduction of heat loss through insulation, windows and doors.
- Efficient lighting, ventilation and lifts.
- Water efficiency.

Installations had to be done by registered suppliers.

REECL collected a number of testimonials from building owners. One example clearly illustrates the multiple benefits of energy savings and improved comfort after efficiency measures were put in place. In the apartment building at 19 Dimcho Debelianov Street in Pazardzik, all windows were replaced and the building insulated, which led to a 40 per cent decrease in electricity bills, while residents reported a feeling of greater warmth and comfort.

Up until August 2019, REECL achieved the following:⁴⁰

- Capital deployed: €90 million financing disbursed.
- Number of retrofits/projects: >55,000.
- Energy saved: approximately. 200 GWh, with an average household saving in electricity spending of about €480 per year.

- GHG emission reduction: approximately 300,000 tons CO₂ per year.

The successful operation of REECL highlighted the importance of providing extensive development and sales support, as well as the need to put resource building capacity within commercial banks.

B. EUROPEAN UNION: PRIVATE FINANCE INITIATIVE FOR ENERGY EFFICIENCY

PF4EE was established in December 2014 by way of an agreement between EIB and the European Commission to address the limited access to adequate and affordable commercial financing for energy efficiency investments.⁴¹ The instrument targets projects which support the implementation of national energy efficiency action plans or other energy efficiency programmes of European Union member States. Funding comes from the following two sources:

- Programme for the Environment and Climate Action, which comes under the auspices of the Directorate-General for Climate Action: €80 million for risk guarantee and expert support.
- EIB: €480 million for long-term financing.

The two main objectives of the PF4EE instrument are the following:

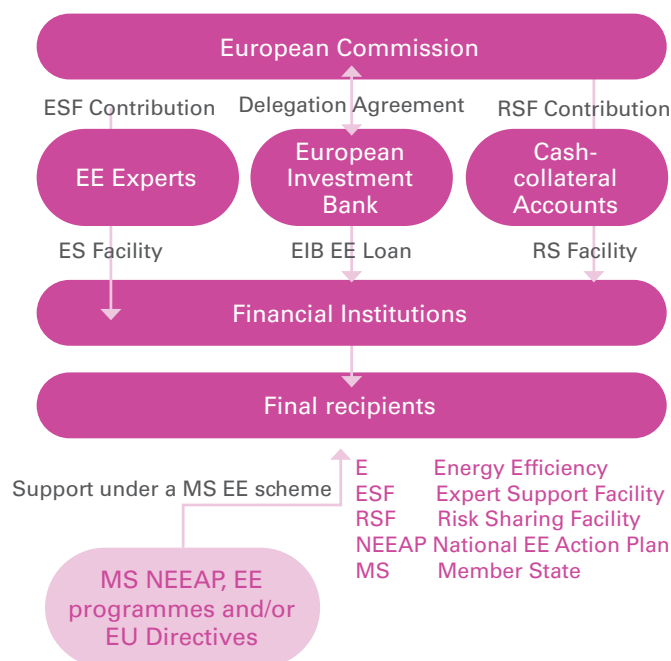
- Making energy efficiency lending a more sustainable activity within European financial institutions, incentivizing it to address the energy efficiency sector as a distinct market segment.
- Increasing the availability of debt financing to energy efficiency investments.

To achieve this, PF4EE combines a portfolio-based credit risk protection provided by means of cash-collateral (the risk-sharing facility) together with long-term financing from the EIB (the EIB Loan for Energy Efficiency).⁴² In order to support the implementation of the PF4EE instrument, expert support services for the financial intermediaries are also available under the expert support facility, and defined for each financial intermediary on an individual basis depending on their capacity needs. The structure is shown in Figure 15.

Eligible projects are energy efficiency projects relating to existing buildings, industry, public lighting, district heating and cooling, and small renewable energy projects for self-consumption and cogeneration of heat and power.⁴³

EIB can provide one PF4EE facility per country within the European Union, and the following countries have already concluded a PF4EE agreement with EIB: Belgium, Croatia, Cyprus, Czech Republic, France, Greece, Italy, Latvia, Poland, Portugal, and Spain. Once the agreement with the local financial institution is finalized, the loans are available to companies with a maximum amount up to €5 million, covering up to 75 per cent of the capital cost of eligible energy efficiency investments. Loans can run for 3-20 years, and interest rates depend on the country.

Figure 15. Structure of the Private Finance for Energy Efficiency Programme of the European Investment Bank



Source: European Investment Bank, 2019b. Private Finance for Energy Efficiency (PF4EE) Instrument: Support provided under the Instrument as at 31 December 2019.

⁴⁰ Residential Energy Efficiency Credit Line, 2020. Welcome to the Residential Energy Efficiency Credit Line (REECL).

⁴¹ European Investment Bank, 2014. Announcement of the New EIB Product Under the Programme for Environment and Climate action (LIFE) Dedicated to Energy Efficiency Investments.

⁴² Private Finance for Energy Efficiency, 2019. Why PF4EE?

⁴³ European Investment Bank, 2019a. Energy Efficiency Projects in Europe: Examples of energy efficiency projects that could be financed through the PF4EE instrument.

Table 8. Use of risk-sharing facilities within Private Finance for Energy Efficiency instruments (Million euros)

FINANCIAL INTERMEDIARY	COUNTRY	AMOUNT
KOMERCNI BANKA	CZ	6.0
BANCO SANTANDER	ES	3.6
CREDIT COOPERATIF SA	FR	4.5
BELFIUS BANQUE	BE	4.8
BANCO CPI	PT	4.0
BPER BANCA	IT	6.0
ZAGREBACKA BANKA	HR	6.4
PIRAEUS BANK	GR	16.0
CYPRUS COOPERATIVE BANK	CY	3.2
BNP PARIBAS BANK POLSKA	PL	16.0
ALTUM	LV	3.0

Source: European Investment Bank, 2019b.

The maximum share covered by the risk-sharing facility is capped at 16 per cent of the individual financial institution's energy efficiency loan portfolio.

By 2019, 11 financial intermediaries were supported by PF4EE instruments with a total of €73.5 million from risk-sharing facilities, as shown in Table 8.

A consortium of Adelphi Consult and MACS Management deliver expert support to financial institutions utilizing the expert support facility. The support delivered is tailored to the needs of each financial institution and can include the following:

- Staff training on energy efficiency.
- Development of energy efficiency products.
- Energy efficiency loans portfolio development.
- Appraisal of energy efficiency investments.
- Risk analysis of individual projects and programmes.
- Reporting on energy savings and CO₂ emissions.
- Energy audits.

In addition to the risk-sharing and expert support facilities, two online tools have been developed, namely the PF4EE WebCheck tool and the Energy Efficiency Quick Estimator tool. These tools aim to support financial intermediaries in marketing dedicated energy efficiency financing, raise awareness for the energy savings potential in different sectors, and facilitate on-lending for energy efficiency.

Users of the tools can get an idea of the savings potential of energy efficiency projects, assess about 20 typical measures in buildings and industry, and obtain energy, cost and CO₂ savings estimates. These kinds of tools help build capacity and reduce transaction costs.

The use of the expert support facility within PF4EE is a good example of a financing instrument being used to build capacity within the financial sector in order to support the creation of a sustainable market for energy efficiency financing.

The following are two examples of PF4EE under utilization:

Hotel, Spain, Gran Canaria:

- Measures: installation of a new chiller with a heat recovery system, heat used for pool heating and domestic hot water generation.
- Investment: €42,900.
- Annual energy savings: 114 MWh of electricity.
- Cost savings: €6,867 per year.
- Payback period: 6.2 years.

Office building, Croatia, Zagreb:

- Measures: deep renovation of a business building, including the complete renovation of the outer building envelope (including all walls and openings, namely, windows and doors) to low energy standard; reconstruction of heating, cooling and ventilation systems; installation of new LED technology in the lighting system and installation of a photovoltaic power generation system on the façade.

- Investment: €2.3 million.
- Annual energy saving: 165 MWh of electricity and 900 MWh of heat.
- Annual cost savings: €70,000.
- Payback period: 33 years.

PF4EE has been successful in developing the energy efficiency financing markets in several countries. By derisking financing through the risk-sharing facility, it has overcome risk perceptions by commercial banks. The provision of specific capacity-building for the banks has also been an important success factor. However, two areas show room for improvement, namely, the development of projects, which could be standardized using standard tools such as those of ICP, and secondly, post-investment monitoring. At the moment, post-investment monitoring is not a requirement, yet would validate the investment decisions and improve capacity within both the supply chain and the banks. Reported savings are deemed rather than measured and verified using the International Performance Measurement and Verification Protocol.

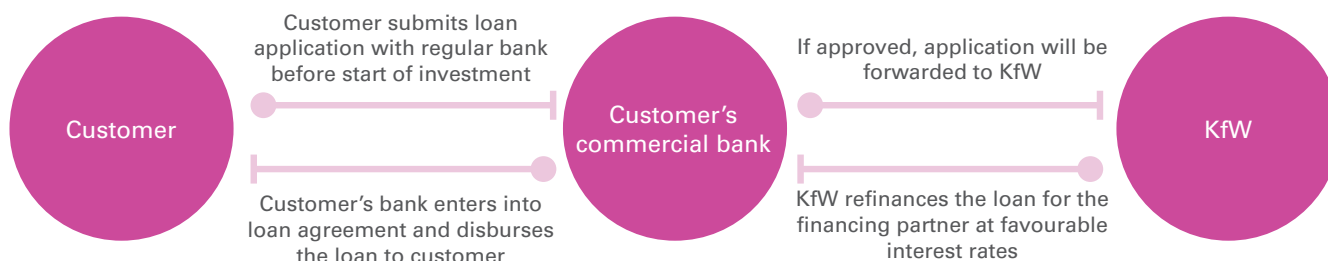
C. GERMANY: KfW ENERGY EFFICIENCY LOANS

The loan scheme of the German development bank KfW for energy efficiency projects is probably the best-known, and largest, of all energy efficiency financing instruments. It was established in 2006 by KfW and covers residential, commercial and public buildings, both refurbishments and new builds.

The programme is related to the German Energy Saving Ordinance, which is a performance-based code that requires mandatory energy modelling to establish the expected primary energy

consumption of residential and non-residential buildings.⁴⁴ The regulation addresses thermal envelope requirements as well as energy-using systems within the building. Over time, the regulations on building performance have been tightened, and the incentives within the KfW financing instrument have been adjusted to stay in alignment with and encourage the use of the highest possible standards, rather than merely reaching the minimum code requirement.

Figure 16. Structure of the KfW energy efficiency loan programme



Source: Dorendorf, Bettina, 2018. KfW Promotional programs for energy efficiency in buildings. Main elements and success factors. 5 December 2018.

⁴⁴ Global Buildings Performance Network (GBPN), 2020. Germany. Summary.

Within the programme, all loans come from commercial banks and are purchased by KfW. KfW is owned by the Federal Republic and federal states of Germany and raises capital on the capital markets.

The structure of the KfW energy efficiency programme is shown in Figure 16.

KfW has no direct contact with the customer.

The advantages of this structure are the following:

- The programme is available in all regions of Germany.
- No KfW branch network is needed.
- It is neutral with respect to financing partners; the proposition is the same for all banks.

In addition to the availability of loans, which are repayable over 20 or 30 years, there is a grant

scheme which provides up to 30 per cent of project costs for those buildings and retrofits that meet the highest performance level as measured under the Energy Efficiency Ordinance; the customer can also take partial debt relief, with the level of relief tied to performance. The lower the performance category the building falls into, the lower the proportion of grant that is available. This structure is shown in Figure 17. Interest rate is at December 1, 2018.

Performance is measured against a reference building defined in the regulations. A KfW-efficiency house 70 uses 70 per cent of the annual primary energy demand of a reference building defined in the Energy Efficiency Regulations, and a KfW-efficiency house 55 uses 55 per cent. In 2016, even higher standards were introduced, namely KfW-efficiency house 40 and KfW-efficiency house 40 Plus. The grant amounts and partial debt relief are also limited to absolute amounts for each category of refurbishment.

Figure 17. Incentives for residential buildings in the KfW energy efficiency loan programme

PROMOTIONAL LEVEL BASED ON ENERGY EFFICIENCY ORDINANCE	MAXIMUM PROMOTIONAL LOAN AMOUNT	LOAN SCHEME		GRANT SCHEME % OF ELIGIBLE COSTS
		INTEREST RATE	PARTIAL DEBT RELIEF	
KfW-Efficiency House 55	Up to EUR 100,000 per housing unit	0.75% p.a.*	40.0%	40%
KfW-Efficiency House 70			35.0%	35%
KfW-Efficiency House 85			30.0%	30%
KfW-Efficiency House 100			27.5%	27.5%
KfW-Efficiency House 115			25.0%	25%
KfW-Efficiency House Code			25.0%	25%
Heating or ventilating package	Up to EUR 50,000 per housing unit		20.0%	25%
Single measures			20.0%	20%

Private customers can choose between partial debt relief and grant

This structure, which skews the amount of grants or debt relief, towards higher-performing buildings clearly encourages consumers to go beyond the bare minimum performance standard set by the building code. It also allows the scheme to be updated as the code evolves towards higher levels of energy performance.

In 2017, KfW committed €51.81 billion to this programme, and there was an expansion in energy efficiency financing of €21.1 billion over the previous year and a €6.8 billion expansion in support for renewable installations.⁴⁵ Since 2006, the programme has triggered about €300 billion of investment which has supported retrofit work in some 5 million housing units. The programme is credited with achieving 17 per cent of the national energy efficiency goals. During the first quarter of 2020, 110,000 housing units were supported with a commitment of

about €5 billion.⁴⁶ A revised promotion came into force to support heat from renewable sources. In total, 92,800 grant applications were made for energy efficiency and renewable energy projects, significantly more than in the same period in 2020.

The KfW programme has clearly been successful in deploying large amounts of capital into residential and other types of buildings and is notable for addressing both the refurbishment or retrofit market⁴⁷ and the new-build market. It reaches national coverage through commercial banks and national promotion. It is powerfully linked to the performance based energy efficiency regulations, and the structuring of the incentive scheme clearly favours action beyond the legal minimum. In countries where building codes have not necessarily been updated, or are poorly enforced, this type of arrangement could be very useful for driving performance-based retrofits.



45 KfW Bankengruppe, 2020a. KfW improves Energy-efficient refurbishment programme.

46 KfW Bankengruppe, 2020b. Promotional investment programmes for energy-efficient construction and refurbishment support the economy.

47 KfW Bankengruppe, 2020c. Existing Properties.

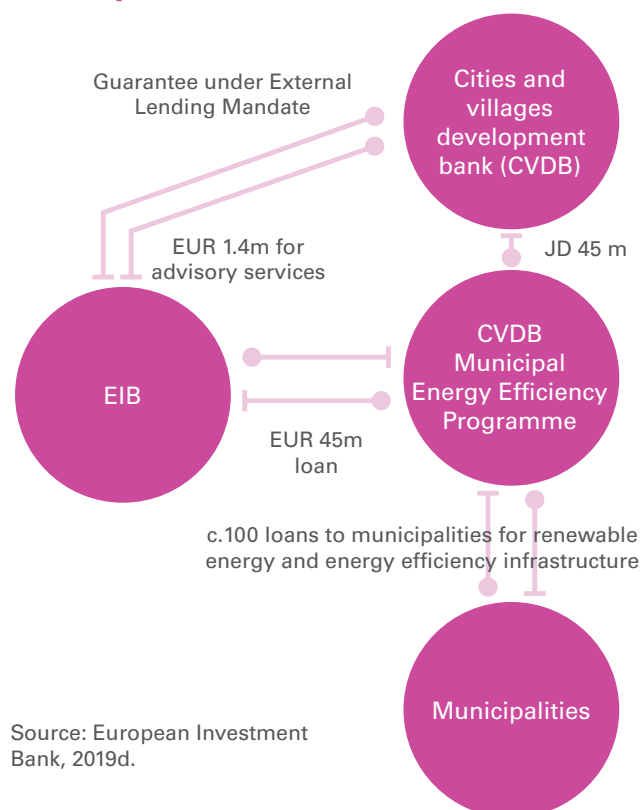
D. JORDAN: MUNICIPAL ENERGY EFFICIENCY PROGRAMME OF THE CITIES AND VILLAGES DEVELOPMENT BANK

In May 2019, EIB provided a €45 million loan facility to the Cities and Villages Development Bank (CVDB), and CVDB agreed to provide an additional 45 million Jordanian dinar (JOD) to municipalities for investment into renewable energy and energy efficiency infrastructure.⁴⁸ It is projected that 100 municipalities across Jordan will benefit from the financing, and funding will be available for projects such as rooftop solar photovoltaic systems, street lighting refurbishments, energy efficiency projects in public buildings, and similar projects. The street lighting component is expected to replace nearly 450,000 older lamps by LED technologies.

The EIB loan is covered by a European Union guarantee under the External Lending Mandate 2014-2020. To support the loan programme, a €1.4 million grant was agreed on in 2020 to fund advisory services including technical studies, developing a pipeline of projects and supporting the management of the programme. This grant has come through the Economic Resilience Initiative which is designed to strengthen the ability to address key challenges of neighbouring countries in the south of the European Union.

This facility supports Jordan's policy of reducing energy use by 20 per cent and raising the contribution of renewables to electricity supply to 15 per cent. The structure of the CVDB Municipal Energy Efficiency Programme is shown in Figure 18.

Figure 18. Structure of the Municipal Energy Efficiency Programme of the Jordanian Cities and Villages Development Bank



Source: European Investment Bank, 2019d.

Figure 19. Structure and funding of the Lithuanian energy efficiency financing platform

SENIOR DEBT LAYER [EUR 125M]

- Financed by commercial banks
- Lowest risk level, losses would only be experienced only if more than 50 per cent of the Modernization Loans in the portfolio defaulted
- Purpose: reduce average cost of capital for the fund

JUNIOR DEBT LAYER [EUR 62.5M]

- Financed by International Financial Institutions
- Purpose: further credit enhancement for the senior debt layer

FIRST LOSS LAYER [EUR 62.5M]

- Highest risk layer
- Financed from (pari passu)
 - EU Structural Funds [EUR 50M]
 - Financial intermediary's funds [EUR 12.5M]
- Purpose: reduce the risks of other layers

Source: VIPA, 2020. VIPA Annual Financial Statements of the private limited company Public Investment Development Agency.

⁴⁸ European Investment Bank, 2019d. CVDB – Municipal Energy Efficiency Programme.

E. LITHUANIA: ENERGY EFFICIENCY FINANCING PLATFORM

Building on its experience gained with the DNMF and ENEF funds (described above), VIPA started to work on a new energy efficiency financing platform in 2018. In October 2019, it was announced that EIB would lend €12.5 million to VIPA as a first tranche of a €25 million commitment to promote a broad range of energy efficiency modernization projects in Lithuania and build a national energy efficiency investment platform.⁴⁹ VIPA has been building pipelines of projects in the following areas: installation of solar panels on homes, the renovation of multi-apartment buildings and efficient lighting in industry.

The platform is designed to leverage in private finance. It is envisaged that the platform will have a portfolio size of €250 million and will act as a single financial intermediary with the capacity to on-lend third-party funds via the modernization loans. The structure of the platform is shown in Figure 19.

The evolution of energy efficiency financing instruments in Lithuania, from a mainly grant-based system to a much more market-based solution is instructive for policy makers and other stakeholders as it illustrates that it is possible to do this through a series of targeted interventions that build private sector capacity.

F. MOROCCO: MOROCCO SUSTAINABLE ENERGY FINANCING FACILITY

The Morocco Sustainable Energy Financing Facility (MorSEFF) is a €110 million credit line for on-lending backed by EBRD, Agence Française de Développement and KfW established in 2013. In 2020, EBRD injected an additional €40 million into the facility. MorSEFF is supported by a grant programme financed through donations from the European Union Neighbourhood Investment Facility and technical assistance via donations from the Neighbourhood Investment Facility and the Multi-donor Fund of the Southern and Eastern Mediterranean region.

EBRD has successfully launched and implemented more than 20 sustainable energy financing facilities since 2006, mostly in Eastern Europe and the Balkans. The facilities provide credit lines to local banks for on-lending to firms, housing associations and others for the purpose of energy efficiency and renewable energy investments. Technical assistance is always provided through project implementation teams to build capacity in local banks and ensure that the sustainable energy lending becomes part of their business in the long run. Sometimes, as in the case of MorSEFF, the facilities are complemented with grant components and/or guarantees.

MorSEFF offers the following:

- Loans or leasing for the acquisition of equipment or the realization of energy efficiency and renewable energy projects.

- An investment grant of 10 per cent of the loan.
- Free technical support for evaluation, implementation and verification of the project.

The market focus is broad, covering industry, commercial and office buildings, transport, and agriculture.

