

Poland: Catching-up Regions: Enhancing energy efficiency to improve the air quality in Malopolskie and Silesia regions

November 30, 2017



Outline

I. Background

II. World Bank Diagnostic Study of SFBs

III. Preparation of Financial Incentive Instruments and Delivery Schemes

IV. World Bank's Global EE portfolio: experience and lessons learned

Background

1. Poland's single-family buildings (SFBs) are one of the main sources of air pollution. Residential Energy Efficiency (EE) measures - such as thermal rehabilitation of buildings and replacement of inefficient boilers – can substantially reduce pollution.
2. Energy poor consumers have little incentive to switch to more efficient solid fuel or gas boilers which use cleaner but more expensive fuels.
3. Anti-smog resolutions in some regions and national regulations and standards for solid fuels and boiler emissions, if enforced, will require SFB's to replace boilers not compliant with new regulations.
4. Existing incentive schemes at the national and regional levels are marred by high transaction costs, institutional fragmentation, and duplication.
5. New financial instruments and implementation mechanisms are needed to support and incentivize poor and non-poor SFBs to make investments in EE measures.

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- II. World Bank Diagnostic Study of SFBs**
- III. Preparation of Financial Incentive Instruments and Delivery Schemes
- IV. World Bank's Global EE portfolio: experience and lessons learned

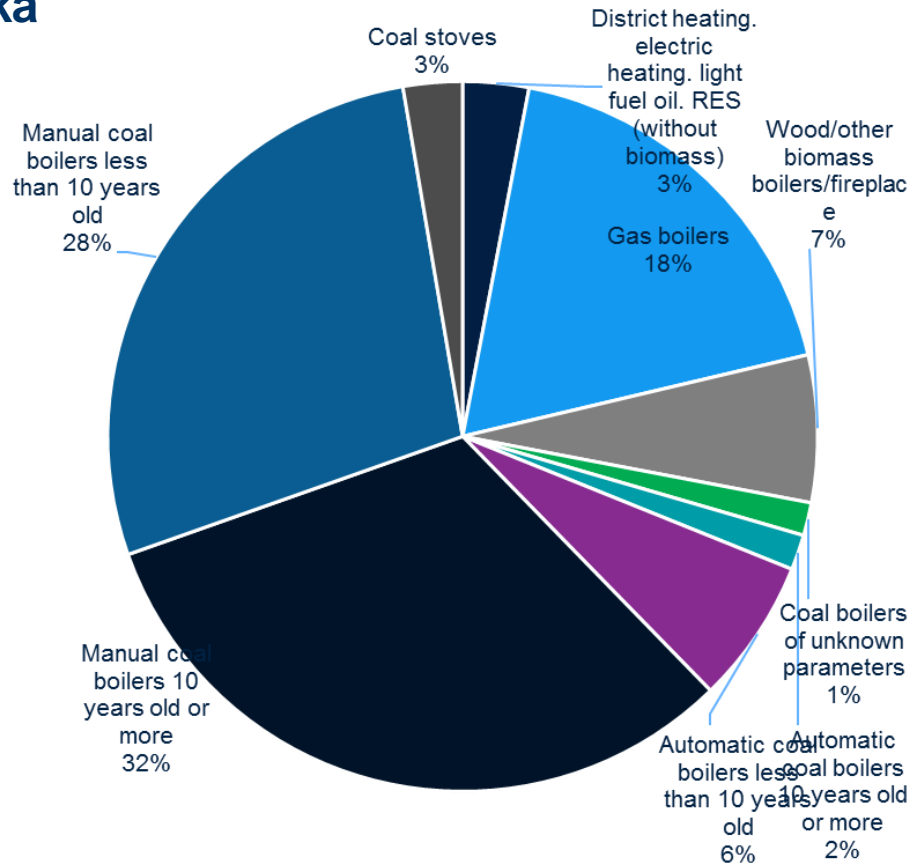
World Bank Diagnostics (2017): Energy Efficiency Opportunities in Single Family Buildings (SFBs) for Reducing Air Pollution

- 77% of SFBs in Małopolskie and 86% in Silesia use solid fuels for space heating
- 86% of coal boilers in Małopolska and 70% of boilers in Silesia are manually fed, inefficient, and have high emissions
- Anti-smog resolutions will require replacement of about 440,000 solid fuel boilers in Małopolska and about 470,000 boilers in Silesia
- About one-third of SFBs in Małopolska do not have insulation on walls, and a quarter do not have roof insulation making them inefficient