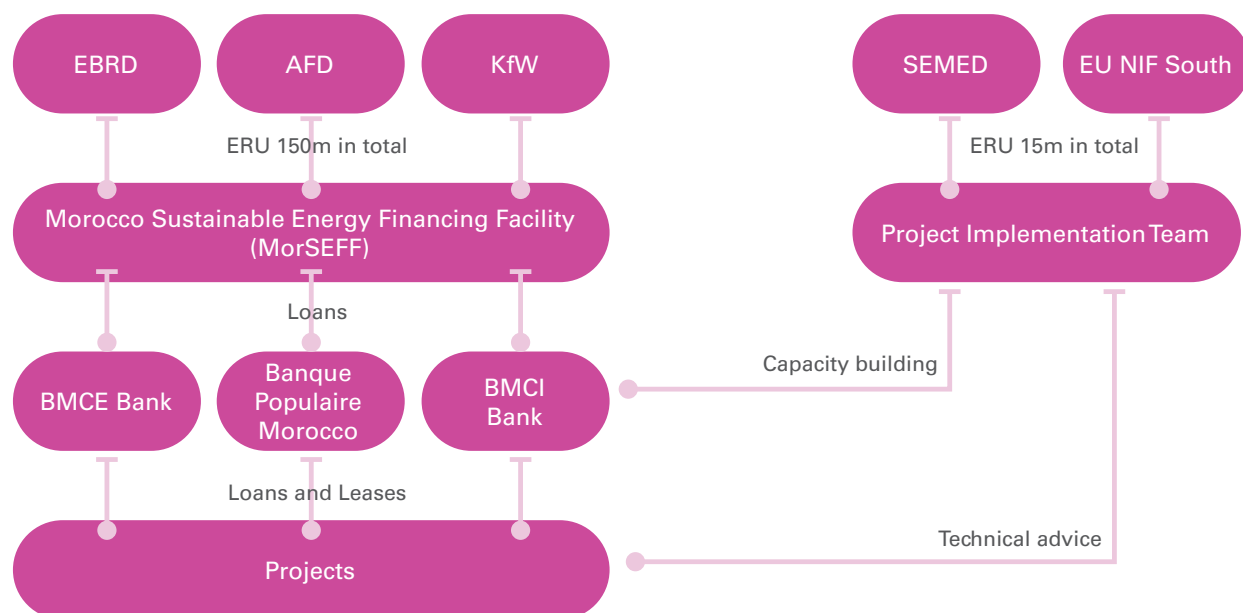
The credit line was originally provided by EBRD to two partner banks for on-lending, namely, BMCE, and its subsidiary Maghrebail, and the Banque Populaire in Morocco, and its leasing subsidiary. In 2018, the Banque Marocaine pour le Commerce et l'Industrie, (BMCI), part of the BNP Paribas Group, was admitted as a third partner. The structure of MorSEFF is shown in Figure 20.

Development Alternatives Inc. was contracted to deliver technical assistance comprising the following three elements:

- Providing partner financial institutions with technical assistance in developing marketing strategies and activities to build customer awareness and fill the pipeline with clean energy projects.
- Working with other agencies, including Government, business associations and development finance institutions, to promote the Facility.
- Training local engineers, energy auditors, architects, and designers to identify and prepare bankable sustainable energy projects.

⁴⁹ European Investment Bank, 2019e. Lithuania: EU support for first energy efficiency investment platform.

Figure 20. Structure of the Morocco Sustainable Energy Financing Facility



Source: Development Alternatives Incorporated (DAI), 2019. Paving the Way for Green Energy Financing in the Mediterranean.

To be eligible, projects in commercial buildings must achieve energy savings of at least 30 per cent. Up to 100 per cent of the capital cost of small projects can be financed subject to the bank's lending criteria. Loans and leases can be up to 3 million Moroccan dirham (MAD) for the purchase and installation of prequalified equipment and using an eligible supplier from a pre-approved list. For new buildings, loans can cover up to 30 per cent of the total investment (excluding land), up to MAD 45 million on a maximum investment of MAD 150 million.

To date, the facility has deployed €110 million and achieved the following:

- Number of projects backed: 260, of which 215 were energy efficiency projects.
- Energy saved: 354 GWh per year.
- GHG reductions: 102,775 tons CO₂.
- Trained 278 credit officers in banks and 40 engineers in energy efficiency financing.

An example project backed by MorSEFF is the retrofit of three riads (traditional buildings with poor energy performance) in Marrakech into energy efficient guesthouses. The company owning the riads approached MorSEFF for project assistance and financing. The MorSEFF team analysed the proposed energy efficiency

measures, which included thermal insulation of roof and walls, installation of two removable roofs, heat pumps, solar panels, under-floor heating, new air conditioning units, and LED lamps, and conducted a financial appraisal.

The installation of these measures cost €88,934 and reduced energy consumption of the buildings by 66 per cent, with savings of 150 MWh per year. The investment paid back within two and a half years. In addition to achieving cost reductions, the project greatly improved the comfort conditions, thereby helping to attract and retain customers. As energy costs are a major element of running hotels in Morocco, the project has increased the firm's competitiveness.

MorSEFF, along with the other sustainable energy financing facilities organized by EBRD, recognizes the need for capacity-building within both the financial sector and the energy efficiency industry. It is reported that the sustainable energy financing facilities are successful in reaching well-established businesses that are aware of the availability of financing and have the capacity to apply for it. The credit lines are disbursed to these companies quickly, but it is also recognised that other SMEs which are not strategically monitoring these financing opportunities find it difficult to access finance.

G. MEXICO: ECO CASA

The idea for EcoCasa was born out of the 2010 global climate talks in Cancun, and it was established in 2013 to contribute towards Mexico's emission reduction target of 50 per cent by 2050.

Mexico has 32.6 million households, and the housing sector is responsible for 14.2 per cent of energy consumption. About 78 per cent of the 126 million population is urban, and about 42 per cent of the population are defined as living in poverty, with approximately 8 per cent living in extreme poverty. About 30 per cent of the total lending for house construction is done through one institution, namely, Sociedad Hipotecaria Federal (SHF), with an annual disbursement of about \$5 billion. About 350,000 houses are built every year. SHF provides loans to housing developers, either directly or through financial intermediaries. It also provides guarantees to banks giving loans to housing developers. On the demand side, SHF provides mortgage insurance and guarantees to commercial banks issuing mortgages; mortgage loans and securitization to Fovissste, a Government agency created to meet demands for housing credits; and loans to INFONAVIT, the National Workers' Housing Fund Institute, which is the main mortgage financing institution. This structure is shown in Figure 21.

As part of Mexico's National Appropriate Mitigation Action (NAMA) plan for sustainable housing, the EcoCasa programme originally aimed to build 27,000 housing units, contributing to the overall

NAMA target of 7 million energy efficiency housing units by 2020. Complementary initiatives under the National Housing Plan include the Hipoteca Verde (green mortgages) and Esta Es Tu Casa (this is your house) programmes. Figure 22 shows the structure of EcoCasa.

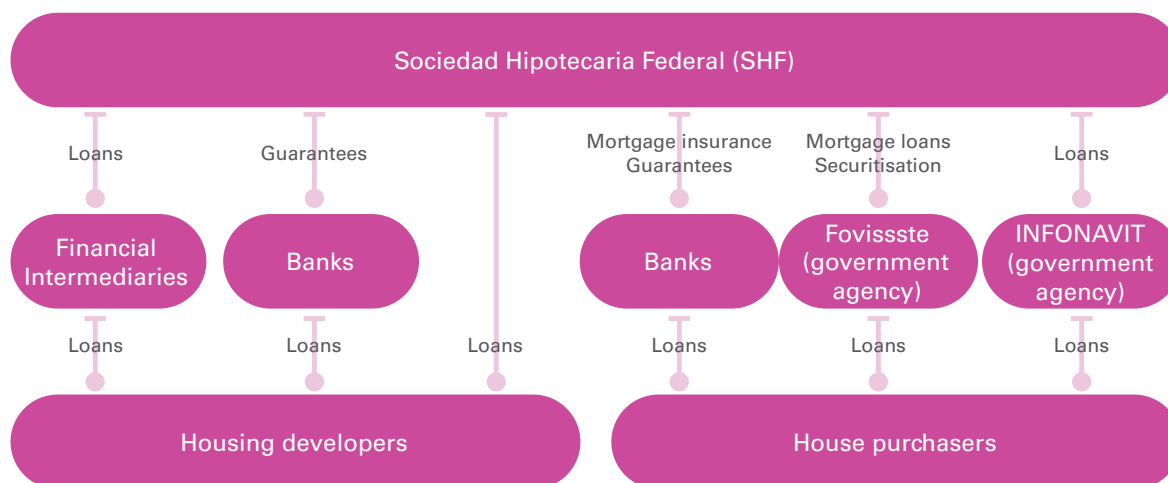
The funding has been managed through SHF and is used for the following three types of financing:

- Soft loans to financial intermediaries.
- Low interest rate loans to housing developers.
- Technical assistance to developers.

Property developers receive soft loans through SHF with contract terms based on the efficiency level of the project. The subsidized interest rates are to compensate for the additional costs required to implement efficiency measures. They can also receive technical assistance.

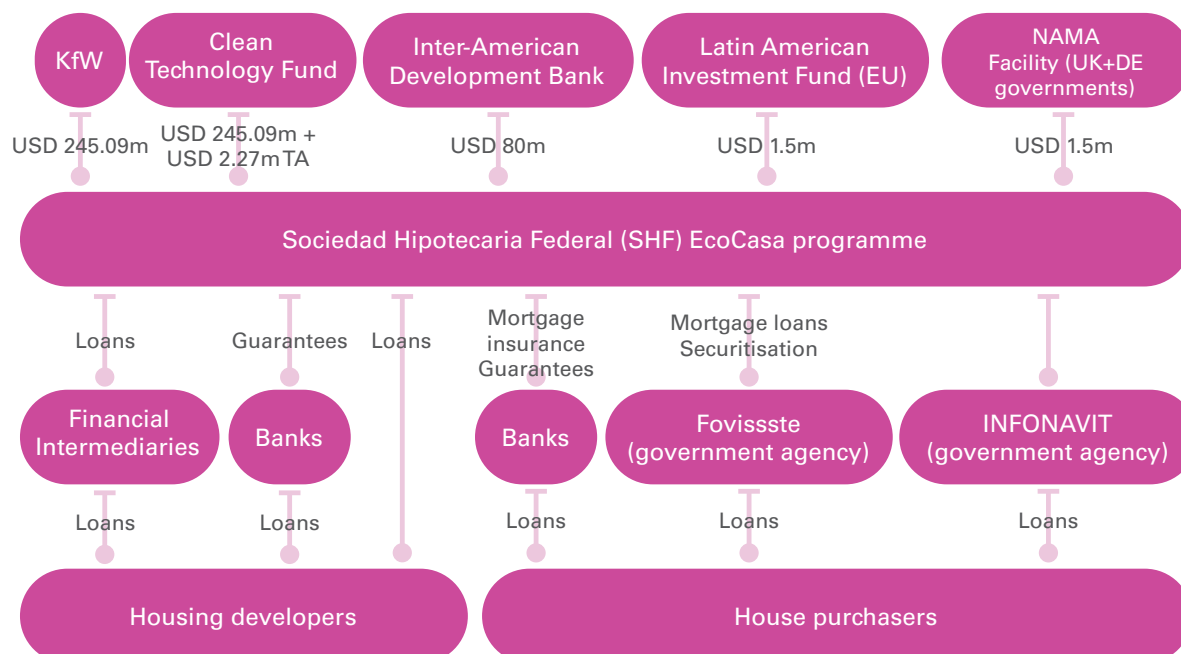
A key priority for the programme is to keep the final property sale price below or on par compared to that of a standard unit to ensure affordability for low-income families. In order to qualify for EcoCasa, developers have to use standard, independent simulation tools for energy use, water use, the urban environment, and the carbon footprint of construction materials. The actual design and technologies incorporated are up to the developer. Due to the variation in climate zones across the country, there are three levels

Figure 21. Funding of housing developers and house purchasers in Mexico



Source: Barbosa, Ernesto Infante, 2018. The role of development banks in financing sustainable and affordable housing: The EcoCasa program.

Figure 22. Structure of EcoCasa



Source: Barbosa, 2018.

Funding to date from various sources is set out in Table 9.

of efficiency defined in the EcoCasa standards. House designs incorporate features such as bioclimatic design, high levels of insulation, low emissivity windows, solar water heaters, and non-energy features such as common green areas. On average, the additional cost of an EcoCasa house is reported at \$361 compared to up to \$635 of benefits; the average house price is \$19,576.

To meet the EcoCasa standard, CO₂ emissions must be at least 20 per cent below the baseline but, in practice, higher performance levels are usually achieved. A conventional house is estimated to be responsible for 4,165 kg CO₂ per annum against average emissions of an EcoCasa house of 2,561 kg CO₂ per annum, a reduction by 38 per cent. To receive the NAMA subsidies, houses have to have emissions of 45 per cent below the baseline and, to achieve the Latin American Investment Facility subsidy, must be designed as zero-energy and plus-energy houses, meaning energy-positive houses to achieve emissions of 80 per cent below the baseline. A number of zero-energy houses have been built according to the passive-house standard.

By April 2018, EcoCasa had supported the construction of 55,313 houses, far exceeding the goal of 32,450 by 2023. More than 216 million Mexicans had benefited from the programme and emissions

had been reduced by 1.76 metric tons CO₂. An important factor in the success of EcoCasa has been its compatibility with the requirements of housing developers. The provision of technical assistance to help developers through the design process has been critical, as has been the use of standard assessment models. Barriers have included subsidized fuel and electricity costs, a short-term perspective on acquisition costs versus running costs and limited awareness amongst householders of the benefits of energy efficiency. There has also been a lack of enforcement of the building codes. Due to the success of EcoCasa, SHF is now working with commercial banks to bring them into the programme.

In October 2020, EcoCasa was approved as a proxy for green bonds certification under the Low Carbon Residential Buildings Criteria of the Climate Bonds Standard. This will allow the issuance of green and sustainable bonds backed by housing projects evaluated, certified and financed by SHF under the EcoCasa programme. This is an important milestone as it will allow refinancing of funds through issuing green bonds.

EcoCasa is a good example of an integrated approach which addresses the needs of both developers and purchasers of homes. It again demonstrates the need for technical assistance

Table 9. Funding for EcoCasa until June 1, 2018

SOURCE OF FUNDS	AMOUNT (MILLION DOLLARS)	USE OF FUNDS
KFW	245.09	Loans
CLEAN TECHNOLOGY FUND	49.51	Loans
CLEAN TECHNOLOGY FUND	2.27	Technical assistance
INTER-AMERICAN DEVELOPMENT BANK	80.0	Loans (green mortgages)
LATIN AMERICAN INVESTMENT FACILITY (FUNDED BY EUROPEAN UNION)	8.00	Subsidies
NAMA FACILITY (FUNDED BY GOVERNMENTS OF UNITED KINGDOM AND GERMANY)	11.3	Subsidies for NAMA implementation
TOTAL	396.16	

Source: Nationally Appropriate Mitigation Actions Facility, 2017. NAMA Facility 5th Webinar: “Lessons Learnt – Early Experiences from NAMA Implementation” 10 October 2017.

to help developers draw up bankable projects. The work on zero-energy and energy-positive houses, although still in its early stage and a small proportion of the total, provides an excellent example of what can be achieved even in markets where these concepts are relatively new and

untried. Another lesson from EcoCasa is the importance, for customers, of the integration of other green features in the developments. The scheme is totally focused on new buildings but could be adapted to retrofits.

H. ROMANIA: GREEN HOMES AND GREEN MORTGAGES PROGRAMME

The Romania Green Homes and Green Mortgages Programme was first established as a pilot project in 2012 with funding from the European Commission through a consortium comprising a bank, a project developer and an energy auditor.

The Programme comprises the following two elements:

- Green Homes Certification by the Romanian Green Building Council (RoGBC).
- Green mortgages provided to buyers of homes

with certification by the RoGBC from a number of commercial banks.

A central player in the development of the Programme has been the RoGBC which, as part of the World Green Building Council, certifies green homes. RoGBC promotes the Programme to attract prospective partner banks and generate awareness of the benefits to all parties.

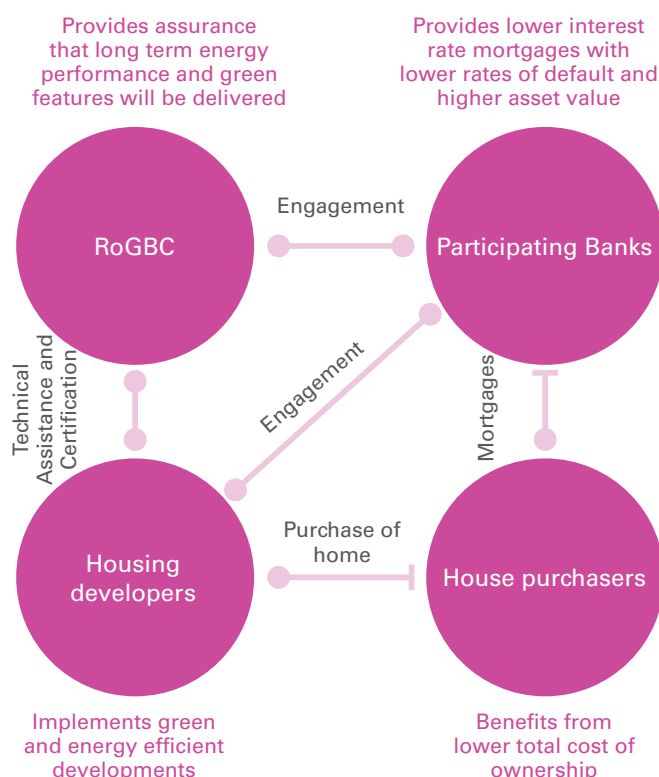
The structure of the Programme is shown in Figure 23. All banks offering home mortgages in Romania can

participate in the Programme as a partner bank, if they agree to the following two required criteria:

- Accept RoGBC criteria and the certification process for green homes.
- Offer substantive interest rate reduction commensurate with default risk reduction and enhanced long-term asset value of homes that qualify for a green mortgage.

The bank is responsible for all financial due diligence associated with its normal underwriting process. A key enabling factor of the Programme has been the National Bank of Romania, which allows buyers of green homes to count estimated energy savings as an additional source of income in loan applications. This, combined with the lower interest rates, allows borrowers to borrow more for energy-efficient construction or renovation which finances additional costs for developers arising from using green construction techniques and certifying the buildings. A lower interest rate and the accrued energy cost savings reduce the total cost of ownership compared to a standard home, reducing the risk of defaults. Banks are able to offer a lower interest rate as the certified green homes have both a lower mortgage default risk and higher asset valuation.

Figure 23. Structure of the Romania Green Homes and Green Mortgage Programme



Source: Romania Green Building Council, 2017. Green Homes & Mortgages. A Toolkit for Residential Investors and Developers.

Raiffeisen Bank, which was the first bank to offer green mortgages in Romania, provides fixed and variable rates that are 0.75 per cent lower for green mortgages than a standard offer (see Table 10).

According to calculations conducted by Raiffeisen Bank, the total cost of monthly ownership for a 70 m² apartment can be up to 15 per cent lower than that of an apartment with a 'B' rating for energy performance. The breakdown is shown in Table 11.

Any project goes through a process containing the following six phases:

Preliminary review: A developer can request a no-cost or low-cost precertification review from RoGBC which quickly assesses the feasibility of the proposed development obtaining a green homes certification.

Registration and signing of the precertification agreement: The developer wishing to proceed with the green homes certification registers the project and pays a registration fee. The certifier reviews the information collected in the preliminary review and agrees with the developer on the measures needed to achieve the green homes certification. The precertification agreement indicates the measures to be implemented and the criteria to be achieved and allows the developer to begin marketing their project as pre-certified for green homes.

Guidance through the design process: The certifier and a qualified energy auditor advise the developer throughout the design process to help ensure that best practice is used and that the project achieves certification. The Programme has a network of green homes approved solution providers with experience in the design issues and equipment and systems needed in a green home.

Designation of the project: Upon project completion, the certifier and energy auditor review the project to confirm that it has been built according to the criteria set out in the precertification agreement. The certifier also checks that the new owners have been provided with adequate information to operate their home in an efficient and green manner. The project team provides a final scorecard and designates the project as a green home.

Offer of a green mortgage: Project developers pursuing certification can discuss the project with participating banks who agree to underwrite green mortgages for purchasers of the properties.

Table 10. Interest rates in the Romania Green Homes and Green Mortgage Programme, 2019 (Percentage)

	STANDARD		GREEN MORTGAGE	
	First 7 years	Variable after 7 years	First 7 years	Variable after 7 years
INTEREST RATE FORMULA	-	ROBOR 3 months+ 3.25		ROBOR 3 months 2.50
INDEXATION	-	2.10	-	2.10
INTEREST RATE	5.50	5.35	4.75	4.60

Source: Romania Green Building Council, 2017.

Note: ROBOR stands for Romanian Interbank Offer Rate.

Table 11. Total cost of monthly ownership for energy performance contract (EPC) A, EPC B and green homes-qualified apartment (Euros)

	EPC B-RATED APARTMENT	EPC A-RATED APARTMENT	ROGBC GREEN HOMES QUALIFIED APARTMENT
SALES PRICE OF A 70m ² APARTMENT	98,000	100,100	104,300
LOAN AMOUNT	83,300	85,085	88,655
MONTHLY MORTGAGE PAYMENT	499	510	505
COST OF ENERGY PER MONTH	101	65	33
TOTAL COST OF MONTHLY OWNERSHIP	600	575	538
NET MONTHLY SAVINGS FOR CERTIFIED GREEN HOMES VERSUS EPC B-RATED APARTMENT	0	25	62
NET ANNUAL SAVINGS FOR CERTIFIED GREEN HOMES VERSUS EPC B-RATED APARTMENT	0	300	744

Source: Romania Green Building Council, 2018. Green homes & mortgages: quality, health and financial returns for all.

Monitoring: Recipients of green homes certification agree to share their energy cost data. The data can be used to refine designs and build capacity within the architecture and construction industry.

The certification and financial mechanisms provided through this Programme build capacity in the building and construction industry to prepare it for the changing regulatory landscape, while delivering immediate benefits to home buyers in the form of reduced total cost of ownership and a higher-value property.

The certification mechanisms present an opportunity for residential investors and developers to differentiate the quality and environmental performance of their buildings while educating consumers on financial and other benefits.

A few examples from the many projects supported by the Programme are described below.⁵⁰

The Vision development in Cluj-Napoca is a building with 177 apartments which delivers energy savings of nearly 40 per cent relative to a standard building. It utilized an existing building structure to minimize resource use and construction waste.

West Side Park in Cluj-Napoca is a residential project comprising 244 apartments. Each apartment is equipped with high-performance windows and large balconies. The façade includes photocatalytic ceramics which protect against pollution and produce oxygen. It also has a large green suspended terrace along with other green spaces as part of the development, which are all accessible by the tenants.

Air Residences in Bucharest is a four-storey development of 11 apartments. It includes numerous sustainable features such as high levels of mineral wool insulation, underfloor heating and photovoltaic solar panels in the common spaces aiming at reducing the electricity costs associated with these spaces. The project also includes secured parking for bicycles.

Stejarii 2 is a 57,000 m² project in Bucharest. It features high levels of energy efficiency, water-use optimization, sustainable materials, electric vehicle charging points, biophilic design, abundant daylighting, and infrastructure for separated waste collection. It also offers sports facilities and spaces for wellness.

Casa Solaris in Bucharest is a single-family home which is one of three pilot energy-positive homes. It includes 72m² of solar panels and feeds surplus electricity into the grid. It is also equipped with 37m² of solar thermal collectors for domestic hot water production and winter heating, utilizing underground thermal storage.

The Programme benefits all stakeholders involved, namely, the developers, the bank and the home buyer. For developers, it provides the following:

- Market differentiation.
- Increased demand for a unique market offering.

For the banks, it provides the following:

- Introduction of a new financial product.
- Reduction of risk of mortgage default.
- A programme that aligns with social and environmental responsibility objectives.

For homeowners, it provides the following:

- A reduced total cost of ownership.
- Health attributes from a green building.
- A higher-value house.

The Programme has been very successful. By the beginning of 2019, agreements had been signed with 25 developers to build more than 6,500 green buildings, all of which were designed to be at least 30 per cent more energy efficient than category A of the Romanian Energy Performance Certificate.

The wide diversity of projects supported shows the power of a market-driven certification-based system. The Programme's provision of technical assistance through the process has increased the capacity of the developer community and the construction industry.

By July 2020, more than 10,000 homes, worth more than €1.5 billion, have been certified or are under agreement to be certified in Romania. The certification criteria have been updated to include criteria to monitor, control and reduce exposure to radon within the homes. The new criteria also reduce or eliminate the use of materials that contain volatile organic compounds such as formaldehyde.

In addition to expanding in Romania, the Programme is now being replicated in 12 countries with the aid of €1.6 million funding by Horizon 2020 of the European Commission in a project called SMARTER Finance for Families.

⁵⁰ Romania Green Building Council, 2018. Green homes & mortgages: quality, health and financial returns for all.

This programme shows the importance of a systems approach as it addresses the needs of all stakeholders, including home buyers, developers and banks. For banks, the focus on being able to reduce default risk is a strength although, by definition, this is hard to prove in a market prior to widespread adoption; to a certain extent, it has to be an article of faith albeit being based on extensive international research. It also illustrates the importance of wider green features in buildings to home buyers whereas energy efficiency on its own is insufficient to motivate action. Other major strengths of the programme

include its link to the energy policy instrument of energy performance certificates, the use of a trusted and independent certification system to build confidence amongst home buyers and banks, and the need for technical assistance. Finally, the programme is an exemplar of using grants, in this case from the European Union, to enable a market actor, in this case RoGBC, to design and build the systems in addition to the demand- and the supply-side capacity, while private-sector banks provide funding on a commercial basis with no public subsidy.

I. UNITED STATES: PROPERTY ASSESSED CLEAN ENERGY

PACE financing was first introduced in California in 2008. PACE is an adaptation of an existing feature of the US property tax system in which local authorities, namely, counties or cities, can allow additional payments to local property taxes to repay specified capital expenditures that produce public good. This system, for example, allows drainage to be paid for across all properties that benefit from it.

PACE programmes allow a property owner to finance the up-front cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment that is attached to the property by as an addition to the property tax bill. Although the tax is levied at county or city levels, State legislation needs to be in place in order to enable this.

This financing model allows property owners to implement improvements without large up-front cash payment (in some cases even 100 per cent up-front financing) and repay the costs over a period of 10-20 years. PACE can be used for residential properties, R-PACE, and commercial properties, C-PACE. Due to the superior position of property taxes over mortgages in the United States, PACE loans have a very low default risk and, therefore, attract a low interest rate.

A PACE assessment is a debt of the property, meaning that the debt is tied to the property as opposed to the property owner(s). In turn, the repayment obligation may be transferred with property ownership if the buyer agrees to assume the PACE obligation and the new first mortgage holder allows the PACE obligation to remain on

the property. This can address a key disincentive to investing in energy improvements because many property owners are hesitant to make property improvements if they think they may not stay in the property long enough for the resulting savings to cover the up-front costs. The structure of a typical PACE programme is shown in Figure 24.

Since 2008, the use of PACE has spread beyond California; PACE legislation is now active in 36 states and the District of Columbia, and PACE programmes are in operation in 24 states and the District of Columbia. Residential PACE is currently only offered in California, Florida and Missouri.

Funding for PACE can come either directly from the local authority, sometimes financed by a municipal bond, or from private lenders. In the latter case, repayments are collected by the local authority as part of the property tax collections and then passed onto the lender. Bonds associated with PACE assessments can be packaged and securitized. Due to the positive environmental impact of property improvements, PACE bonds are often certified as green bonds.

Up until the end of 2019, PACE had achieved the following:⁵¹

Commercial PACE

- Capital deployed: \$1.5 billion.
- Number of retrofits/projects: 2,000 + buildings.
- Energy saved: 7,929 GWh.
- GHG reduction: 2,850,000 tons CO₂ equivalent.

Residential PACE

- Capital deployed: \$6 billion.

⁵¹ PACENation, 2020b. PACE Facts.

- Number of retrofits/projects: 280,000 + homes.
- Energy saved: 21,811 GWh.
- GHG reduction: 4,586,000 tons CO₂ equivalent.

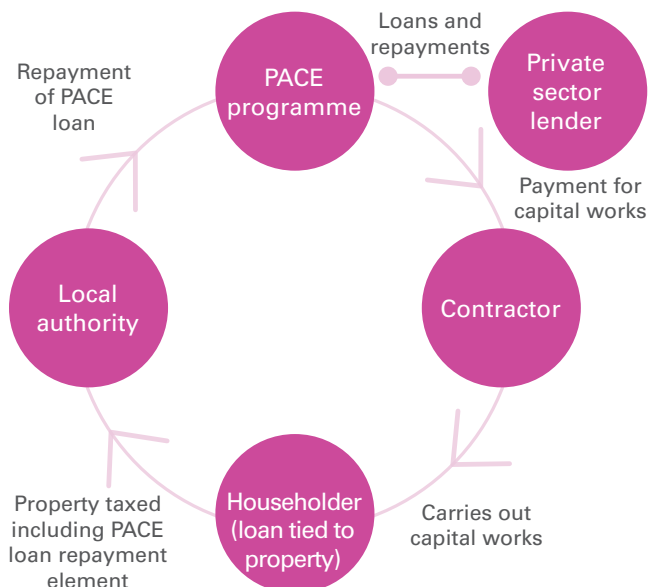
Certain concerns have arisen from PACE programmes. Due to its nature as a debt of property instrument, eligibility is based on property information rather than the homeowner's ability to pay. In isolated instances, where property owners did not receive full disclosure on the affordability and cost of financing, the property taxes ended up more than what the owners could repay. Many buyers and sellers have had difficulty with sales of homes with PACE tax assessments due to this reason. Concerns can also exist about the quality of work undertaken although some PACE programmes do require a certain level of contractor training and quality control.

The Federal National Mortgage Association, better known as Fannie Mae, and the Federal Home Loan Mortgage Corporation, known as Freddie Mac, do not purchase or underwrite loans for properties with existing PACE-based tax assessments, as PACE financing takes priority over other lien holders. This constraint has reduced the adoption of residential PACE. However, Fannie Mae and Freddie Mac do offer refinancing to pay off the PACE obligation and to ensure that the mortgages comply with their requirements.⁵²

The PACE model has been adapted in Canada, South Africa and Australia. It is also being developed in Europe with support from the European Commission's Horizon 2020 programme through the EuroPACE project.⁵³ In addition, in some areas in the United States, PACE funding programmes have been extended to include non-energy efficiency projects including residential solar, water efficiency and earthquake protection.

PACE addresses some of the barriers to energy efficiency financing. Specifically, by offering long-term and relatively low-cost loans, it can address the barrier of high capital costs, and the fact that it is tied to the property rather than the owner enables longer loan terms. It is also the first category of energy efficiency financing to have a secondary market which enables recycling of capital by primary lenders. However, as mentioned above, it has not been without problems, and attempts to replicate it in other countries are hampered by the nature of their specific property tax systems which are different to that in the United States.

Figure 24. Structure of a typical PACE programme



Source: PACENation, 2020b. PACE Facts.



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⁵² Freddie-Mac, 2020. Refinancing and Energy Retrofit Programs.

⁵³ EuroPACE, 2021. EuroPACE Integrated Home Renovation Platform.



OTHER TYPES OF ENERGY EFFICIENCY VEHICLES

This chapter examines examples of other types of energy efficiency financing vehicles, including various types of ESCOs and Super ESCOs. The rationale for this is that, although ESCOs do not usually finance projects themselves, their functions can go beyond simply being a transaction enabler. The main difference between Super ESCOs at present seems to be the extent to which they provide project finance. In the case of EPC type of Super ESCO, exemplified by Etihad Energy Services, and more recently by Tarshid, in Saudi Arabia, they undertake development work using their own resources and, therefore, are bringing development finance to bear on energy efficiency projects. They do not, however, provide project finance which comes from banks and other institutional lenders, and in some cases from the clients themselves.

The other type of Super ESCO is exemplified by Energy Efficiency Services Ltd. in India. It provides both development finance and project finance using its own financial resources which come from both the equity, provided by the sponsors (four utilities), and loans which are a combination of concessional and commercial.

The regional energy services operator SPL OSER, which is effectively an ESCO owned by a group of local authorities and which accesses bank debt for project finance, is also included in this chapter.

A. FRANCE: SOCIÉTÉ PUBLIQUE LOCALE D'EFFICACITÉ ÉNERGÉTIQUE, AUVERGNE-RHÔNE-ALPES

SPL OSER was set up in 2012 by the Regional Council of Rhone Alpes and 10 local public authorities covering the towns of Bourg en Bresse, Chambéry, Cran-Gevrier, Grigny, Montmélian, Meyzieu, Romans sur Isère, Saint Fons, Saint-Priest, and the Loire Intercommunal Energies Association.

SPL OSER was established as a local public-sector company specifically to overcome technical and financial barriers facing the local authorities in carrying out energy efficiency projects in the public building sector. OSER acts mainly as a publicly owned ESCO. The original funding to establish the company came from the Regional Authority (€5.3 million) and 21 municipalities who contributed €1 per inhabitant. EEEF awarded a €1.1 million grant for operational costs.

The company provides technical, legal and financial expertise and project management assistance to its shareholders and the local authorities, including

feasibility studies, public procurement and financial advice, to support renovation projects in public buildings that significantly increase their energy performance. The goal is for every retrofitted building to reach the French Bâtiment Basse Consommation standard of 80kWh/m²/year.

The structure of SPL OSER is shown in Figure 25.

To receive third-party finance via SPL OSER for a renovation project, members have to contribute 10 per cent of the total investment amount to the equity of SPL OSER. The remaining 90 per cent is financed through loans taken by SPL OSER. Typically, the projects have capital costs of between €0.8 million and €5 million.

To date, some 33 projects have been completed, and the aim is to complete 12-13 projects per year. So far, the French public-sector financial institution Caisse de Dépôts has deployed €41 million and EEEF €5 million.⁵⁴

⁵⁴ SPL Oser, 2020. Fiche Projet Renovation Energetique.

Figure 25. Structure of SPL OSER



Source: Cityinvest, n.d. OSER Regional Energy Services Operator.

An example of a project completed by SPL OSER is the Community Eligibility Provision School Group building, which was built in 1972, and houses a kindergarten and an elementary school. At the time of renovation, the building had a dilapidated envelope. Implemented measures included external thermal insulation, replacement of joinery, installation of mechanical ventilation with heat recovery, renovation of lighting, repair of roof terraces, repair of the heating substation, distribution and heat emitters, and the installation of a photovoltaic facility. In addition, structural improvements were integrated into the renovation work that included critical improvements to accessibility and fire safety, and a reconfiguration of the spaces.

Before the energy renovation, annual energy consumption amounted to 472 MWh at a cost of €30,200 per annum and with emissions of 9.3 kg CO₂/m². After the renovation, annual energy consumption was reduced by more than 45 per cent,

to 248 MWh, an annual energy cost of €16,100 and emissions of 4.9 kg CO₂/m².⁵⁵

SPL OSER itself is responsible for project development assistance, project management and getting financing. Any other services are outsourced via a competitive tender process. The loans taken by SPL OSER have a maturity of up to 20 years and the member/beneficiary pays a fixed service fee to SPL OSER as specified in a service agreement for a minimum of 18 years.

The company is managed by a board of directors and a special assembly to provide governance and oversight.

The core SPL OSER team comprises the following:

- A general manager, ensuring the coordination of the team and, the relations with the shareholders communities.

⁵⁵ SPL Oser, n.d. CEP School Group – Annecy.

- An administrative and financial manager.
- Four energy renovation operations managers, who define the objectives of the renovation projects, lead the overall energy performance procurement and manage the project during design and construction. They also intervene during the operation phase to monitor energy performance.
- An energy renovation works manager to monitor on-site operations.
- Two assistants for the administrative and financial management of projects and the social life of the SPL.

- An energy performance and operations manager, ensuring post-delivery follow-up.

The availability of technical expertise in third-party financing has been a key success factor of this initiative, which enables renovation projects despite a lack of financial resources by municipalities. In addition, the engagement of local authorities, shared vision and involvement in the board means that they have ownership (financial as well) and an interest to sustain the fund.

B. DUBAI: ETIHAD ENERGY SERVICES

The Etihad Super ESCO, Etihad Energy Services, was established by the Dubai Water and Electricity Authority (DEWA) in 2013 under the auspices of the Dubai Supreme Council of Energy with the aim to foster the growth of an EPC market in Dubai.⁵⁶ It is 100 per cent owned by DEWA and funded by public investment and bank loans. The objective was to achieve energy and carbon savings and build capacity within the ESCO industry and the finance sector.

Its main focus is on building retrofits and increasing the penetration of district cooling. Lately, it has also implemented roof-top solar projects. For building retrofits, Etihad ESCO was given a target to retrofit 30,000 existing buildings with a projected project capital value of 400 million United Arab Emirates dirham (AED), energy savings of 20 per cent by 2021 and 30 per cent by 2030. Specifically, it has a target of achieving energy savings of 1.7TWh by 2030 and reducing CO₂ emissions by 1 million tons by 2030.⁵⁷

Initially, the focus was on retrofitting Government buildings and industrial facilities. It has since expanded to the residential building sector, including housing blocks and clusters of villas. Etihad ESCO targets Government and other entities that own large property portfolios.

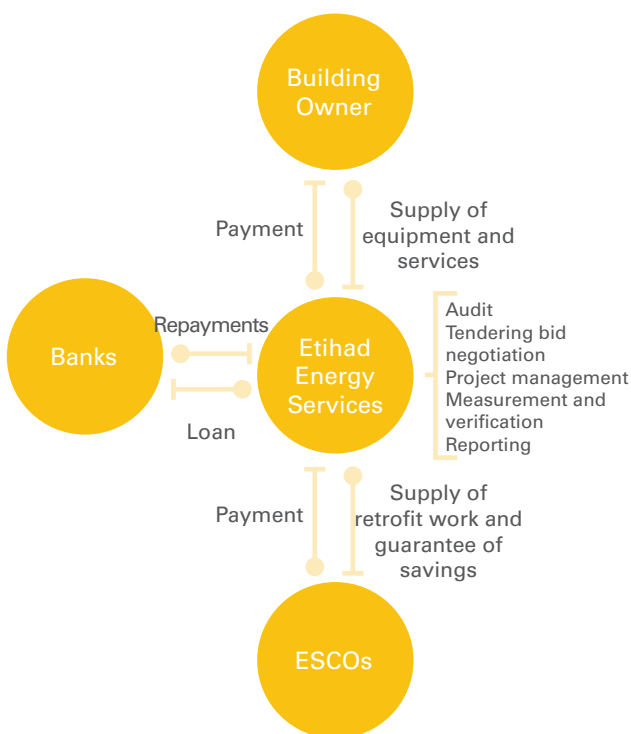
Etihad Super ESCO develops projects, bundles them, contracts accredited private ESCOs to undertake the work on a guaranteed EPC, and arranges finance from public and/or commercial sources. The operation of the Super ESCO is summarized in Figure 26. These activities are carried out within an ESCO market operational framework which is regulated by the Dubai

Regulatory and Supervisory Board for Electricity and Water and based on the following:

- An ESCO accreditation scheme.
- Standard EPCs.
- Measurement and verification guidelines.
- A dispute-resolution mechanism.

Some examples of projects carried out by Etihad Super ESCO are described in the following paragraphs.

Figure 26. Operation of Etihad Super ESCO



Source: Etihad Energy Services, 2020.

⁵⁶ Le Gentil, Stephane, 2015. Dubai's Energy Efficiency Policy for Buildings.

⁵⁷ Etihad Energy Services, 2020. About Etihad ESCO. Newsletter for Q2 2020.

A \$4.36 million (AED 16 million) project for DEWA in seven buildings including 55 energy efficiency measures covering lighting, cooling and ventilation achieved a reduction in energy consumption of 31 per cent amounting to 5 GWh per year and annual cost savings of \$0.71 million (AED 2.6 million). The measures also increased living comfort in the buildings.

A \$5.7 million (AED 21 million) project to replace lighting in power stations with LED lighting resulted in a reduction of energy consumption for lighting by 68 per cent and an annual saving of \$1.6 million (AED 6 million) per year. This is part of an overall \$10 million (AED 37 million) investment across the area covered by DEWA, including power stations and offices.

In November 2015, Etihad Super ESCO announced the world's first building retrofit project funded through Islamic financing. The project is located in the Jebel Ali Free Zone and is expected to be the largest retrofit to date in the Arab region, covering 157 buildings. The retrofit is projected to result in estimated yearly savings in electricity consumption of 26 GWh and in water consumption of 200 million imperial gallons, amounting to a total of \$6 million (AED 22 million) in annual cost savings. Capital cost was reported as \$17.4 million (AED 64 million) with a payback period of less than three years. The funding is provided through the National Bonds Corporation.