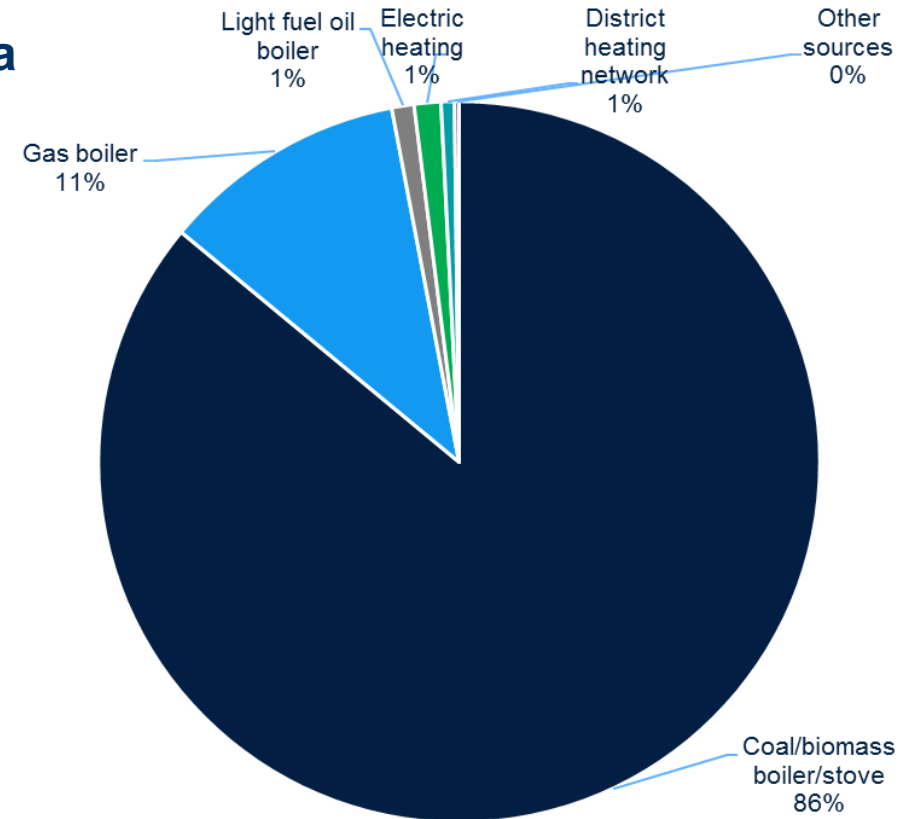
	Malopolska	Silesia
Number of SFBs (2016)	563,700	547,200
SFBs located in rural areas	73%	47%
Estimated number of solid fuel boilers (2016)	435,000	470,000
SFB's with access to gas network	64.4%	36.3%
SFB's with uninsulated walls (nos. & %)	190,500 (34%)	293,200 (54%)

World Bank Diagnostics (2017): Energy Efficiency Opportunities in Single Family Buildings (SFBs) for Reducing Air Pollution

Malopolska



Silesia



SOURCE: World Bank's Poland Catching Up Regions Program: EE Diagnostics (2017)

World Bank Diagnostics (Poland CuR2 -2017): EE Investment Opportunities and Potential Benefits in SFBs

Replacement of old manually-fed coal boiler with Eco-design automatic coal boiler & thermal retrofit of SFB			
	Boiler replacement + thermal retrofit of SFB**	Only boiler is replaced	Only thermal retrofit of SFB (old boiler is retained)**
Average Energy Savings (in KWh/sqm/yr)	319	127	262
Fuel savings (coal use)	6.9 tons	3.4 tons	5.3 tons
Annual fuel cost savings (the new boiler requires higher priced coal)	1,080 PLN	(1,857) PLN	1,479 PLN
Total investment***	82,000 PLN	13,500+	68,500 PLN
Annual reduction in particulate emissions	98 kg	95 kg	42 kg
Annual reduction in CO2 emissions	3.4 tons	(4.1) tons*	4.0 tons

• Note that without thermal retrofit, the heat load of the SFB is unchanged and will need a larger capacity boiler than with thermal retrofit.

• The automatic-fed coal boiler consumes electricity for its operations

+ An automatic Ecodesign boiler (5-10 kW) costs about 9,000 PLN compared to about 2,500 PLN for a “smoker” or manually fed boiler.

Including cost of installation and duct work, the cost of installing a new automatic boiler is about 13,500 PLN

*** In case of boilers it includes cost of Duct Work and Installation costs also

** Cost of Energy Audit is not included

World Bank Diagnostics (Poland CuR2 -2017): EE Investment Opportunities and Potential Benefits in SFBs

Model Estimates for Two Regions Only

Cost of replacing solid fuel boilers and thermal retrofit in SFBs in Malopolska and Silesia