By the end of the second quarter of 2020, Etihad Super ESCO reported that it had retrofitted 7,646 buildings, resulting in savings of 304.9 GWh of electricity and 442.2 million gallons of water, with a reduction in annual CO₂ emissions of 136,829 tons.⁵⁸

The Etihad Super ESCO is the leading global example of successfully implementing a super ESCO using EPCs and illustrates the different elements joined within an appropriate structure. It is a transaction enabler because it develops projects using its own resources, and its presence within the transaction structure helps to derisk the projects for lenders. Because of its resources, it is able to develop portfolio-wide projects for owners of large property portfolios which speeds up upscaling, spreads risk across portfolios and overcomes the common barrier of small projects which are below the minimum ticket size of banks and institutional lenders. By using commercial ESCOs to undertake the actual work and by providing guaranteed performance through EPCs, it is building capacity in the market.

The Etihad Super ESCO illustrates the importance of linking financial instruments with policy instruments, in this case the ESCO regulations, which set standards. Furthermore, its ownership by DEWA facilitates the effects of large-scale energy efficiency programmes and their integration into electricity system planning.

C. SAUDI ARABIA: TARSHID

Tarshid is the Super ESCO created in 2017 by the Ministry of Finance, the Ministry of Energy, Industry and Mineral Resources, and the Saudi Energy Efficiency Center with assistance from the World Bank as part of the strategic framework laid out by Saudi Arabia's Vision 2030.⁵⁹ It was capitalized with \$507 million, equivalent to 1.9 billion Saudi riyal (SAR), by the Public Investment Fund.

As Saudi Arabia's super ESCO, Tarshid has been mandated to develop, fund and manage energy (and resource) efficiency projects in public buildings and streetlighting. It is the only Government entity that is mandated to retrofit buildings with the objective to reduce electricity and water use in Government buildings by 25-30 per cent. The focus on public buildings and streetlighting serves the dual purpose of reducing

Government spending on energy (which, in turn, can be directed towards investments in the power sector) as well as offering more oil to export, thereby generating greater revenues.

The Public Investment Fund expects energy efficiency to be a key growth sector in Saudi Arabia, with an estimated market size of \$800 million annually in Saudi Arabia alone.

Tarshid manages and funds the projects, which are implemented by private ESCOs. Tarshid takes buildings or sets of buildings and tenders them to ESCOs that are contracted to implement the retrofit measures. A number of well-known international companies have successfully won ESCO contracts with Tarshid, including Siemens, Enova (subsidiary of Veolia) and Engie (after it

⁵⁸ Ibid.

⁵⁹ Tarshid, 2021. Welcome to Tarshid.

obtained an ESCO license in 2018). Retrofitting measures to reduce energy use in public buildings can include small sewage treatment plants, solar panels, replacing incandescent lightbulbs with LEDs, and upgrading old air-conditioning units. Figure 27 shows the operation of Tarshid.

An example project is the range of measures to reduce energy use implemented in the facility of the Saudi Standards, Quality and Metrology Organization by Enova. Its building complex in Riyadh covers a total floor area of 193,000 m² across 11 buildings that house office and laboratory spaces.⁶⁰ It has resulted in energy savings of more than 30 per cent, equivalent to 6 GWh per year.

Implemented measures include the following:

- Installation of a building and chiller management system that optimizes the

- pumping system of the entire complex.
- Replacement of approximately 14,500 conventional lightbulbs with LED lighting.
- Optimization of the structural building, for instance through the installation of air curtains and chilled water line insulation to reduce cooling losses.

Another example project is the National Information Center, a collaboration between Siemens and Tarshid. This project is foreseen to save 28 per cent in energy consumption annually by means of an energy savings performance contract and to reduce CO₂ emissions by 4,200 tons.

As in Dubai, the work of Tarshid has been supported by efforts to implement standards and accreditation for ESCOs in order to strengthen capacity-building within the ESCO industry.

D. FACTORS FOR SUCCESS

Analysis of the financing instruments described above, and others around the world, strongly suggests that, in order to successfully deploy capital into energy efficiency, it is necessary to have four elements present.

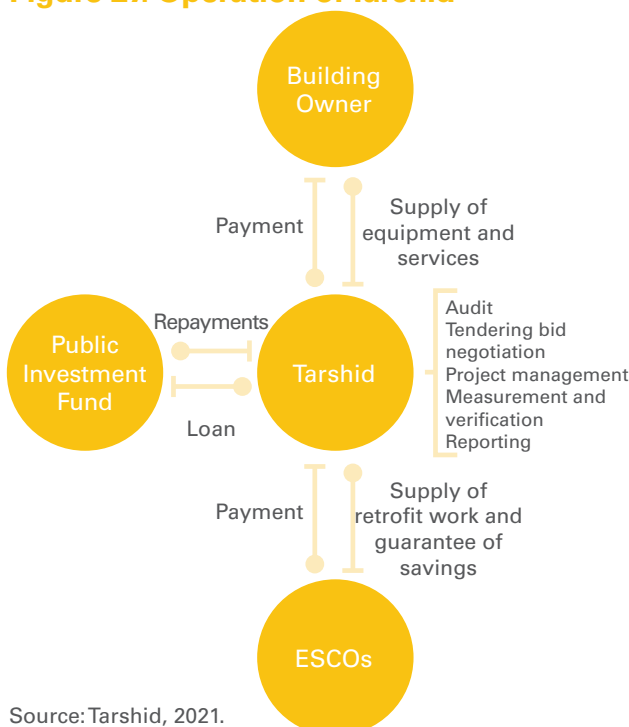
Firstly, there must of course be adequate capital. It is important to note the different types of capital. Development capital, which by its very nature has a higher risk, is vital, as is project capital, which is of lower risk. The evidence suggests that even well developed markets such as the United Kingdom and France face a shortage of development capital and development capacity. The design of any financing instrument must recognize this and secure development capital and project implementation capital.

Secondly, capacity-building has to be addressed. Capacity-building is indispensable in three areas which all require resources. These areas are the following:

- The demand side, namely, customers: Customers, whether they are individuals or organizations making management and investment decisions, must want to buy energy efficiency improvements which means that they need to know of the possibilities, how to buy them and how to finance them. Energy efficiency by itself is not necessarily attractive

enough to motivate customers and, therefore, other, more attractive, non-energy benefits such as comfort and health need to be emphasized in communications. In all financing instruments, communication, stakeholder engagement and marketing are essential elements.

Figure 27. Operation of Tarshid



Source: Tarshid, 2021.

⁶⁰ Design Middle East, 2020. Enova delivers first-ever retrofit project awarded in KSA by Tarshid.

- The supply side, namely, the entire supply chain that designs, specifies and supplies equipment and builds projects: In nearly all countries, the capacity of the supply chain, particularly to undertake sophisticated whole-building retrofits or achieve near-net zero new buildings, is a constraint to scaling up energy efficiency. Addressing this requires actions on standards, training, certification, and accreditation which is outside the remit of the finance sector per se – although it does benefit the finance sector, and such actions require policy and industry leadership and do carry a cost. Linking standards, certification and accreditation systems to existing standards and/or other Government and industry initiatives are important. National and international standards such as those for green buildings or the Investor Confidence Project can be important tools. One important potential problem for customers and investors alike is the proliferation of standards, and an alignment of standardization at a national, or even regional, level can help to improve transparency, reduce transaction costs and build a more efficient and functioning market.
- The finance industry: Energy efficiency is a new type of investment, and the capacity to understand it, evaluate projects and assess risks is limited. In order to scale up investment in energy efficiency, this deficit must be addressed at the operational level within banks and institutional investors. Any financing instrument working with the private sector, or even public finance institutions, must address this lack through training and the development of standard tools, for example the Energy Efficiency Financial Institutions Group's Underwriting Toolkit (see section on derisking tools). As experience with energy efficiency financing grows and it becomes more mainstream and commoditized, the need for special derisking tools will decline.

Thirdly, it is necessary to build a scalable enterprise from the beginning. This requires standardization of processes, procedures and agreements. Traditionally, the energy efficiency industry has been very fragmented with a wide diversity of processes and contracts. Even when developers design standard energy efficiency measures, their methodology and approach often differs from other developers. This has contributed to the high transaction cost of energy efficiency financing as lenders then need to have the various approaches assessed as part of investment decisions. Any customization increases transaction

costs and risks. Designers of financing instruments must build in standardization from the beginning.

Fourthly, the role and design of both derisking tools and transaction enablers are critical success factors. Due to the nascent nature of the energy efficiency financing market, and the many barriers to project development and deployment, it is essential to include both derisking tools and transaction enablers in the design of any energy efficiency financing instrument. Failure to do so risks allocating capital without being able to deploy it and missing major opportunities to improve energy efficiency as part of investments planned for non-energy reasons.

Finally, in order to upscale investment into energy efficiency, it is necessary to address large markets and portfolios to build pipelines of projects. Pipeline development requires resources on the part of a financing instrument over and above the resources needed to support individual project development. It is important to be specific about the particular market segment(s) being targeted and how these can be addressed at scale. The example of the Super ESCOs, Etihad Energy Services and Tarshid is instructive in this regard as they target portfolios of properties and not individual buildings. Energy Efficiency Services Ltd. in India builds large pipelines by aggregating demand across states and across India. In the residential market, the approach to targeting large portfolios of projects will vary according to the structure of the housing market. Where large numbers of homes are owned by public authorities, these institutions are an obvious route to achieving change at a large scale.

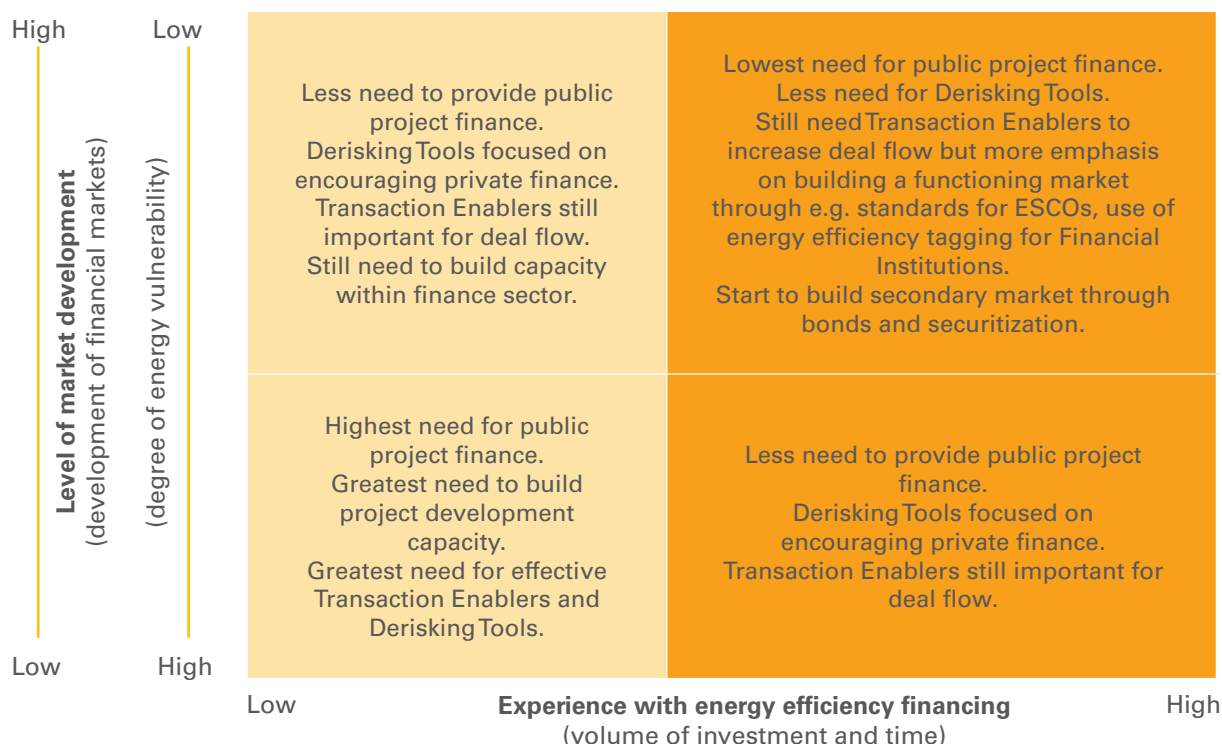
Given the presence of these four factors, other questions such as ownership of the financing instrument, are less important. Many of the examples given in this report are publicly owned or at least initiated by the public sector. Given the need to scale up investment, it will be essential to ultimately bring in private-sector finance. In the early stages of market development, public finance can help catalyse and prove the market. As the market evolves, the public-private partnership model, or blended finance model, exemplified by funds such as the London Energy Efficiency Fund has an important role to play. Once energy efficiency becomes more recognized as an asset class, purely private financing instruments, including funds listed on stock exchanges, will become more prevalent. Such funds are emerging now in more mature markets such as the United Kingdom.

Figure 28 illustrates the change in emphasis needed according to the state of development of the market. A market with a high level of energy vulnerability and relatively poorly developed financial markets will have the highest need for public finance and to build project development capacity. Levels of energy vulnerability are relevant as in building energy efficiency projects with energy vulnerability, energy savings are usually taken in the form of increased levels of comfort, and, therefore, projects produce less or no financial savings. There will also be the highest need for effective transaction enablers and derisking tools to ensure projects are developed and can be financed due to low levels of capacity in both the supply chain and the finance sector. Markets where energy vulnerability is lowest and financial markets are most mature will have the lowest need for public project finance as the private markets can provide this. There is still a need for transaction enablers (these remain necessary even in mature markets), but less need for derisking tools as the financial markets have a greater understanding of the underlying risks of energy efficiency projects. In these markets, secondary financing of energy efficiency starts to occur. Even advanced markets such as the

European Union and the United States have not yet widely reached this status, and much work continues to move towards a situation where energy efficiency projects become an established asset class which is as easily financed as other categories such as houses or cars.

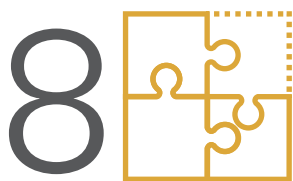
The ownership question is likely to be different in different Arab subregions, with more mature financial markets having a higher proportion of private investment and/or ownership while in less developed financial markets a higher proportion of public investment will be needed. Where more public finance is needed, the Government should consider developing a long-term strategy to help build the domestic financial market. Even well-developed financial markets will likely face a continued need for public investment in development capital and project development as is seen in European and other markets. Public ownership can also bring other benefits such as increased ability to convene and enrol stakeholders. The question of ownership and other variables with respect to regional, national and even local market differences is discussed further in the next chapter.

Figure 28. Characteristics of energy efficiency financing markets



Source: Compiled by author, ESCWA.





PROPOSED INSTRUMENTS TO DEVELOP SMART MARKET SOLUTIONS

In order to scale up investment into energy efficiency in buildings, it is important to have mechanisms that address all of the barriers, not just finance. These mechanisms also need to be linked to implementation instruments. Proposals for the generic design of three types of smart market solutions that can scale up investment into energy efficiency in buildings in the Arab region are presented in this chapter, along with a discussion of some of the regional, national and local considerations to be taken into account when designing a financing instrument.

A. GENERIC DESIGNS FOR A FINANCING INSTRUMENT TO DEVELOP SMART MARKET SOLUTIONS

This section proposes three generic designs for a financing instrument that can be used to develop smart market solutions for financing energy efficiency in buildings, namely, funds, Super ESCOs and an instrument modelled on EcoCasa. It draws upon the analysis of existing financial instruments and best practice examples of instruments in other countries that have successfully accelerated the rate of investment into building energy efficiency. Within the generic design, the balance of various elements, for instance, public versus private capital sources, and the type and nature of the critical elements of derisking tools and transaction enablers, will vary according to regional and local conditions.

As was discussed in the section on designing financing instruments, in order to scale up the flow of investment into energy efficiency, it is necessary to increase the flow of developed, bankable, projects and the amount of capital allocated to energy efficiency, whether it be public capital, private capital or a combination of both. Public capital has a major role to play, particularly in driving demand through catalysing financing instruments that support policy, and utilizing derisking tools to attract private capital. Attracting private capital is necessary in all markets as the size of the investment needed to fully utilize the available energy efficiency potential exceeds the capacity of public investment.

B. ENERGY EFFICIENCY FUND DESIGN

A generic design for an energy efficiency fund is shown in Figure 29.

The fund can be capitalized by contributions from the Government, multilateral development banks, institutional investors, and others including private companies and/or philanthropic capital. It should include the following three elements:

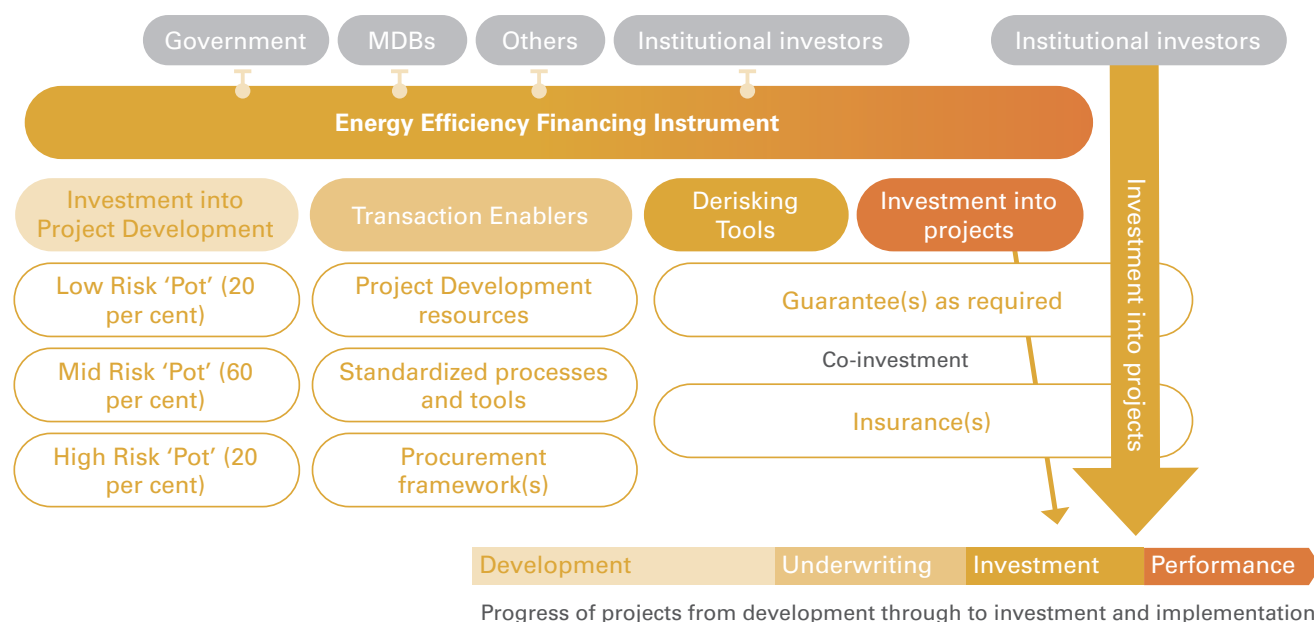
- Investment into project development.
- Transaction enablers appropriate to the market(s) it operates in.
- Derisking tools that are appropriate to the needs of institutional capital.

In addition to these three elements, it should also include in investing in projects, preferably

alongside private institutional capital.

The overall aim of the fund should be to develop projects to the point at which they are bankable and secure funding for them. It can use some of its own capital in projects as co-investor alongside institutional investors and use appropriate tools such as guarantees to derisk projects for private capital.

The available development capital can be split into different risk pots which allows investment into the development stage of projects of varying risk profiles, with risk being determined by stage of development (with very early stage being the riskiest) and the nature of the project (a function of technology, market and other factors).

Figure 29. Generic design for an energy efficiency financing instrument

Source: Compiled by author, ESCWA.

1. Regional and local variation to the generic model

As shown in Table 12, the specific design features and the way they are assembled will vary according to regional, national and local characteristics.

In addition to these structural design issues, there are also questions of ownership and governance. A financing instrument can be owned completely by the public sector, completely by the private sector, or, as is often the case in Europe, it can be a public-private partnership. Publicly owned financing instruments can be owned by the central government, a Government agency or by a municipality where this is possible. Local

ownership, as exemplified by SPL OSER, helps ensure that relevant stakeholders such as local authorities who own building stock (non-residential or residential) are engaged.

Two other design characteristics need to be considered, namely, the sector(s) the instrument is designed for (residential, non-residential, public, and commercial buildings) and the technical scope of projects that the instrument can deploy capital into. These parameters and the factors to consider are shown in Table 13.

Table 12. The effect of regional and local conditions on the design of financing instruments

COMPONENT	FACTORS TO CONSIDER
ROLE OF PUBLIC SECTOR AS PROVIDER OF CAPITAL AND CATALYST	Degree of development of financial sector Existence of sustainable investing regulations
DEGREE TO WHICH PUBLIC CAPITAL IS NEEDED FOR PROJECT FINANCING (AS OPPOSED TO DEVELOPMENT)	Experience in energy efficiency financing Availability of project-type finance Access to financial services (particularly in residential sector in least developed countries)
USE OF DERISKING TOOLS	Experience in energy efficiency financing Real and perceived risks of energy efficiency projects Sector focus (which affects ability to repay)
USE OF TRANSACTION ENABLERS	Level of demand for energy efficiency projects Capacity to develop energy efficiency projects

Source: Compiled by author, ESCWA.

Table 13. Other factors in the design of financing instruments

PARAMETER	FACTORS TO CONSIDER
FOCUS OF INVESTMENT (SECTOR)	Local needs Identification of the biggest impact
INVESTMENT SCOPE	• Local needs • In least developed countries, there is a need to integrate energy efficiency with energy supply to increase energy access • Integration with high-performance buildings and green buildings needs to be considered • Business models such as energy as a service or energy efficiency as a service • The instrument's investment rules must be appropriately designed

Source: Compiled by author, ESCWA.

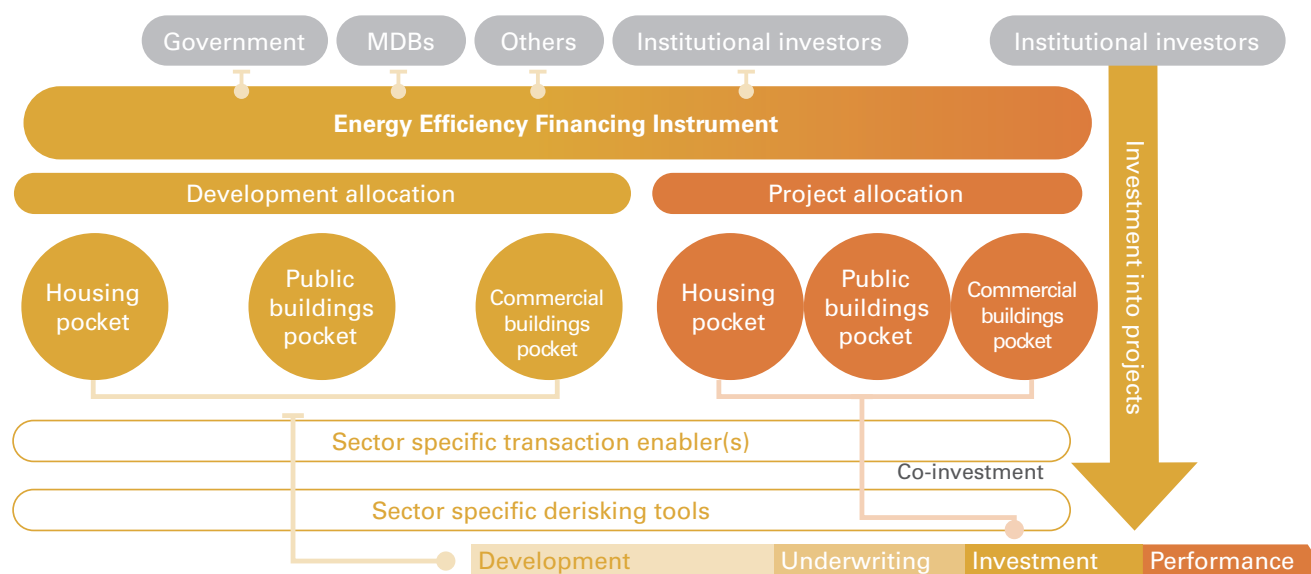
2. An instrument covering multiple sectors

Another design issue to consider is whether or not to have one overarching instrument or separate instruments for different sectors. The differences within the different sectors, particularly between residential, public and commercial buildings, are significant in terms of technologies but also in terms of the nature of the end user and their drivers, as well as their use of and experience with financing tools. Different skill sets are needed to develop and implement projects, both technical skills and stakeholder engagement skills. These differences strongly suggest that a sectoral approach is optimum, which was followed, for example, in Lithuania, where separate instruments were established for residential buildings (DNMF) and non-residential buildings (ENEF). Furthermore, given the need for a high degree of stakeholder engagement, particularly in the residential sectors, the use of locally-based instruments such as SPL OSER may be required.

Due to the relatively high costs of establishing a financing instrument, particularly a fund, a possible solution would be to establish an overarching fund with different pockets allocated to different sectors or localities. For each pocket, however, appropriate derisking tools and transaction enablers would need to be established, possibly on a localized basis (see Figure 30).

The specific sectors will likely require different transaction enablers and different derisking tools in addition to different sources of private capital. Within the sector pockets, however, processes, procedures and contracting must still be standardized.

Figure 30. Design of an energy efficiency fund with sector-specific pockets



Source: Compiled by author, ESCWA.

C. THE SUPER ESCO MODEL

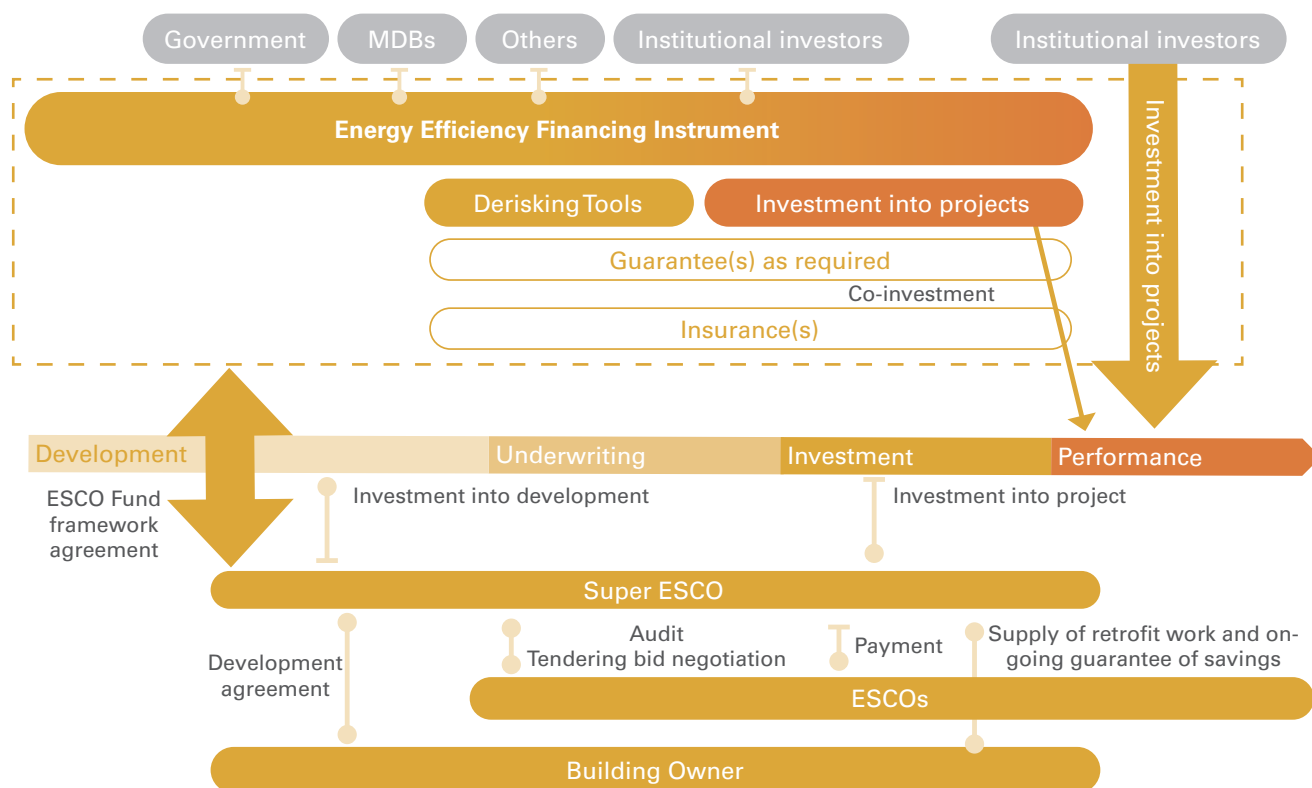
As has been discussed above, the Super ESCO model addresses many of the barriers to developing and financing energy efficiency projects at scale. The regional examples of Etihad Energy Services and Tarshid are world-leading demonstrations of the power of Super ESCOs based on EPCs. They can be replicated and adapted to the needs of other countries, and this process is now beginning with work to develop Super ESCOs known to be underway in several countries.

As discussed, it is important to link Super ESCOs

with regulatory changes to ensure adequate accreditation and certification of ESCOs, and to link them with available project finance. Etihad Energy Services uses various sources of project finance, and Tarshid utilizes the Public Investment Fund. To establish a Super ESCO, it is important to secure the source of project funds, and one model could be to combine a Super ESCO with a dedicated fund. The Super ESCO would be the primary transaction enabler for the fund while acting as a significant derisking tool. This combined fund/ Super ESCO model is illustrated in Figure 31.



Figure 31. Combined fund/Super ESCO instrument



Source: Compiled by author, ESCWA.

D. AN INSTRUMENT FOR NEW HOUSING

The EcoCasa model has been successful in Mexico and there is scope to replicate and adapt the model to the Arab region. This will be particularly useful in countries with a high rate of new building. The necessary local adaptations will depend on the local institutional arrangements for funding new housing and the distribution of housing tenures (freehold with mortgage, freehold without mortgage, leasehold, private rental, and public rental), which vary greatly across the region. In the case of high levels of home rentals with large, public landlords, there is clear scope to scale up

the model rapidly subject to funding. Whatever the arrangements for funding housing, adapting the process so that all new investment into housing is aimed at energy efficient, green buildings could best be done by adapting existing processes rather than creating a new financing instrument.

The Romania Green Mortgage Programme is another useful example, particularly for its use of public money to create demand, build an operating system and facilitate lending by commercial banks.

E. ENABLING EXISTING FINANCIAL INSTITUTIONS TO MODIFY EXISTING PROCESSES: EFFICIENCY FIRST

One characteristic of investment to improve energy efficiency is that much of it is not undertaken for energy efficiency reasons. Examples include renovations of buildings at the end of their useful life or buildings whose use is being changed. In these cases, major works are undertaken and a

higher level of energy efficiency can be achieved simply as a result of higher building codes, where applicable, and the use of new building systems such as new air conditioning replacing old systems. However, in these situations and new build, many cost-effective opportunities to

improve the energy efficiency levels beyond the minimums required by building codes are missed, which locks in higher-than-needed energy use, operating costs and emissions until either the building is replaced entirely or undergoes another major renovation, which could be between 20 and 50 years. Insufficient attention has been paid to maximizing these opportunities to increase the energy efficiency of normal, everyday building renovations. Existing financial institutions lending to or investing in these markets have existing customer relationships, lending facilities and processes which can be adapted and leveraged to promote higher levels of energy efficiency. Interventions in this area require building capacity, particularly within the existing real-estate finance sector, and changing investment or lending processes to ensure that opportunities for higher levels of efficiency are not missed.

An example from Europe is ING Real Estate Finance, a major private-sector real-estate lender, who has developed a policy of only lending to commercial buildings with an energy performance certificate greater than C or above. Furthermore, it offers advice to property owners on options how to upgrade the energy performance and more favourable terms on buildings or portfolios with higher performance levels. This has been driven by policy developments, specifically the introduction of MEPSs, which mean that some buildings could become stranded assets, and the recognition that higher-performing buildings and portfolios have lower financial risks. This is an example of greening finance, namely, adapting an

existing lending/investment process rather than green finance, namely, creating a special financing instrument. There is a need to address both rather than just focus on creating special vehicles for green investment. From a purely energy efficiency perspective, the need exists to make all investment a driver of energy efficiency and not just specialized energy efficiency financial instruments.

Current efforts by the Energy Efficiency Financial Institutions Group (EEFIG), referred to in a later section, are examining how to provide tools that will allow financial institutions to incorporate the energy-efficiency-first principle into their lending and investing activities. If successfully adopted, this will reduce the number of lost opportunities where new buildings or renovations are planned without incorporating the optimum level of energy efficiency. The role of Governments can be to convene the various stakeholders, building owners and operators, financial institutions, and the supply chain, to help them address constraints through capacity-building, specific transaction enablers and derisking tools. It would be possible to build an instrument that helps existing financial institutions adapt their processes to ensure that energy efficiency opportunities are not missed. This would require building demand, developing operating systems, building capacity, and putting in place appropriate derisking tools. Adapting policies of existing lending institutions to incorporate the energy-efficiency-first principle is likely to be a most cost-effective route to mainstreaming energy efficiency finance.

F. OTHER CONSIDERATIONS

Different segments within the building sector have quite different energy efficiency opportunities, different ownership and tenancy structures, and different financing routes. Commercial real estate, for example, is very different from retail or the residential sector. Financing instruments, and particularly transaction enablers, have to be appropriately designed for these different situations.

Most of the financing instruments considered here have been almost exclusively focused on what could be called classical energy efficiency projects such as upgrades to building envelopes or systems. It is important to recognize the following five factors:

- One of the major barriers to energy efficiency

has been that, on its own, it is not necessarily a high priority to building owners, users or decision makers.

- The energy market everywhere is evolving quickly with the advent of very low-cost renewables, particularly solar energy, and energy storage becoming much cheaper.
- New business models such as energy as a service are emerging which combine energy supply and capital projects to increase energy efficiency and demand flexibility.
- Energy efficiency is one component of high-performance buildings, which combine high performance in several dimensions including energy, life-time emissions and health. The issue of making buildings healthier is gaining traction

as the link between indoor conditions and health become clearer. Healthy buildings as a selling feature may be more attractive to consumers and decision makers than energy efficiency meaning that health factors should be used in messaging rather than energy efficiency which may not be perceived as interesting.

- Global institutional investors are increasingly focusing on achieving and measuring impact (impact investing).

These factors suggest that an exclusive focus on energy efficiency in its traditional sense may be counterproductive. It is important to write the mandate of any financing instrument so that it can invest in projects that may include elements such as roof-top photovoltaic installations, demand response where this can be financially rewarded and make buildings healthier. Other types of projects to potentially increase the efficiency of the built environment in the Arab region include district cooling schemes. These are not directly building energy efficiency projects. In other words, they do not themselves affect the fabric of buildings, but they can provide cooling in a more efficient, sustainable way than each building having its own conventional air conditioning system. They can also potentially provide energy storage for the electricity system through the storage of excess coolth in the form of chilled fluid when renewable power production is high and cooling demand is low. Projects that integrate the built environment, the energy supply system and even transport in the form of electric vehicles are likely to become more common.

In addition, much of the focus of financial instruments in Europe has been on retrofitting existing buildings as the rate of new build is very low and most of the building stock that will be in existence in 2050 has already been constructed. It is important not to forget new buildings,

especially in areas such as the Arab region, where a high proportion of the building stock that will exist in 2050 has not yet been built. Although the introduction and tightening of building codes is an important policy instrument, it is vital to remember that building codes are only a minimum standard and it is necessary to build capacity amongst specifiers and developers to design and construct new buildings that far exceed building codes – buildings that are effectively net-zero or even net-positive energy buildings. This requires the promotion of standards such as the passive house standard (adapted for climate), capacity-building and specific financing tools. The EcoCasa programme in Mexico is a good example of a financing instrument aimed at new buildings.

With increased focus on sustainability in its widest sense, and with pressure from regulators, global investors are increasingly focused on impact in all areas, namely, economic, social and environmental, and measuring the impact of their investments and lending activities. Impact investing is rapidly growing, and energy efficiency is well placed to attract impact-driven capital. Therefore, any instrument designed to attract institutional capital, irrespective of which market it is operating in, should take this into account and design impact-driven strategies and measurement systems. As described above, energy efficiency in buildings can have multiple impacts beyond energy saving and reductions in emissions including, but not limited to, better health outcomes, better learning outcomes, poverty reduction, and job creation. Energy efficiency financing instruments should include impact measurement procedures, using one of the emerging standards, such as that developed by the Impact Management Project, into their standard procedures and systems.⁶¹

G. CREATING AN ECOSYSTEM OF FINANCIAL INSTRUMENTS

It has become evident that different market sectors and different local situations require different designs for financing instruments. Rather than simply focusing on creating dedicated single instruments, policymakers should consider the

need to enable the creation of an ecosystem of financing instruments, covering multiple sectors and specific market segments.

⁶¹ Impact Management Project, 2020. A forum for building global consensus on how to measure and manage impacts.



9

PROPOSALS FOR MODELS TO DERISK ENERGY EFFICIENCY

This chapter presents tools and models for derisking energy efficiency projects that have been used elsewhere. It starts with a discussion of the nature of the risks inherent in energy efficiency project financing. The specific derisking tools to be used within financing instruments have been presented above; this chapter looks at macrolevel derisking tools that can assist both specific financing instruments but also the entire economy.

A. TWO LEVELS OF DERISKING

The following two levels of derisking are to be considered: firstly, the microlevel, which needs to be addressed within the design of financing instruments utilizing the derisking tools described above; and secondly, the macrolevel, which utilizes other derisking strategies that operate across the economy. The microlevel derisking tools were elaborated in the sections above. This section considers the macrolevel derisking tools that can be used to impact the whole energy efficiency market. As described above, derisking tools

are most often discussed in terms of derisking an investment for the provider of finance but derisking for the customer is also important to build confidence in any proposed project as well as in the energy efficiency sector as a whole. Some of the derisking tools described here, such as standardization of project development and documentation, apply to both the provider of finance and the customer.

B. UNDERSTANDING RISK IN ENERGY EFFICIENCY INVESTMENTS

Before discussing derisking models, it is important to have a clear understanding of the nature of risks inherent in energy efficiency investments.

For many years, energy efficiency has been presented as a low-risk, sometimes even zero-risk, investment but the reality is different and more subtle. In practice, investing in energy efficiency, like any other investment, carries various types of risk. The types of risk can be divided into the following four categories:

- Execution risk.
- Performance risk.
- Regulatory risk.
- Credit risk.

A proper identification and understanding of risks is essential for any financial investment decision,

irrespective of the source of funds or the target returns. One problem that is now recognized is the scarcity of data on the actual performance of energy efficiency projects of all types. In many cases, the results of energy efficiency projects have not been measured; but even if results have been measured and verified, the actual performance has not been translated into actual investment performance or turned into any kind of risk analysis. This is in contrast to other asset classes, including other energy assets classes such as wind power or solar power, where technical and financial performance is easily measured, typically through a fiscal electricity meter.

It is important to have a common understanding of risks. The various types of risks are explored further below, and models to derisk energy efficiency are presented.

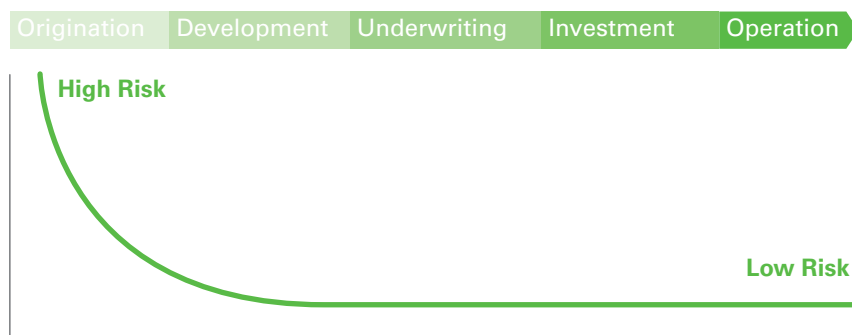
C. THE PROJECT LIFE CYCLE AND RISK

The life cycle of energy efficiency projects is similar to other sustainable energy projects and includes the following stages:

- Origination: the process of creating a project concept.
- Development: developing the project technically, financially and commercially to the point at which it becomes bankable.
- Underwriting: the process of deciding whether or not to invest, which normally involves assessing value and risks.
- Investment: the process of making the investment.
- Operation: the ongoing operation of the project throughout its life.

The risks of a project fall as it progresses through these stages, as shown in Figure 32. The type of capital that can be employed varies from one project stage to another. Development is risky and is, therefore, usually undertaken using higher-risk equity or balance sheet funding. Once a project is developed, it has lower risks and can be financed by a combination of equity and debt. After a period of operation, when the performance of the project is proven, it may be possible to reduce the cost of the debt and/or increase the proportion of debt used by refinancing through low-risk, relative return instruments such as bonds.

Figure 32. Stages in the project life cycle and risk profile



Source: Compiled by author, ESCWA.

1. Performance risks

Performance risk is essentially the risk that a project does not produce the financial returns that are projected at the time of making the investment decision.

The returns from the energy savings resulting from any energy efficiency investment are a function of the units of energy saved and the price of energy.

Savings = Number of units of energy saved x Price of units of energy

A number of technical, human and financial factors can lead to savings being less than anticipated. They can be divided into intrinsic risks, which are those risks associated directly with the measure itself, and extrinsic risks, which are those factors

that are outside the measure itself. The risks associated with key factors are described below along with mitigation strategies.