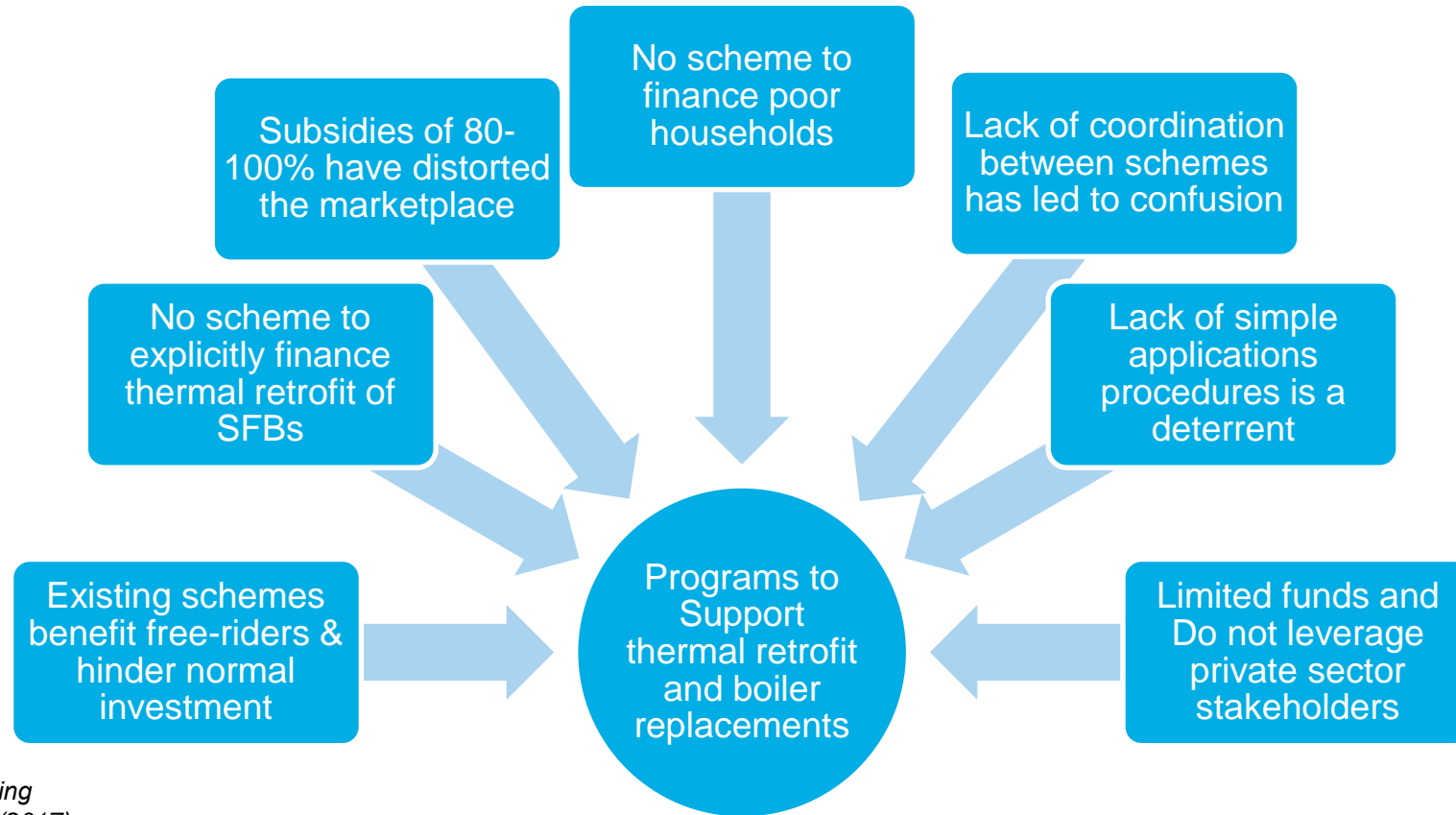
	Malopolska	Silesia
Estimated solid fuel boilers to be replaced	440,000	470,000
Cost of replacement with automatic Ecodesign coal boiler (no thermal retrofit)	5.94 b PLN (€ 1.4 b)	6.35 b PLN (€ 1.5 b)
Cost of thermal retrofit (no boiler replacement)	30.1 b PLN (€ 7.1 b)	32.2 b PLN (€ 7.6 b)
Cost of thermal retrofit and boiler replacement	36.0 b PLN (€ 8.5 b)	38.6 b PLN (€ 9.1 b)

- *The opportunity for savings in energy and reducing pollution is huge*
- *Enormous investments are required to achieve implementation at scale (ca. 200 billion PLN across Poland)*
- *Critical to mobilize private capital by leveraging limited public finance*
- *Supportive environmental regulations and mandates in place*

KEY CONCLUSIONS:

1. Replacement of the boiler with an Eco-design compliant boiler (coal or gas), very substantially increases the annual fuel purchase costs for the SFB.
2. When the boiler replacement is accompanied with thermal retrofit of the SFB, the heat demand is reduced and a lower capacity boiler can be installed, consequently lowering the cost of fuel purchase.
3. The cost of boiler replacement and thermal retrofit is however too high and cannot be recovered through fuel cost savings in a reasonable time period.
4. Replacement of the boiler alone brings the highest reduction in particulate emissions.

Limitations of Existing Financial Schemes to Support SFBs Implement EE Measures



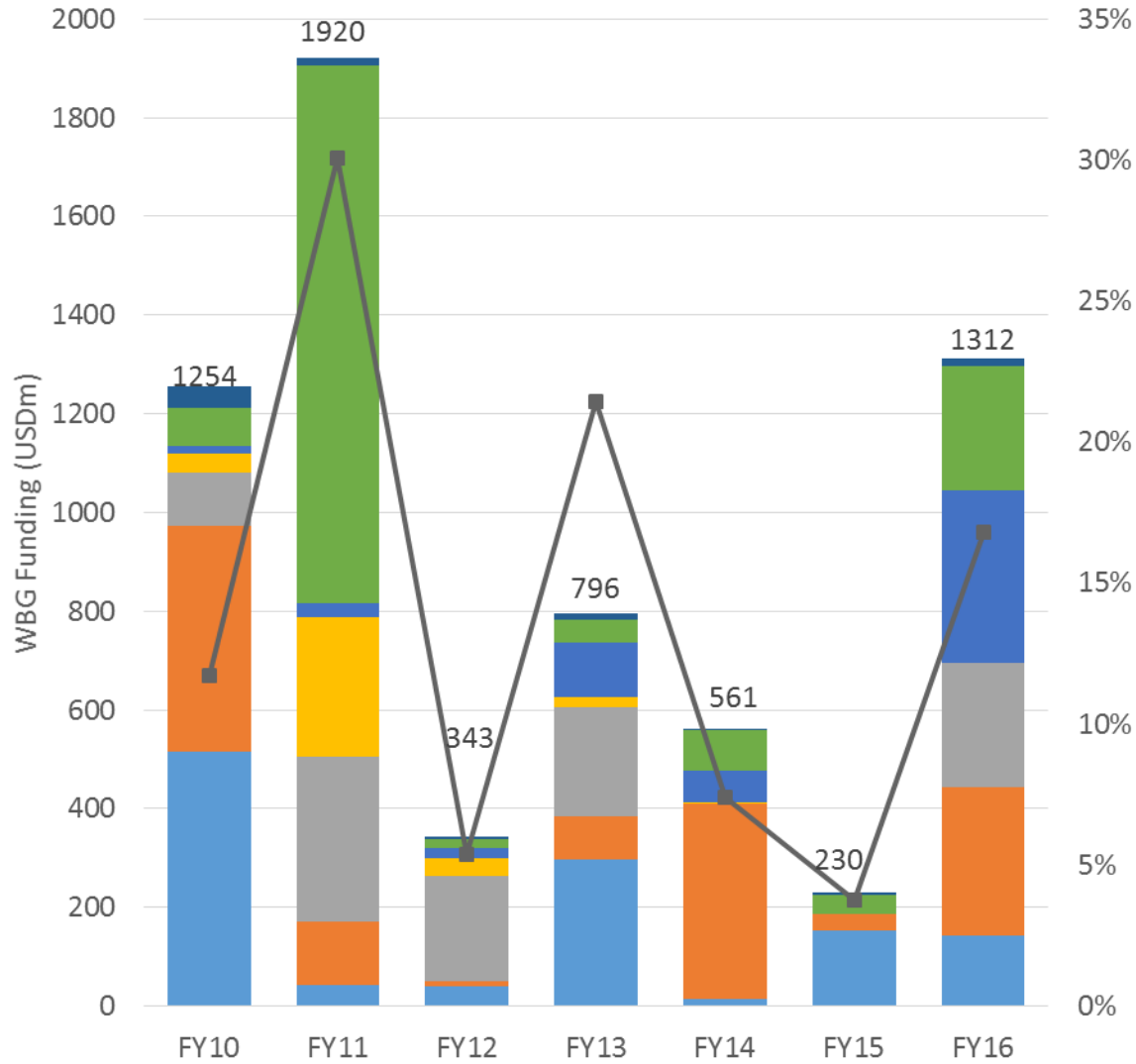
SOURCE: World Bank's Poland Catching Up Regions Program: EE Diagnostics (2017)

Scalable, sustainable and market-based financing solutions and delivery mechanisms are needed

Outline

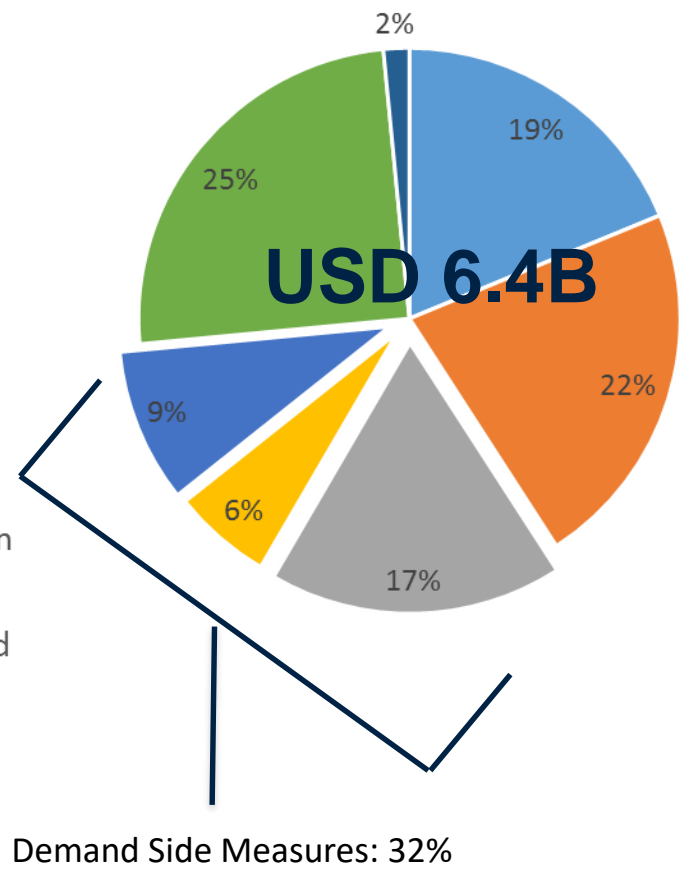
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WBG's EE investment portfolio (by year, sub-sector)



- Technical Assistance
- General EE
- Public Buildings and Urban
- Residential Buildings
- Industry
- Power and Heat Generation
- Electricity Transmission and Distribution
- % of EEX Commitments

FY 2010-2016



Steps in the development of Financial Instruments and Delivery Mechanisms

1

Review various financing instruments and meet stakeholders to obtain feedback on options applicable to poor and non-poor SFBs in Poland

2

Identify institutional framework and implementation mechanism to roll out financing instruments

3

Draft financial instruments and delivery mechanisms targeting specific SFB customer segments

4

Finalize financial instruments and delivery mechanisms in consultation with stakeholders