(a) Design risks

Design risk concerns the failure of the energy modelling and technical design process, selection of energy efficiency measures and engineering design to accurately predict the volume of energy savings, all other factors being equal. This failure may come about through a number of causes including the inaccuracy of design models and simple design error – someone making a mistake in the design. A design failure may be hard to establish unless it concerns a mathematical error

or obvious mis-specification. Design failures may occur in all types of energy efficiency projects but are more likely in complex, multi-technology projects where measures can interact. Interactions between energy efficiency measures can be difficult to predict using simple design models and tools. The issue of actual energy performance not meeting design levels is typically called the performance gap.

Mitigants to reduce design risk include the following:

- Selecting the design team carefully based on its previous results.
- Specifying the use of appropriate national or international standards in project design, development and documentation.
- Requiring designers to share all data, calculations and simulation files for quality control.
- Insurance policies.
- Investors and lenders may choose to reduce savings projections (derating them) for use in a financial model.

Box 22. An example of the performance gap in building energy efficiency projects

One of the major issues in energy efficiency is that there is often a significant difference between the projected savings and the actual savings that are achieved in practice. This is known as the performance gap. A United States study on energy efficiency projects in more than 230 multifamily housing buildings carried out for Deutsche Bank showed that the realization rate, which is the actual savings compared to the projected savings, was 61 per cent with a 90 per cent confidence level of +/-14 per cent. This is due to a number of factors including poor baselining, poor design and use of unrealistic assumptions on key parameters such as the running time of equipment.

Source: Deutsche Bank, 2012. Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting.

Box 23. Addressing the performance gap

The performance gap can be addressed through several techniques. Firstly, it is important to carefully select engineering teams and equipment vendors based on their experience of the sector and the type of project. Experience in another sector, or even another segment of the market, may not be transferrable. It is also important to check compliance with standards and norms.

Secondly, the use of standardized development processes such as those of the Investor Confidence Project (ICP) can reduce performance gaps. The ICP Investor Ready Energy Efficiency™ certification for projects requires trained project developers to follow the ICP protocols and the project to be independently verified by an ICP quality assurance professional. ICP originated in the United States and was introduced to Europe with the assistance of the European Commission's Horizon 2020 programme. It is now operational in Canada as well.

Source: Investor Confidence Project, 2020. Unlocking Capital for Energy Efficiency Projects.

(b) Equipment failure risks

Equipment of any kind may not perform according to the specifications of the manufacturers or may fail altogether during the life of the investment. Contractors will not typically assume equipment failure risks themselves but rather seek to claim them according to manufacturers' warranties.

Equipment risks can be mitigated as follows:

- Selecting equipment vendors carefully based on experience and track record.
- Requiring the longest possible warranties.
- Ensuring that manufacturers are able to stand behind the warranties offered.
- Ensuring that all equipment is operated as per the manufacturers specifications and that all required maintenance procedures are carried out.
- Selecting appropriate insurance policies.

The designers of financial instruments can also request that projects only use equipment and contractors on approved lists and with certain accreditation.

Box 24. The importance of measurement and verification

Another issue with many energy efficiency projects is that the quality of measurement and verification of the results can vary from low (or completely absent) to very high, which affects the project outcome itself and the ability to monitor the outcome. Many energy efficiency projects do not include measurement and verification, which makes the actual outcome uncertain. In this case, savings may be over- or understated and may indeed be illusory as they could be caused by other external factors such as weather and changes in production levels.

The International Performance Measurement and Verification Protocol (IPMVP) sets out methodologies for determining energy and water savings. Good practice requires that measurement and verification are integrated into the process of identifying, installing and operating energy efficiency measures. IPMVP methodologies should be used to measure the performance of all energy efficiency measures. For larger projects, and particularly complex energy services contracts, an independent professional firm specializing in measurement and verification should be appointed.

Source: Efficiency Valuation Organization, 2020.

(c) Operations and maintenance risks

Correct operations and maintenance of equipment installed as part of an energy efficiency measure is important for reducing long-term performance risks, particularly in large buildings with complex systems. Specified maintenance procedures such as regular cleaning of filters, adjustment of burners, among others, must be carried out to ensure that savings remain at projected levels.

Mitigants for operations and maintenance risks include the following:

- Using measurement and verification as a way to track savings over time and quickly identify variations in savings that could result from poor maintenance and other factors.
- Providing an operations manual and ensuring that operators are properly trained in the use of the equipment. This also applies to householders, especially when dealing with measures such as

sophisticated thermostats and controls.

- Including continuous commissioning into contracts, whenever appropriate.
- Requesting basic operational performance warranties from maintenance contractors.

(d) Weather risks

Weather conditions can have a significant impact on energy savings, and, in particular, ambient air temperatures affect the amount of energy used for space conditioning (heating or cooling). In assessing the performance of any energy efficiency measure, it is important to take into account the effects of weather through the use of measurement and verification techniques. It is essential to normalize reported savings taking into account ambient temperature when studying the impact of an energy efficiency measure.

(e) Risks from change of building use patterns

Any calculation of energy savings is based on a baseline consumption and with the assumption that other factors remain constant. As building energy use is affected by many factors, especially by the numbers of occupants, hours of occupation and usage and operation patterns (how people use the building and its energy consuming appliances), any changes in these factors will affect the actual level of savings achieved in practice. Whether or not this is important depends on the situation and the nature of the contract that is used to deliver the energy efficiency measure. In a residential setting, a householder may not achieve the levels of savings that were predicted, or sold to them, due to changes in usage. This can affect both financial returns (savings) and, consequently, consumer confidence in the measures. In more complex situations such as large commercial buildings where an EPC is being used to implement and finance energy efficiency measures, these factors can lead to contractual disputes. For example, a client may argue that the energy savings achieved because the occupants ensured that lights were turned off thermostat settings were reduced, or increased in case of space cooling, whereas the contractor will argue that they came about through the measures that were invested in. Proper measurement and verification procedures, combined with other monitoring practices and appropriate contract clauses, are essential to avoid these kinds of disputes.

2. Energy price risks

Projected financial savings from any energy efficiency measure will be based upon a projected energy price; however, during the lifetime of any investment, energy prices can change up or down, affecting the level of financial savings achieved in practice. This can be particularly important in residential projects where a certain level of financial savings promised to a consumer do not materialize due to an increase in energy prices. The underlying level of energy savings in kWh may be exactly as predicted but the consumer does not see them and perceives this to be a

failing, even though, in reality, they are still saving relative to what they would have been paying if the energy efficiency measure had not been implemented. These situations can lead to loss of trust by the consumer in the measure and the agency or agencies promoting them. Clarity in the performance contract is important to overcome this risk, and consumer education during the contracting period, and throughout the life of the measures, is important for avoiding this situation.

3. Credit risks

Any project that includes advancing capital to purchase and install an energy efficiency measure and then recovering payments over an extended time period from the beneficiary, or other party, carries a credit risk, the risk of default. Banks and financial institutions are used to dealing with credit risks. Credit risk can be exacerbated in energy efficiency projects which are aimed at low-income

households, for instance.

Credit risk can be mitigated by the following measures:

- Using standard credit checking techniques.
- Providing credit guarantees.

D. RISK ANALYSIS

Any financial investment into an energy efficiency measure or measures should be subject to a risk assessment just like any other investment. As noted above, this often does not happen in energy efficiency investments. A risk analysis should examine the effects and probabilities of changes in any of the critical inputs that affect the outputs of the financial model. Identifying the most sensitive

factors, namely, those that have the largest effect on outputs, can drive consideration of acquiring additional information on that factor. This may, for example, include spending on additional pre-investment monitoring to assess the variability of a particular factor rather than simply relying on a single number.

E. THE ACTUAL RISKS OF ENERGY EFFICIENCY

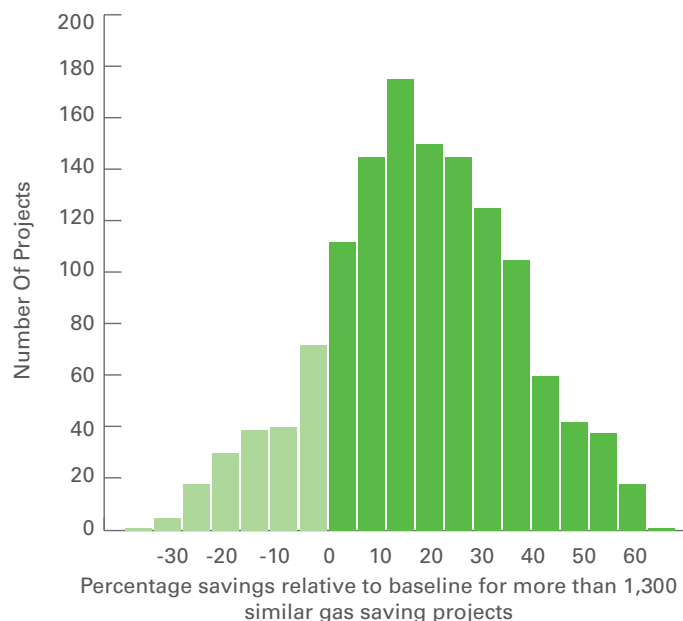
As noted above, there is very little data on the actual performance of energy efficiency projects and, hence, their real risk profiles. In the last few years, however, more data have started to be collected through the Pay for Performance and Metered Efficiency models in the United States and databases such as the Derisking Energy Efficiency Platform (DEEP) of the Energy Efficiency Financial Institutions Group (EEFIG). Analysis of these data shows that, although energy efficiency measures do have a spread of performance (risk), a portfolio analysis of large numbers of similar projects demonstrates that they do, on average, perform and that the risks

are relatively low. Developing this kind of portfolio analysis for energy efficiency is an important development for energy efficiency financing.

Figure 33 shows the actual measured performance of a portfolio of similar gas saving projects in California.

As can be seen from the graph, some of the individual projects actually led to an increase in energy usage (those showing negative savings highlighted in red). This could be due to any or a combination of the factors described above, such as technical failures, bad installation, changes in

Figure 33. Savings from a portfolio of more than 1,300 similar gas saving projects in California



Source: Golden, Matt, Adam Scheer and Carmen Best (2019). Decarbonization of electricity requires market-based demand flexibility. *The Electricity Journal* 32, Issue 7, August-September 2019, 106621.

the pattern of usage, and additional occupants. The portfolio as a whole, however, shows a normal distribution curve around the 15-20 per cent level of savings. If the financial investment was made on the assumption of this level, it will perform as expected whereas, if it was made on an assumed level of savings of, for example, 25 per cent, it would underperform.

Designers of financing instruments should require measurement and verification of the technical performance and the financial performance of all projects. Where possible, and subject to confidentiality measures, sharing of technical and performance data can help increase confidence in energy efficiency amongst the finance community, and provide useful information the technical community can learn from.



F. RISK PERCEPTION AND DERISKING

There is a difference between actual risks and perceived risks. One of the barriers to scaling up investment into energy efficiency is its perceived risk, which is really based on an absence of performance data rather than data on poor performance. Energy efficiency is relatively unknown to financial institutions, and there is little capacity, either internally or externally, to properly assess the value and risks of efficiency projects,

which makes it easy to dismiss investment into energy efficiency because of uncertainty or perceived risks.

In addition to the specific derisking tools within financing instruments described above such as guarantees and insurance, a number of macro-level derisking tools can be used.

G. EXAMPLES OF MACRO-LEVEL DERISKING TOOLS

A number of examples of macro-level derisking initiatives exist in different markets and are described below. They fall into the following four categories:

- Mechanisms to increase communication between the finance and energy efficiency industries, as part of capacity-building.
- Collection and dissemination of data on energy

efficiency investments.

- Development and adoption of standards and standardized tools.
- Certification and accreditation schemes.
- Development of insurance markets.

The examples given can serve as models for the Arab region.

H. INCREASING COMMUNICATION BETWEEN THE FINANCE AND ENERGY EFFICIENCY INDUSTRIES

Traditionally, there has been very little contact between the energy efficiency industry and the finance industry because the scale of energy efficiency financing has been very small. The major point of contact has been in geographic and sectoral markets where third-party financing of EPCs has developed. Despite such contact, there is often a gap in understanding between the two groups, which inhibits investment, particularly when projects are developed in ways that do not meet the needs of the finance industry. In order to help the energy efficiency financing market grow and derisk the sector, it is important to increase contact and understanding between the two sectors. This is an important area for building capacity.

The Energy Efficiency Financial Institutions Group

EEFIG was established by the European Commission and the United Nations Finance Initiative in 2013 specifically to improve communications between the finance sector and the energy efficiency industry, and address the barriers to upscaling investment into energy efficiency.

The first EEFIG report, issued in 2015, made a number of recommendations which have relevance to all markets (Box 26).

In 2019, the work of EEFIG was further extended with additional financing from the European Commission. In this third phase of EEFIG, which will run until 2023, a number of the specific

barriers to increasing energy efficiency will be addressed by working groups made up of members from the finance sector and industry. To date, the working groups that have been established cover the following topics:

- Supporting the development of the Taxonomy on Sustainable Finance by the European Union and the tagging of energy efficiency loans.
- Further developing the Derisking Energy Efficiency Platform (see below).
- Assessing the multiple benefits of energy efficiency investments.
- Update on energy efficiency financing practices.
- Strengthening the links between energy efficiency and property values.
- Reducing the risks of energy efficiency investments.
- Developing energy efficiency financing for industry.
- Making the energy efficiency first principle operational within financial institutions.

Further working groups are planned. In addition, efforts are under way to create mini-EEFIGs within individual countries, which is important as energy efficiency financing is primarily country-specific and each country may have differing legal or other barriers.

An Arab region equivalent to EEFIG, bringing together energy efficiency and finance professionals to explore barriers to upscaling investment and encouraging greater collaboration, could be a useful tool for the region.



Box 25. The Energy Efficiency Financial Institutions Group

The Energy Efficiency Financial Institutions Group (EEFIG) was established in 2013 by the European Commission Directorate-General for Energy and the United Nations Environment Programme Finance Initiative. It has created an open dialogue and a work platform for public and private financial institutions, industry representatives and sector experts to identify the barriers to the long-term financing of energy efficiency and propose policy and market solutions. EEFIG has engaged 120 active participants from 100 organizations to deliver clear and unambiguous messages.

In February 2015, EEFIG presented its landmark report, *Energy Efficiency – the first fuel for the EU economy: How to drive new finance for energy efficiency investments*, which provided a significant advance in the understanding and knowledge of the issues around energy efficiency financing. The findings of the EEFIG report have contributed to actions such as G20 commitments, and the European Commission has taken the EEFIG report into full consideration for the implementation and development of energy efficiency-related policies. In 2015, five national EEFIG processes were launched taking the EEFIG methodology and results and replicating them at the national level in Bulgaria, France, Germany, Poland, and Spain.

In 2016, a consortium was formed to pursue EEFIG's conclusions and create an evidence base that would derisk energy efficiency investments for a new and emerging number of financial institutions entering this market. EEFIG is supported by a consortium of partners including COWI, Buildings Performance Institute Europe, EnergyPro, National Technical University of Athens, Fraunhofer Institute for Systems and Innovation Research, and Climate Strategy & Partners. On November 30, 2016, EEFIG's Derisking Energy Efficiency Platform (DEEP) was launched with over 7,800 projects in an open-source, pan-European Union database to improve the sharing and transparent analysis of existing energy efficiency projects in the buildings and industrial sectors. On June 22, 2017, the EEFIG Underwriting Toolkit was launched during the European Union Sustainable Energy Week. The toolkit is aimed specifically at financial institutions interested in ways to design better financial products for energy efficiency investment projects.

Source: Energy Efficiency Financial Institutions Group, 2020. The Energy Efficiency Financial Institutions Group.



Box 26. Recommendations contained in the 2015 report of the Energy Efficiency Financial Institutions Group

Market actions

- Improvement of buildings certification methodologies and energy performance certificate standards and the implementation of minimum performance standards upon building upgrade, sale or rental to help build a vibrant and comparable pan-European market for energy efficiency investments in buildings.
- Improvement of information flows by developing an open-source energy and cost database for buildings and effective systems for sharing information and technical experience within industry sectors.
- Facilitation of innovation such as on-bill repayment and on-tax finance mechanisms by creating pilots to help grow energy efficiency investments in commercial and residential buildings.
- Development of a project rating system to provide a transparent assessment of the technical and financial risks of buildings' energy renovation projects and their contracting structure.

Economic actions

- Streamline, blend and optimize the use of revenues from European Structural and Investment Funds, Horizon 2020 and the European Union Emissions Trading System for energy efficiency investments by improving their linkage to national building renovation strategies together with national energy efficiency funds and energy market reforms.
- Increase the use of targeted fiscal instruments to motivate both building owners and companies to prioritize energy efficiency during their natural replacement cycle.
- Review public and private accounting treatment of energy performance contracts.
- Experts to examine the discount rates used in energy modelling, policymaking and investment decision-making, to adequately balance the benefits and risks of energy efficiency.

Financial actions

- Develop a common set of procedures and standards for energy efficiency and buildings renovation underwriting for both debt and equity investments.
- Adjust to financial regulatory frameworks to better support capital market innovation, ensure that risk assessment and related capital requirements for long-term energy efficiency investments correctly reflect their risks and develop market potential for green bonds, citizen financing, factoring funds for energy performance contracts, and other more innovative sources of financing for energy efficiency.
- Address barriers to expanding the green mortgage market, for instance, by examining how to include energy costs and energy efficiency potential in mortgage affordability calculations.
- Ensure that new regulatory frameworks for financial institutions (Solvency II and Basel III) do not prejudice energy efficiency investments.
- Ensure that public technical assistance and project development assistance facilities are compatible and can be easily combined with market-based and concessional funding by qualified and experienced financial institutions.
- Ensure that public refinancing facilities, such as those operated by the European Central Bank, confirm eligibility for financial instruments relating to energy efficiency.

Institutional actions

- Increase the capacity to facilitate ongoing project development assistance to all relevant actors and technical assistance to relevant public-sector bodies and entities for development and aggregation of energy efficiency investments in small and medium-sized enterprises and households.
- Review the public authority procurement rules to better value lower operational costs as a part of their tender assessment processes.
- Strengthen institutional capacity to implement national buildings renovation roadmaps that enable long-term planning and supply chain scale-up to deliver and finance ambitious renovation programmes for buildings.
- Increasingly focus on regulatory frameworks which support strong corporate energy efficiency investment choices at key points in their investment cycle (connecting with energy audits).
- Ensure that current State aid rules do not unnecessarily burden accelerated energy efficiency investing and the upscaling of public-private financial instruments.

Source: European Commission, 2015. Energy Efficiency – the first fuel for the EU economy.

I. DATA COLLECTION AND DISSEMINATION

Understanding risk in any investment class requires data on the actual performance of investments in practice. Investors and lenders use data to assess risk and price financial products. As explained above, in energy efficiency, there is a paucity of actual performance data, both technical and financial. This creates uncertainty which increases the risk premium required by lenders, leading

to a mismatch between pricing and actual risks, or completely prevents investment. Establishing mechanisms through which data can be collected and shared can be an important way to build understanding of the actual risks involved in energy efficiency financing, building capacity within the finance industry and, hence, derisking investment.

1. EEFIG Derisking Energy Efficiency Platform (DEEP)

An example of data collection and sharing is the Derisking Energy Efficiency Platform (DEEP) of the Energy Efficiency Financial Institutions Group. DEEP is an open-source initiative to upscale energy efficiency investments in Europe through the improved sharing and transparent analysis of existing projects in building and industry. DEEP was one of the outputs of the 2015-2017 EEFIG Derisking Project funded by the European Commission and is currently being supported and extended by further funding within the EEFIG project. DEEP was established by requesting a standard set of information on energy efficiency investments from a wide range of actors including public and private investment funds, financial institutions, national and regional authorities, and energy efficiency solution providers. When it was launched in 2017, DEEP included data on 10,000 individual projects in buildings and industry across Europe. DEEP can produce analyses of projects by geography, building type, project type, payback periods, and avoided costs of energy. Users can carry out their own analyses and create user-specific analysis and charts. Examples are shown below.

At the time of writing, the DEEP summary was as follows:

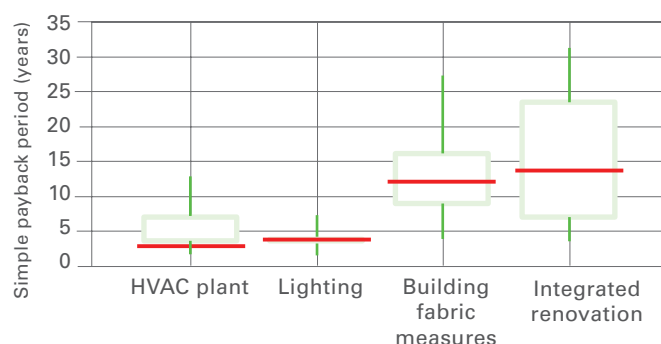
- 5,499 building projects.
- Median payback 4.8 years.
- Median avoidance cost 2.5 eurocent/kWh.