Financial Instruments Initially Considered for SFBs in Poland

Name of the Instrument	Key Institution that Implements	Country Examples	Applicability to Poland						Thermal Retrofit	Remarks/Reasons Why or Why Not ?
			High Income	Poor	Rural	Urban	Boilers			
Public Financing including subsidies and grants	Government and public agencies	Poland, Bulgaria, Czech Republic, Slovenia, Armenia, Belarus, FYR Macedonia, Kazakhstan, Kosovo, Montenegro, Serbia		X	X	X	X	X	Poland has experience with grants and subsidies for EE. It should consider provision of subsidies/grants to specific customer segments such as energy poor SFBs to reduce free-riders	
Public Financing: EE Funds	Independent, publicly-owned entity, Marshals Office, Municipality	Bulgaria, Croatia, Armenia, Bulgaria, Mexico, Romania, China, Korea, India	X	X	X	X	X	X	EE Funds are potentially applicable to Poland with support from IFIs and the EC. The financing, implementation and institutional mechanisms need to be examined.	
Public Financing: Utility programs	Gas and Electric Utilities	Belgium, Denmark, France, Ireland, Italy, Netherlands, UK, USA	X	X	X	X	X	X	The applicability of Utility programs to Poland needs to be examined. Gas and electric utilities could potentially be interested in financing and implementing boiler replacement programs that promote gas boilers and heat pumps to expand their service offering and increase sales.	

Financial Instruments Initially Considered for SFBs in Poland

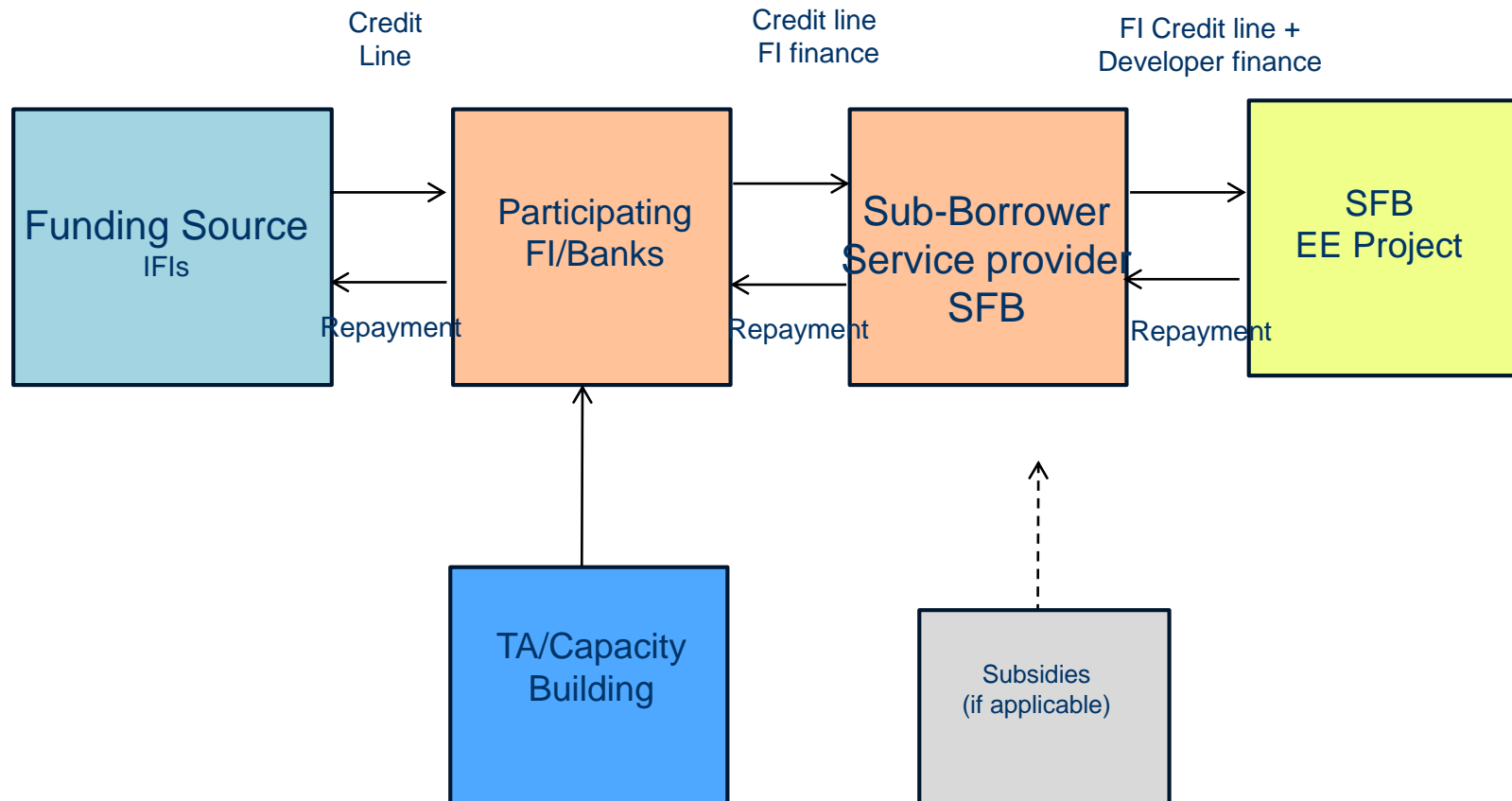
Name of the Instrument	Key Institution that Implements	Country Examples	Applicability to Poland						Remarks/Reasons
			High Income	Poor	Rural	Urban	Boilers	Thermal Retrofit	Why or Why Not ?
Public Financing: Public ESCO/Implementing Agency	Independent public entity as ESCO	Armenia, China, Croatia, Poland, Ukraine, United States, Uruguay	X	X	X	X	X	X	National and Regional Environment Protection Funds provide financing to implementing agencies and to customers. The viability of a Public ESCO model in Poland to coordinate implementation and lower transaction costs needs to be examined.
Subsidies & Grants: Tax incentives /credits/rebates	Government entities	USA, France, Belgium, UK, Austria	X	X	X	X	X	X	Poland could consider tax incentive schemes in combination with other financing mechanisms to channel fiscal rebates to customers. The viability needs to be examined.
Commercial Financing: EE Credit Lines	Participating Financial institutions and banks, with funding from IFIs, EC and government	China, Germany, India, Poland, Serbia, Turkey, Tunisia, Sri Lanka, Bangladesh							Polish banks have experience with credit lines for SMEs. The applicability of a similar program for financing EE needs to be discussed with the banks