It should be noted that only approximately 10 per cent of projects in DEEP have actual performance data associated with them, the majority only has a priori data on projected performance.

Figures 34 and 35 represent types of output that can be obtained from DEEP.

An Arab region equivalent to DEEP could be a powerful derisking tool. Any implementation of this proposal should, however, ensure that real performance data can be collected in a move towards automatic data collection.

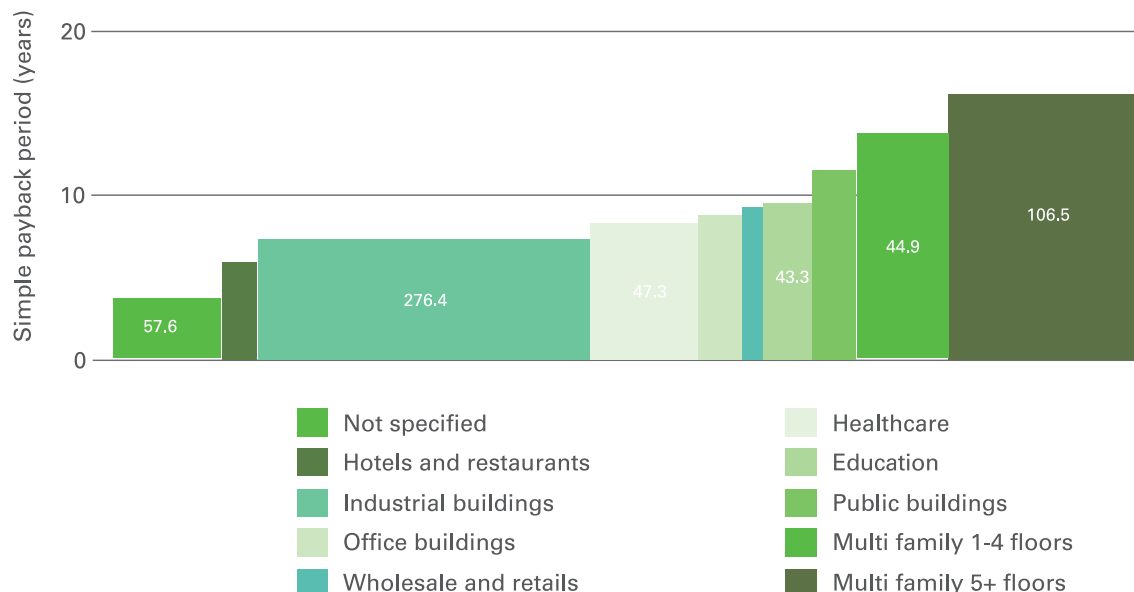
Figure 34. Sample data from the Energy Efficiency Financial Institutions Group's Derisking Energy Efficiency Platform: distribution of payback on 10 per cent, 25 per cent, 75 per cent and 90 percent by measure type



Source: Energy Efficiency Financial Institutions Group, 2017b. EEFIG De-risking Energy Efficiency Platform (DEEP).



Figure 35. Sample chart from the Energy Efficiency Financial Institutions Group's Derisking Energy Efficiency Platform: energy saving by average payback period and building type



Source: Energy Efficiency Financial Institutions Group, 2017b. EEFIG De-risking Energy Efficiency Platform (DEEP).

2. United States Department of Energy Building Energy Data Exchange Specification and Standard Energy Efficiency Data Platform

One barrier to the exchange and comparison of building-related data is the lack of standardization of terminology, even for terms that, at first sight, appear obvious such as floor area. Floor area can mean many things, including gross internal area, gross floor area and lettable floor area. The Building Energy Data Exchange Specification (BEDES) was funded by the United States Department of Energy and developed by a collaboration of stakeholders. It established data terms, definitions and field formats to facilitate the exchange of data on building characteristics and energy use. The BEDES Dictionary contains a common set of terms and definitions for building characteristics, efficiency measures and energy use, which can be used to support the analysis of the energy performance of buildings.

One of the applications of BEDES is the Standard Energy Efficiency Data (SEED) Platform which was introduced by the United States Department of Energy 'to help public agencies that are either

implementing building performance reporting regulations and/or tracking the performance of their own buildings'.⁶² SEED saves public authorities from making duplicative investments into project data collection and reporting systems.

Another application of BEDES is eProject Builder, which is a secure, web-based data management platform that allows ESCOs and customers to preserve, track and report information for their energy project portfolios. It facilitates collaboration between customers and the implementors of projects, allows projects to be benchmarked against project performance metrics, and generates statistics and reports for a portfolio of projects.

These applications can help derisk projects by standardizing building performance and energy efficiency project data. Arab regional versions, possibly based on the underlying United States systems, could be developed and implemented.

⁶² US Department of Energy. SEED FAQ. Available at <https://www.energy.gov/eere/buildings/seed-platform-frequently-asked-questions>.

J. DEVELOPMENT AND ADOPTION OF STANDARDS AND STANDARDIZED TOOLS

Financing any category of projects, or asset class, at scale requires standardization in order to reduce transaction costs and risks, facilitate capacity-building within the finance sector and enable secondary markets to develop. This is true for all financial products. Large-scale financing of, for instance, mortgages or car loans could not exist without a high degree of standardization. Financing wind power projects, for example, when the wind industry started to emerge in the early 1990s, was not standardized, but now the way in

which projects are developed and documented, data are collected and analysed and finance is deployed is highly standardized. Today, financing wind power is a global industry at scale with many market participants. Although energy efficiency is more heterogeneous than, for example, wind power, policymakers and other stakeholders need to move towards that level of standardization in order to upscale investment.

1. Standardization of project development and documentation: the Investor Confidence Project

One source of risk and increased transaction costs, as outlined above, is the lack of standardization in the development and documentation of energy efficiency projects. Although design standards do exist in most countries, their application can vary, as can the exact method of calculating energy savings, the underlying key assumptions of calculation, the extent to which variables such as weather are considered, the use of operations and maintenance plans, the use of measurement and verification plans, the use of commissioning plans, and the way in which projects are documented and presented for investment. This increases transaction costs as investors or lenders, or even internal decision makers, have to consider using third-party engineers to review the proposals and to value and risk-assess them. It also hinders investors or lenders from building human capacity in this area and investment in systems to help scale up investment.

One approach to standardization that has been used in the United States, the European Union and Canada is the Investor Ready Energy Efficiency™ (IREE) project certification system by ICP. IREE uses a set of open source protocols, developed for different types of projects such as simple, single technology or complex, multi-technology projects. Project developers can be accredited as ICP project developers based on their qualifications,

experience and having passed an ICP training course. Projects can be certified as IREE projects if the following applies:

- They have been developed by an ICP-accredited project developer.
- They have been developed and documented following the appropriate ICP protocol.
- The project has been assessed by an ICP-accredited quality assurance professional.

Although deployment of ICP IREE is still in its early stages in Europe (it is more developed in the United States), its ability to reduce both performance risk and transaction costs has been proven by Munich Re, a provider of energy efficiency project insurance, who offers lower insurance rates for IREE-certified projects and does not require third-party engineering assessment, which would be an additional cost.

In the European Union, the development of ICP was supported by the European Commission Horizon 2020 funding. As each country within the European Union has different technical standards, the protocols had to allow for variations between countries whilst maintaining a common quality standard. Such an approach would also be possible within the Arab region.

2. Standardization of contracts

Standardization is also important for contracts, particularly EPCs. Such contracts are complex by nature, and lack of standardization hampers their adoption. Standardization reduces transaction costs and risks when seeking third-party capital for projects undertaken under an EPC. Standardization

is also needed during the process of developing and procuring such contracts.

A number of initiatives around the world have developed the standardization of EPCs. Some of these are summarized in Table 14.

Table 14. Some global initiatives to standardize energy performance contracts

TITLE	COUNTRY	PUBLISHER	DATE	SOURCE
ENERGY PERFORMANCE CONTRACT MODEL	United States	Building Owners and Managers Association	2008	Building Owners and Managers Association International (BOMA), 2020
EUROCONTRACT	European Union	Berlin Energy Agency, Austrian Energy Agency plus others consortium members	2007	European Commission, n.d.
MODEL ENERGY PERFORMANCE CONTRACT	United Kingdom	United Kingdom Government	2015	United Kingdom Department of Energy and Climate Change, 2015
MODEL DOCUMENTS FOR AN ENERGY SAVINGS PERFORMANCE CONTRACT PROJECT	United States	United States Department of Energy	n.d.	United States, Department of Energy, n.d.
SHARED SAVINGS CONTRACT	Dubai	Regulatory and Supervisory Bureau for the Water and Electricity Sector in Dubai	n.d.	Regulatory and Supervisory Bureau, 2020

Source: Compiled by author, ESCWA.

3. Other standardized tools

A number of standardized tools can build capacity and grow the energy efficiency financing market. The areas in which tools are important include, but are not limited to the following:

- Initial assessment of potential energy efficiency projects that can be used to sell projects to decision makers.
- Underwriting/assessing the value and risk of energy efficiency projects.
- Matching projects to sources of finance.

This does not include the many technical tools available to assist in developing and engineering energy efficiency projects.

EEFIG Underwriting Toolkit

The EEFIG Underwriting Toolkit is designed to assist financial institutions to scale up their deployment of capital into energy efficiency. It was compiled with the following objectives in mind:

- Help originators, analysts and risk departments within financial institutions to better understand the nature of energy efficiency investments and, consequently, better evaluate both their value and risks.
- Provide a common framework for evaluating energy efficiency investments and analysing the risks that will allow training and capacity-building around standardized processes and understanding.

- Help developers and owners seeking to attract external capital to energy efficiency projects to develop projects in a way that better addresses the needs of financial institutions.
- Foster a common language between project developers, project owners and financial institutions.

The Underwriting Toolkit had the potential to become the basis of training packages for financial institutions considering deployment of capital into energy efficiency.⁶

4. Certification and accreditation schemes

Systems of certification and accreditation, both for individual practitioners and for companies, can build capacity and, hence, build confidence in energy efficiency and energy services propositions, helping to increase transaction flow. Two examples are the accreditation schemes of ESCOs in Dubai and Singapore.

Box 27. The accreditation scheme of energy service companies in Dubai

The accreditation scheme of energy service companies (ESCOs) in Dubai has already been mentioned in connection with the work of the Super ESCO, Etihad Energy Services. The accreditation scheme aims to give prospective clients confidence in contracting with ESCOs by recognizing companies which have appropriately qualified personnel in the organization, a robust financial status and a track record of successfully delivering energy saving projects in Dubai.

Saudi Arabia is following a similar model, and the approach is recommended for other countries aiming to use a Super ESCO to develop an ESCO market.

Source: Regulatory and Supervisory Board, 2020. ESCO Accreditation.

Box 28. The accreditation scheme of energy service companies in Singapore

According to Energy Efficient Singapore, a Singapore Government agency, the overall objective of accreditation is to enhance the professionalism and quality of services offered by energy service companies (ESCOs). This will enhance confidence in the energy services sector and help promote the growth of the industry. It is an important market development measure for Singapore. The accreditation scheme can lead to the following benefits:

- Develop professional and qualified ESCOs and energy engineers.
- Enhance the standing of ESCOs, and in particular energy auditing services.
- Support services procurement and selection procedures.
- Support public-sector incentive schemes in the promotion of energy efficiency.
- Reduce false claims amongst industry players.

There are different levels of accreditation for different levels of experience and types of systems expertise the ESCO possesses.

Source: Energy Efficient Singapore, 2020. Programmes and Grants. ESCO Accreditation Scheme.

63 For more information, see Energy Efficiency Financial Institutions Group, 2017a. EEFIG Underwriting Toolkit. Value and Risk Appraisal for Energy Efficiency Financing; Energy Efficiency Financial Institutions Group, n.d. The Energy Efficiency Financial Institutions Group.

10




DEVELOPING A COMMON LANGUAGE FOR ENERGY EFFICIENCY FINANCING

To increase investment flows into energy efficiency, there is a need in all markets to increase communication between energy efficiency professionals and finance professionals. The two professions speak very different languages, and failure to communicate is a barrier to developing bankable projects and programmes. This chapter provides a dictionary of common terms for both energy efficiency and finance professionals.

A. INTRODUCTION

Energy efficiency and finance are two different expert domains with very different languages. Unlike in the development of renewable energies, for example, there has generally been very little contact between energy efficiency and finance professionals as the amounts of third-party investment into energy efficiency have been small. This means that the two groups speak very different

languages and that in order to scale up investment into energy efficiency, it is important to build a common language between the two domains. This chapter reviews some of the most important concepts in energy efficiency and energy efficiency financing and serves as a starting point towards defining a standard language.

B. DEFINITIONS: ENERGY

TERM	ABBREVIATION	DEFINITION
DEEMED SAVINGS	-	Deemed savings, sometimes referred to as stipulated savings, is a method which estimates future energy savings on a theoretical basis without requiring performance measurement of an energy efficiency project after implementation. The deemed savings approach has incorrectly been referred to by some as an measurement and verification option, and it has been suggested that the Efficiency Valuation Organization (EVO) add deemed savings as a fifth measurement and verification method in its globally recognized International Performance Measurement and Verification Protocol (IPMVP). However, since deemed savings do not include the measurement of energy use after implementation, it cannot be considered a measurement and verification method and, thus, can never be an IPMVP option. Source: Efficiency Valuation Organization, 2019.
DEEP RETROFIT	-	Deep retrofit means the implementation of a set of energy efficiency measures that achieve a high level of energy savings. While there is no universally accepted definition of a deep retrofit, the International Energy Agency Energy in Buildings and Communities (EBC) Programme Annex 61 project defined it as a major building renovation

		project in which the intensity of site energy use, including plug loads, has been reduced by at least 50 per cent from the pre-renovation baseline. Source: International Energy Agency, 2017. Deep retrofits usually involve whole building analysis and optimizing a combination of energy efficiency measures including changes to the building fabric; heating, ventilation and air-condition (HVAC); controls; lighting and appliances; and a systems-thinking approach. Deep retrofits should be compared to retrofits achieving a lower level of savings, usually through the implementation of a limited set of simple energy efficiency measures such as HVAC, controls or lighting upgrades (often called 'low-hanging fruit').
DEMAND RESPONSE	DR	DR means that energy users change their electricity consumption in response to a signal or incentive from the network operator. Source: Association for Distributed Energy, 2020. DR is usually triggered at times of high demand as a way of balancing supply and demand. Signals can be manual or automatic and lead to demand being reduced, for instance, by switching off non-essential loads. DR can be mandatory or voluntary, and consumers can be incentivized by the utility to take demand response action. Traditionally, DR has been thought of as customers reducing demand but increasingly, especially in markets with high levels of variable renewable energy, it can include customers turning up demand. DR is usually associated with electricity although it could, in principle, also be applied to gas consumption.
DISTRIBUTED ENERGY RESOURCE	DER	A DER is a resource sited close to customers that can provide all or some of their immediate electric and power needs and can also be used by the system to either reduce demand (such as energy efficiency) or provide supply to satisfy the energy, capacity or ancillary service needs of the distribution grid. The resources, if providing electricity or thermal energy, are small in scale, connected to the distribution system, and close to the load. Examples of different types of DER include solar photovoltaic, wind, combined heat and power, energy storage, DR, electric vehicles, microgrids, and energy efficiency. Source: United States, Department of Energy, 2018.
EMBODIED ENERGY		Embodied energy is the total energy required for the extraction, processing, manufacturing, and delivery of buildings. Unlike the life cycle assessment, which evaluates all of the impacts over the whole life of a material or element, embodied energy only considers the front-end aspect of the impact of a building material. It does not include the operation or disposal of materials. Source: European Commission, 2020. As buildings become more energy efficient in their operation, the amount of embodied energy becomes more significant.

ENERGY AS A SERVICE	EaaS	In the electricity sector, service business models, typically referred to as EaaS, provide the customer with energy services, such as lighting, in exchange for a recurring fee. The customer benefits from avoiding direct electricity payments, expensive upgrades for electrical equipment or software, or device management while still benefiting from the use of the device. Similar to service models in other sectors, EaaS can make better technology (such as energy devices and software) more accessible and benefit consumers, service companies, the electrical grid, and potentially society overall. Source: Resources for the Future, 2019.
ENERGY CONSERVATION MEASURE	ECM	An ECM is any intervention taken with the intention of reducing energy usage for any given process. ECMs can be single technology interventions such as LED lighting, or combinations of multiple technologies in complex projects. The term ECM is increasingly being replaced by EEM (see below).
ENERGY EFFICIENCY	EE	EE means the ratio of output of performance, service, goods, or energy, to input of energy. Source: European Commission, 2012.
ENERGY EFFICIENCY AS A SERVICE	EEaS	EEaS is a pay-for-performance, off-balance sheet financing solution that allows customer to implement energy and water efficiency projects with no upfront capital expenditure. The provider pays for project development, construction and maintenance costs. Once a project is operational, the customer makes services payments that are based on actual energy savings or other equipment performance metrics, resulting in immediate reduced operating expenses. The energy services agreement (ESA) is the most common type of arrangement, but other models such as light-as-a-service (LaaS) and energy subscription agreements are also in use. Source: United States Department of Energy, Better Building, n.d.
ENERGY EFFICIENCY IMPROVEMENT		Energy efficiency improvement is an increase in energy efficiency as a result of technological, behavioural and/or economic changes. Source: International Standards Organization, 2015.
ENERGY EFFICIENCY MEASURE	EEM	EEM is the same as ECM.
ENERGY EFFICIENCY NETWORK	EEN	EENs are a concept to accelerate energy efficiency progress in companies. They were developed in Switzerland back in the late 1980s. Since then, the approach has been successfully transferred to other countries inside and outside Europe, including Austria, Germany, France, Italy, Sweden, Canada, China, Japan, and the United States. Source: Odyssee-Mure, 2016.

ENERGY INTENSITY		Energy intensity is measured by the quantity of energy required per unit output of activity. At the aggregate level of the economy energy, intensity is measured as energy/gross domestic product (GDP). For tracking SDG 7, the following definitions of energy intensity are used: Overall economy: total primary energy supply in MJ/GDP in \$2011 PPP. Services: total final energy consumption for services in MJ/services value added in \$2011 PPP. Residential: total final energy consumption for residential sector in MJ/residential floor area in m². Source: International Energy Agency and others, 2019.
ENERGY PERFORMANCE CONTRACT	EPC	An EPC is defined as a contract under which energy efficiency measures are provided, verified and monitored during the whole term of the contract, and paid for by reference to a contractually agreed level of energy efficiency improvement or other agreed criterion such as financial savings. Source: United Kingdom, Department of Energy and Climate Change, 2015.
ENERGY PERFORMANCE CONTRACTING		Energy performance contracting means a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings. Source: European Commission, 2012. In an energy performance contract, the contractor, typically an energy service company (ESCO), designs and delivers a set of energy efficiency measures and guarantees their performance over the length of the contract. Such contracts are often associated with third party financing of energy efficiency. They have mainly been used in the public sector.
ENERGY PRODUCTIVITY		Energy productivity is a measure of the economic benefit we receive from each unit of energy we use. It is calculated by dividing total economic output (for instance, GDP or revenue) by the amount of energy consumed (for instance, barrels of oil equivalent, or kilowatt hours of electricity). At the aggregate level of the economy, it is the inverse of energy intensity, GDP/energy. Energy productivity of an economy is affected both by energy efficiency and the structure of an economy. Source: Alliance to Save Energy, n.d.

ENERGY SERVICE		Energy service is the physical benefit, utility or good derived from a combination of energy with energy efficient technology or with action, which may include the operations, maintenance and control necessary to deliver the service, which is delivered on the basis of a contract and, under normal circumstances, has proven to result in verifiable and measurable or estimable energy efficiency improvement or primary energy savings. Source: European Commission, 2012.
ENERGY SERVICE COMPANY	ESCO	An ESCO is a company that offers energy services which may include implementing energy efficiency projects (and also renewable energy projects) and, in many cases, on a turn-key basis. The three main characteristics of an ESCO are the following: • ESCOs guarantee energy savings and/or provision of the same level of energy service at lower cost. A performance guarantee can take several forms. It can revolve around the actual flow of energy savings from a project, can stipulate that the energy savings will be sufficient to repay monthly debt service costs, or that the same level of energy service is provided for less money. • The remuneration of ESCOs is directly tied to the energy savings achieved. • ESCOs can finance or assist in arranging financing for the operation of an energy system by providing a savings guarantee. Therefore, ESCOs accept some degree of risk for the achievement of improved energy efficiency in a user's facility and have their payment for the services delivered based (either in whole or at least in part) on the achievement of those energy efficiency improvements. Source: Joint Research Centre, 2020.
ENERGY SAVINGS PERFORMANCE CONTRACT	ESPC	An ESPC is a budget-neutral approach to make building improvements that reduce energy (and sometimes water) use and increase operational efficiency. Source: United States Department of Energy, n.d.c. ESPCs are essentially the same as EPCs. The ESPC terminology is more common in the United States, particularly in connection with federal and state projects. EPCs are more common in Europe and elsewhere.
GRID-INTERACTIVE EFFICIENT BUILDINGS		A grid-interactive efficient building is an energy efficient building with smart technologies characterized by the active use of distributed energy resources to optimize energy use for grid services, occupant needs and preferences, and cost reductions in a continuous and integrated way. Source: United States Department of Energy, 2019.

		As electricity systems evolve to have higher levels of variable renewable energy, there is an increasing need for flexibility within the electricity system. Demand response can provide a degree of flexibility, and it is envisaged that buildings will become more grid-interactive, automatically changing demand in response to signals from the electricity system, either physical or price signals. In addition, more and more buildings will have a degree of self-generation through renewables such as PVs and/or cogeneration/trigeneration. Buildings will become both consumers and producers of electricity ('prosumers') and regularly interact with the grid actively rather than just be passive consumers. Providing energy and ancillary services to the grid can provide a source of income to building owners and reduce carbon intensity of the grid.
GUARANTEE OF ENERGY EFFICIENCY IMPROVEMENT		A guarantee of energy efficiency improvement is a commitment of the service provider to achieve a quantified energy efficiency improvement (as defined in EN 15900:2010). Source: International Standards Organization, 2017.
INTERNATIONAL PERFORMANCE MEASUREMENT AND VERIFICATION PROTOCOL	IPMVP	This Protocol is an international standard for evaluating the energy savings produced by energy efficiency projects. Source: Efficiency Valuation Organization, n.d.
MANAGED ENERGY SERVICES AGREEMENT	MESA	A MESA is a variation of an energy services agreement (ESA). In an ESA, the provider develops, finances, owns, operates, and maintains all energy efficiency measures and equipment installed during the term of the project. A MESA differs from an ESA because the provider also assumes the broader energy management of a client's facility, including the responsibility for utility bills, in exchange for a series of payments based on the customer's historic energy use. Source: Institute for Market Transformation, n.d.
MEASUREMENT AND VERIFICATION	M&V	The measurement and verification is the process of planning, measuring, collecting, and analysing data for the purpose of verifying and reporting energy savings within an individual facility resulting from the implementation of ECMs. Savings cannot be directly measured, as they represent the absence of energy use before and after implementation of a project, making appropriate adjustments for changes in conditions. M&V activities consist of some or all of the following: • Meter installation calibration and maintenance. • Data gathering and screening. • Development of a computation method and acceptable estimates. • Computations with measured data. • Reporting, quality assurance and third-party verification of reports. Source: Efficiency Valuation Organization, 2020.

METERED ENERGY EFFICIENCY TRANSACTION STRUCTURE	MEETS	MEETS is a fundamentally different approach to energy efficiency. An energy tenant has a long-term agreement with the building owner to harvest and sell metered energy savings. Savings are produced by investing capital from an investor and paying rent to the building owner. Revenue is created by selling the metered energy savings to the local utility under a contract similar to a power purchase agreement. Source: Metered Energy Efficiency Transaction Structure Coalition, 2010.
MULTIPLE BENEFITS		The term multiple benefits aims to capture a reality that is often overlooked, namely, that investment in energy efficiency can provide many different benefits to many different stakeholders. Whether by directly reducing energy demand and associated costs (which can enable investment in other goods and services) or facilitating the achievement of other objectives (for instance, making indoor environments healthier or boosting industrial productivity), recent research acknowledges the enormous potential of energy efficiency. Source: International Energy Agency, 2014. The multiple benefits of energy efficiency improvements include, inter alia, the following: • Increase in asset value. • Increase in disposable incomes. • Savings on public budgets. • Reduction in local air pollution. • Employment. • Improved health and well-being. • Poverty alleviation. • Increase in industrial productivity. • Macroeconomic impacts (such as reduction in imports). • Reduction in greenhouse gas emissions.
NEARLY ZERO ENERGY BUILDING	NZEB	NZEB is a European Union definition that means a building with a very high energy performance. The nearly zero or very low amount of energy required should be covered to a very significant extent from renewable sources, including energy from renewable sources produced on-site or nearby. Source: European Commission, 2020.
NET ZERO CARBON BUILDING		A net zero carbon building is a highly energy-efficient building with all remaining operational energy use from renewable energy, preferably on-site but also off-site production, to achieve net zero carbon emissions annually in operation. Source: World Green Building Council, 2017. Other definitions of net zero carbon buildings consider both operational energy and energy use in construction, including embodied carbon. The World Green Building Council has developed a framework definition around two approaches to net zero carbon, which is as follows:

		Net zero carbon – construction: When the amount of carbon emissions associated with a building’s product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy. Net zero carbon – operational energy: When the amount of carbon emissions associated with the building’s operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset. A third approach for net zero carbon – whole life is being developed. Source: World Green Building Council, 2019.
NET ZERO ENERGY BUILDING	NZEB	An NZEB is an energy efficient building where, on a source basis, the actual delivered energy is less than or equal to the on-site renewable exported energy. Source: United States Department of Energy, 2015. NZEB can mean either net zero energy building or nearly zero energy building (see above).
NON-ENERGY BENEFITS	NEB	NEBs are multiple benefits of energy efficiency that are not energy-related (see multiple benefits).
ON BILL FINANCING	OBF	OBF allows utility customers to invest in energy efficiency improvements and repay the funds through additional charges on their utility bill. Under this approach, a third party (such as an energy service provider) provides upfront funding for energy efficiency improvements to an investor (such as a tenant in a commercial building). The investor pays back the loan via the energy bill. In many cases, repayments are structured in such a way that the monthly energy savings achieved through the investment equal or outweigh the loan repayments. If structured properly, an OBF programme can substantially reduce the cost of an improved access to financing. Source: OECD, 2015. Collection of repayments by OBF is lower risk in many markets as consumers have lower default rates on their energy bills than for other general borrowing.
ON BILL REPAYMENT	OBR	OBR is another term for on bill financing.
ONE STOP SHOP		One stop shops aim at providing integrated services for existing buildings. They offer a turnkey solution to clients, removing the need for building owners to contact, and possibly contract with, several different contractors. In addition to adding cost and complexity to the renovation process, having to utilize multiple contractors increases the risks of technical errors. Examples in Europe include PassPicardie, France; Oktave, France; Rhodoshop, Bulgaria; SuperHomes, Ireland; and BetterHome, Denmark. Source: Turnkey Retrofit, 2020.

POTENTIAL FOR IMPROVING ENERGY EFFICIENCY		The potential for improving energy efficiency has long been studied, both at national and international levels, and within individual sectors within countries such as residential buildings, commercial buildings and industry (and subsectors). Potential can be divided into technical potential, which is the potential that is achievable by applying all available technology without consideration of economics, and economic potential, which is the potential that can be achieved by applying technologies that are economic. It is understood that there is a gap, namely, the energy efficiency gap, between the economic potential and what is actually implemented, a gap that exists because of the many barriers to improving energy efficiency.
POWER PURCHASE AGREEMENT	PPA	A PPA refers to a long-term electricity supply agreement between two parties, usually between a power producer and a customer. Source: Next Kraftwerke, n.d.
RETROFIT		Retrofit means the addition of new technology to older systems. For buildings, typical technologies added include thermal insulation, new windows/glazing, new heating, ventilation and air conditioning equipment, control systems, low water flow taps and showerheads, and rooftop solar (photovoltaic or thermal) systems.
RISKS OF ENERGY EFFICIENCY INVESTMENTS		In finance, risk is the possibility that the actual return will be different from its expected return. Risk is often defined as quantifiable whereas uncertainty is not quantifiable. One of the barriers to energy efficiency financing is the lack of data on the real performance of projects which means that, generally, there is a degree of uncertainty about the outcome. Financial institutions and investors are comfortable with various levels of risk depending on their objectives and investment mandate but they are not comfortable with uncertainty. The risks of energy efficiency investment are set out in the section on derisking. Governments and other agencies should encourage and facilitate the collection of more data on the real risks of energy efficiency investments of all types.
SPECIFIC ENERGY		Specific energy is the quotient describing the total energy consumption per unit of output or service. Example: annual kilowatt hour (kWh) per square metre (m²). Source: International Standards Organization, 2020.
VALUE OF ENERGY EFFICIENCY INVESTMENTS		Value is defined as worth, usefulness or importance in comparison with something else. Traditionally, the value of energy efficiency was primarily thought to be the units of energy saved and their financial value (units x price). In recent years, the perspective has changed to include the multiple non-energy benefits of energy efficiency (described above). One of the barriers to improving energy efficiency is that the value of energy saved can be quite small and relatively unimportant to the consumer.

		compared to other costs. For example, in commercial offices, there is a generally accepted ratio of 3:30:300 which refers to the relative cost of utilities, rent and staff in that order. Even making a 50 per cent saving on utilities only has a very small impact on the overall cost base and, therefore, may be deemed unimportant. When assessing the value of energy efficiency investments, it is now recognized that the value of non-energy benefits, such as productivity improvements or improved health and well-being, may be more valuable than the energy cost savings, and may be strategic to the decision maker. Investments that are considered strategic are far more likely to proceed than non-strategic investments. The science of identifying and valuing all the non-energy benefits of energy efficiency investments is still evolving but should be encouraged to make better business cases for investment. One potential problem is that the benefits fall to different actors. Consumers benefit from lower energy bills but in a rented home, for instance the long-term value of increased asset value, falls to the landlord. The benefits of reduced need to invest in electricity infrastructure fall to the utility or distribution/transmission company. The benefits of reduced air pollution or reduced import of fuel operate at the national level. The source, value and beneficiary of all of the multiple benefits of energy efficiency needs to be considered in investment decisions, especially those utilizing public money.
VOLUMETRIC RISK		A cash flow risk caused by deviations in delivered (or saved) volumes (of energy) compared to the expected volumes. Source: OECD, 2015.

C. DEFINITIONS: FINANCE

TERM	ABBREVIATION	TERM
AGGREGATION		Aggregation refers to aggregating demand, such as communities joining up in cooperatives or pooling energy demand in a region and bulk-procuring services to deliver household energy efficiency systems, or aggregating a portfolio of projects (normally small enterprises or projects) with similar technologies or business models. Some of the benefits of aggregation include transaction cost reductions and limited risk exposure because aggregation distributes costs and diminishes the associated risks of a portfolio's execution, meaning that risks are distributed if a project underperforms. Source: Basel Agency for Sustainable Energy for United Nations Environment, 2019.
BANKABLE		Projects that have sufficient collateral, probability of success and predictability of future cash flow become bankable, in other words, acceptable to prospective financiers. Source: OECD, 2015.

BLENDED LOANS		Blended loans mix grants or concessionary loans with additional funds raised from other sources such as capital markets. Blended loans can reduce borrower costs. Blended mechanisms are increasingly used by multilateral development banks. Source: Basel Agency for Sustainable Energy for United Nations Environment, 2019.
BUNDLING		Project bundling is the grouping of different energy efficiency projects into one project package to enlarge the total project size. Source: Energy 4 Cohesion, 2007.
CAPITAL RECYCLING		Capital recycling means providing refinancing once a project is at the operational stage so that early-stage investors have an exit strategy, allowing them to free up capital to invest in new projects, in other words, to recycle their capital. Source: OECD, 2015.
CO-INVESTMENT		Co-investment is a form of direct investment whereby institutional investors partner up with other investors to invest in an asset. Source: OECD, 2015.
CONVERTIBLE DEBT		A combination of debt and equity, convertible loans can be repaid or converted into company shares at a later date. Source: Basel Agency for Sustainable Energy for United Nations Environment, 2019.
CREDIT ENHANCEMENT		Credit enhancement is any measure that reduces the risk that a financing will not be repaid. Source: United States Department of Energy, 2020.
CROWDFUNDING		Crowdfunding is the practice of raising capital through the collective efforts of a large pool of individuals or peer-to-peer lending that can include individual investors, family and friends typically through social media and crowdfunding web platforms. Finance offered through crowdfunding includes lending, equity, donations, and insurance, among others. Source: Basel Agency for Sustainable Energy for United Nations Environment, 2019.
CROWDING-IN		Crowding-in occurs when public investment increases the marginal productivity of private capital or labour, or reduces the costs that investing firms incur and induces greater private investment than would have occurred otherwise. Source: OECD, 2015.
CROWDING-OUT		Crowding-out occurs when a public intervention directly displaces the efforts of the private sector by undertaking projects the private sector would otherwise have done. Crowding-out can also occur directly if Governments use distortionary taxes to fund public investment. Source: OECD, 2015.

EXTERNAL LENDING MANDATE	ELM	ELM is an important instrument through which the European Union supports investment in partner countries. It is based on a partnership between the European Commission and the European Investment Bank (EIB), whereby the Commission provides a guarantee from the budget of the European Union to enable the EIB to increase its lending outside the European Union in support of its policies. Source: European Commission, 2019.
FINANCING INSTRUMENT		A financing instrument is a tradeable asset of any kind, either cash, evidence of an ownership interest in an entity, or a contractual right to receive or deliver cash or another financing instrument. Source: OECD, 2015.
FORFAITING		Forfaiting involves selling long-term receivables to buyers (forfaiters) who are willing and able to bear the costs and risks of credit and collections. Source: Financial Dictionary. Forfaiting is a way of enabling recycling of capital for the initial investor in a project that creates a long-term stream of repayments.
FUND		A fund is an investment company that invests funds which are aggregated and pooled from individual investors for a fee. Investment funds give individual investors access to a wider range of financial products than investors themselves would have been able to access. Source: Financial Dictionary.
GREEN BONDS		Green bonds were created to fund projects that have positive environmental and/or climate benefits. The majority of the green bonds issued are green use-of-proceeds or asset-linked bonds. Proceeds from these bonds are earmarked for green projects but are backed by the issuer's entire balance sheet. There have also been green use-of-proceeds revenue bonds, green project bonds and green securitized bonds. Source: Climate Bonds Initiative, 2020.
GREEN INVESTMENT BANK		Green investment banks are broadly defined as a public, quasi-public or non-profit entity established specifically to facilitate and crowd in domestic private low-carbon-resilient infrastructure investments. Source: OECD, 2015.
IMPACT INVESTING		Impact investments are investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return. Impact investments can be made in both emerging and developed markets and target a range of returns from below market-to-market rate, depending on investors' strategic goals. Source: Global Impact Investing Network, 2020.
INSTITUTIONAL INVESTOR		An institutional investor is a legal entity that accumulates the funds of numerous investors (which may be private investors or other legal entities) to invest in various financial instruments and profit from the process. Source: Corporate Finance Institute, 2020a.

INVESTMENT GRADE		In the context of bond ratings, investment grade is the rating level above which institutional investors have been authorized to invest. Investment-grade bonds are those that are assigned a rating in the top four categories by commercial credit rating companies. S&P classifies investment grade as BBB or higher, and Moody's classifies investment-grade bonds as BAA or higher. Source: OECD, 2015.
LOAN LOSS RESERVE	LLR	LLR is a credit enhancement approach that provides partial risk coverage to lenders, meaning that the reserve will cover a prespecified amount of loan losses. For example, an LLR might cover a lender's losses up to 10 per cent of the total principal of a loan portfolio. Source: United States, Department of Energy, 2020.
MEZZANINE FINANCING		Mezzanine financing is a layer of financing that fills the gap between senior debt and equity in a company (or project). It can be structured either as preferred stock or as unsecured debt, and it provides investors with an option to convert to equity interest. Mezzanine financing is usually used for growth prospects, such as acquisition and expansion of the business. The basic form of mezzanine financing is unsecured debt and preferred stocks. As mezzanine financing is unsecured, it carries higher risks, and investors require a higher rate of return than secured lenders. Source: Corporate Finance Institute, 2020.
MULTIPLE BENEFITS		The term multiple benefits aims to capture a reality that is often overlooked, namely, that investment in energy efficiency can provide many different benefits to many different stakeholders. Whether by directly reducing energy demand and associated costs (which can enable investment in other goods and services) or facilitating the achievement of other objectives (for instance, making indoor environments healthier or boosting industrial productivity), recent research acknowledges the enormous potential of energy efficiency. Source: International Energy Agency, 2014. The multiple benefits of energy efficiency improvements can include, inter alia, the following: • Increase in asset value. • Increase in disposable incomes. • Savings on public budgets. • Reduction in local air pollution. • Employment. • Improved health and well-being. • Poverty alleviation. • Increase in industrial productivity. • Macroeconomic impacts (such as reduction in imports). • Reduction in greenhouse gas emissions.
NON-ENERGY BENEFIT	NEB	NEBs are the multiple benefits of energy efficiency that are not energy-related (see multiple benefits).

ON BILL FINANCING	OBF	OBF allows utility customers to invest in energy efficiency improvements and repay the funds through additional charges on their utility bill. Under this approach, a third party (such as an energy service provider) provides upfront funding for energy efficiency improvements to an investor (for instance, a tenant in a commercial building). The investor pays back the loan via the energy bill. In many cases, repayments are structured in such a way that the monthly energy savings achieved through the investment equal or outweigh the loan repayments. If structured properly, an OBF programme can substantially reduce the cost of an improved access to financing. Source: OECD, 2015. Collection of repayments by OBF is lower-risk in many markets as consumers have lower default rates on their energy bills than for other general borrowing.
ON BILL REPAYMENT	OBR	OBR is another term for on bill financing.
PUBLIC-PRIVATE PARTNERSHIP	-	A public-private partnership is a long-term contract between a private party and a Government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility and remuneration is linked to performance. Source: World Bank, 2017.
REVOLVING DEBT		A revolving debt is a type of debt that typically has a variable interest rate, an open-ended term and payments that are based on a percentage of the balance. Source: OECD, 2015.
RISK-ADJUSTED RETURN		Risk-adjusted return is a measure of valuing return on investment calculated in a way that takes into account the risk associated with the investment. Source: OECD, 2015.
SECURITIZATION		Securitization is the process of transforming illiquid financial assets into tradable products. Source: OECD, 2015.
SPECIAL-PURPOSE VEHICLE	SPV	An SPV is a legal entity created to fulfil specific and well-defined financial or regulatory objectives. For project finance, an SPV may be created to hold the assets associated with a project, thereby keeping the investment off the balance sheets of project developers. Within the securitization framework, an SPV can be a legal entity which may issue securities or other debt instruments, may legally or economically own assets underlying the issue of the securities mentioned above and be financially and legally isolated from the originator. Source: OECD, 2015.
RISK MITIGATOR		A risk mitigator is a targeted financial intervention that is aimed at reducing, re-assigning or re-apportioning different investment risks. Source: OECD, 2015.

TRANSACTION ENABLER		A transaction enabler is a process or technique which facilitates investment by reducing the associated transaction costs or otherwise enabling the investment to be made. Source: OECD, 2015.
UNDERWRITING		In the case of loans, underwriting is the process by which a lender decides whether a potential creditor is creditworthy and should receive a loan. For securities issuances, underwriting is the procedure by which an underwriter, such as an investment bank, brings a new security issue to the investors in such an offering. Source: OECD, 2015.
VALUE AT RISK	VAR	VAR is a financial metric that estimates the risk of an investment. More specifically, VAR is a statistical technique used to measure the amount of potential loss that could happen in an investment portfolio over a specified period of time. VAR gives the probability of losing more than a given amount in a given portfolio. Source: Corporate Finance Institute, 2020.
VALUE OF ENERGY EFFICIENCY INVESTMENTS		Value is defined as worth, usefulness or importance in comparison with something else. Traditionally, the value of energy efficiency was primarily thought to be the units of energy saved and their financial value (units x price). In recent years, the perspective has changed to include the multiple non-energy benefits of energy efficiency (described above). One of the barriers to improving energy efficiency is that the value of energy saved can be quite small and relatively unimportant to the consumer compared to other costs. For example, in commercial offices, there is a generally accepted ratio of 3:30:300 which refers to the relative cost of utilities, rent and staff, in that order. Even making a 50 per cent saving on utilities only has a very small impact on the overall cost base and, therefore, may be deemed unimportant. When assessing the value of energy efficiency investments, it is now recognized that the value of non-energy benefits, such as productivity improvements or improved health and well-being, may be more valuable than the energy cost savings, and may be strategic to the decision maker. Investments that are considered strategic are far more likely to proceed than non-strategic investments. The science of identifying and valuing all the non-energy benefits of energy efficiency investments is still evolving but should be encouraged to make better business cases for investment. One potential problem is that the benefits fall to different actors. Consumers benefit from lower energy bills but in a rented home, for instance, the long-term value of increased asset value falls to the landlord. The benefits of reduced need to invest in electricity infrastructure fall to the utility or distribution/transmission company. The benefits of reduced air pollution or reduced import of fuel operate at the national level. The source, value and beneficiary of all of the multiple benefits of energy efficiency needs to be considered in investment decisions, especially those utilizing public money.

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