Financial Instruments Initially Considered for SFBs in Poland

Name of the Instrument	Key Institution that Implements	Country Examples	Applicability to Poland						Remarks/Reasons
			High Income	Poor	Rural	Urban	Boilers	Thermal Retrofit	Why or Why Not ?
Commercial Financing: Risk Sharing Facility	Participating Financial institutions and banks, with funding from IFIs, EC and government	Bulgaria, China, FYR Macedonia, Hungary, Philippines, Poland, Tunisia, Poland	X	X	X	X	X	X	Polish banks have experience with risk sharing facilities for financing SMEs. The applicability of a similar program for financing EE needs to be discussed with the banks.
Commercial Financing: Leasing Programs	Public and commercial banks financing equipment manufacturers, suppliers, regional administrations and municipalities	China, EU, USA	X	X	X	X	X	X	Polish banks have experience with lease financing for corporates and SMEs. The applicability of a lease finance program to promote EE needs to be discussed with the banks

Financing Instruments Being Considered for Supporting SFBs

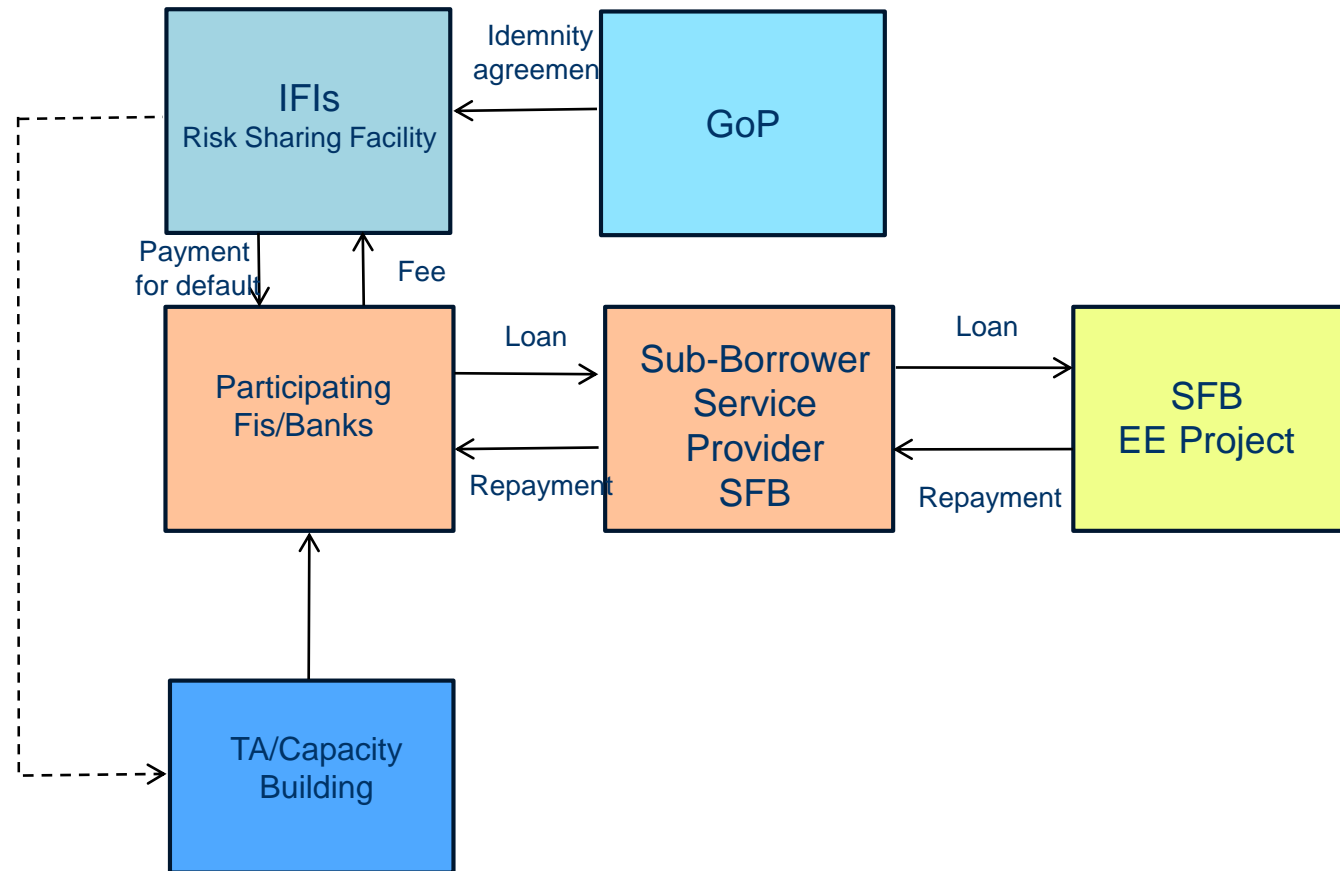
Financing for non-poor SFBs: EE Credit Lines for Participating FIs



Financing for non-poor SFBs: EE Credit Lines for Participating FIs

- Incentivizes commercial banks create an EE business by lowering risk
 - Offers improved financing terms
 - Leverages commercial capital
 - Can be targeted at specific customers
- Program managed through normal bank lending procedures
- Attractive to creditworthy customers
- Program monitored through normal FI procedures
- China, Germany, India, Poland, Serbia, Turkey, Tunisia, Sri Lanka, Bangladesh
 - Polish banks have experience with credit lines for SMEs. The applicability of a similar program for financing EE needs to be discussed with the banks.
- Will favor creditworthy clients
 - Credit line may subsidize participating FI - on-lending should be at market rates
 - Needs committed FI willing to finance EE
 - Needs FI with technical knowledge of EE to evaluate applications
- TA needed to develop project pipeline, lower transaction costs, and build capacity
 - Participating FIs identified through a rigorous process

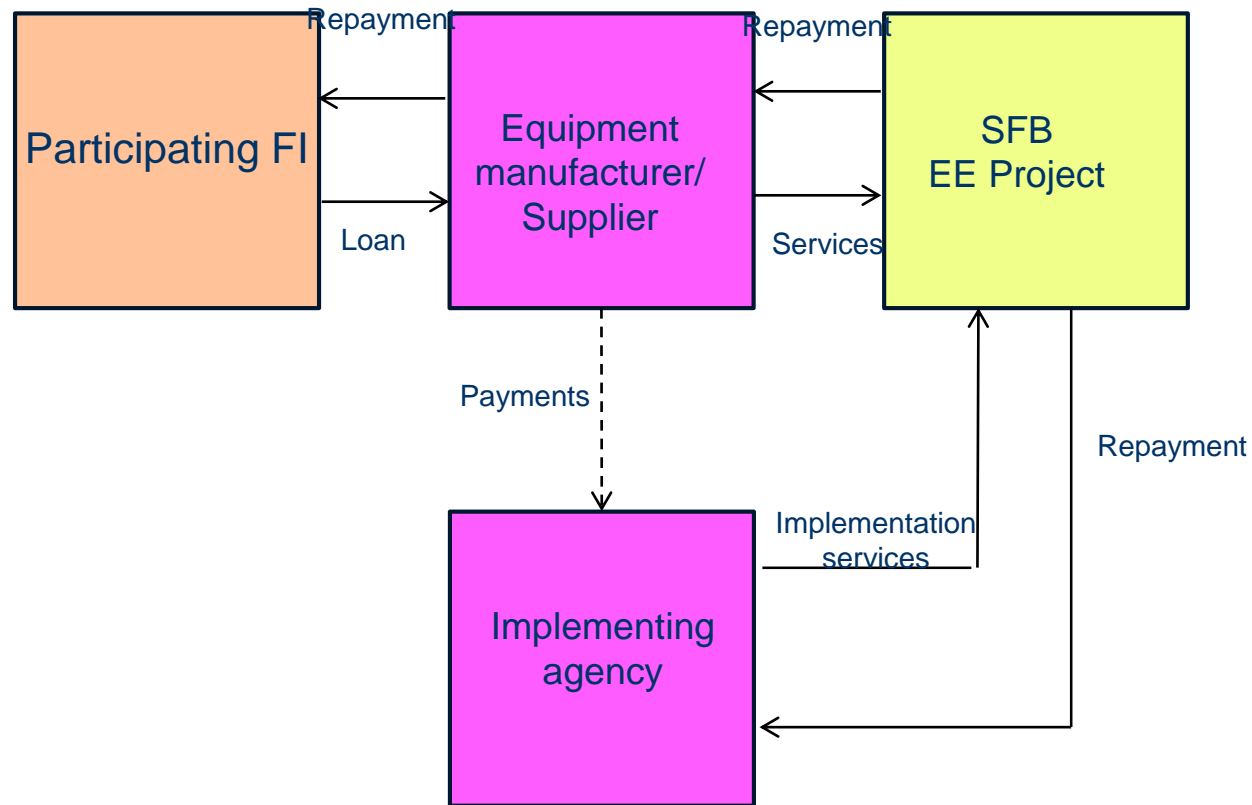
Financing for non-poor SFBs: Risk Sharing Facility for Participating FIs




Financing for non-poor SFBs: Risk Sharing Facility for Participating FIs

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- Government or donor agency provides a partial guarantee to cover defaults
 - Mobilizes private capital and risk is shared by the bank
 - Lowers risks for commercial banks
 - Normal FI lending procedure is followed
 - Improved commercial borrowing terms
 - Participating banks sign agreements specifying loan targets and conditions
 - Banks conduct due diligence and process loans
 - Indemnity Agreement between government and MDB to indemnify MDB for guarantee trigger
 - Attractive to creditworthy customers
 - Program monitored through normal FI procedures
 - Savings may be inadequate to make repayments over a short timeframe
 - Equipment suppliers and installers may not be creditworthy for lease financing
 - Would principally benefit creditworthy customers
 - May need policy or legislative changes to enable lease financing for SFBs
 - May need policy changes to permit regions and municipalities to operate leasing programs
 - Bulgaria, China, FYR Macedonia, Hungary, Philippines, Poland, Tunisia, Poland
 - Polish banks have experience with risk sharing facilities for financing SMEs. The applicability of a similar program for financing EE needs to be discussed with the banks.


Financing for non-poor SFBs: Manufacturer Financing/Leasing Programs



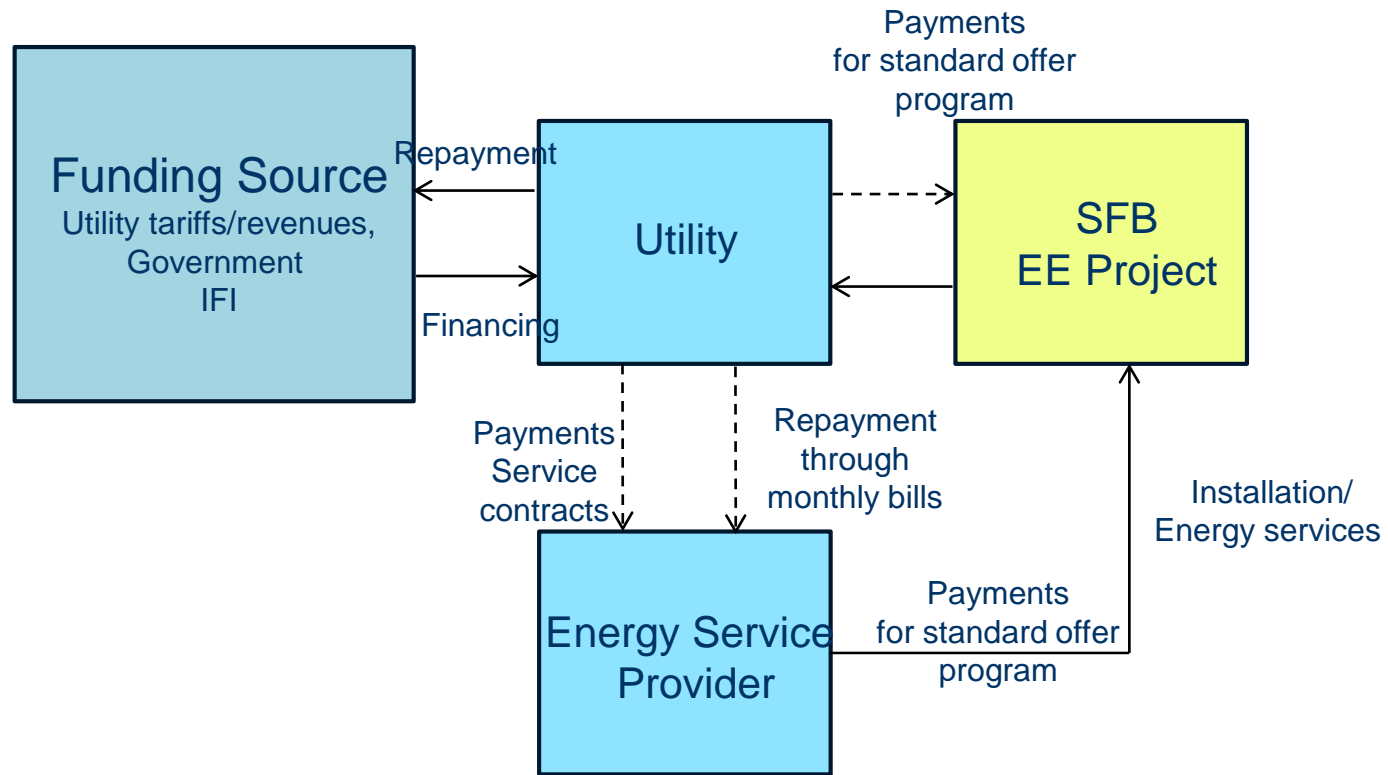
Financing for non-poor SFBs: Manufacturer Financing/Leasing Programs

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- Lowers upfront investment for customers
 - Incentivizes equipment manufacturers and suppliers to sell EE equipment and services
 - Regions and municipalities may also operate leasing programs
 - Lease payments may qualify for tax credits
 - A public or commercial bank provide lease financing to entity operating leasing program
 - May be combined with a utility bill payment mechanism to lower repayment risk

Program results monitored closely by implementing agency

- Savings may be inadequate to make repayments over a short timeframe
 - Equipment suppliers and installers may not be creditworthy for lease financing
 - Would principally benefit creditworthy customers
 - May need a policy or legislative changes to enable lease financing for SFBs
 - May need policy changes to permit regions and municipalities to operate leasing programs
 - China, EU, USA
 - Polish banks have experience with lease financing for corporates and SMEs. The applicability of a lease finance program to promote EE needs to be discussed with the banks
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Financing for non-poor SFBs: Utility EE programs



Financing for non-poor SFBs: Utility EE programs



Can be structured as a regular equipment installation payment which is paid back through monthly utility bills in installments

Can be structured as a Standard Offer Program where customers/ESCOs are paid for savings delivered

Utility EE program provides financing to customers and repayments are through the utility billing system

Standard offer programs lower utility risk since payments are based on verified savings

Utility benefits from additional customer services and potentially increased sales


The utility has to establish a separate unit (EE or DSM cell) to manage and/or implement the EE programs

Attractive to customers since no/low first cost and scheduled repayment based on savings through utility bills of benefit
Program monitored through utility IT systems

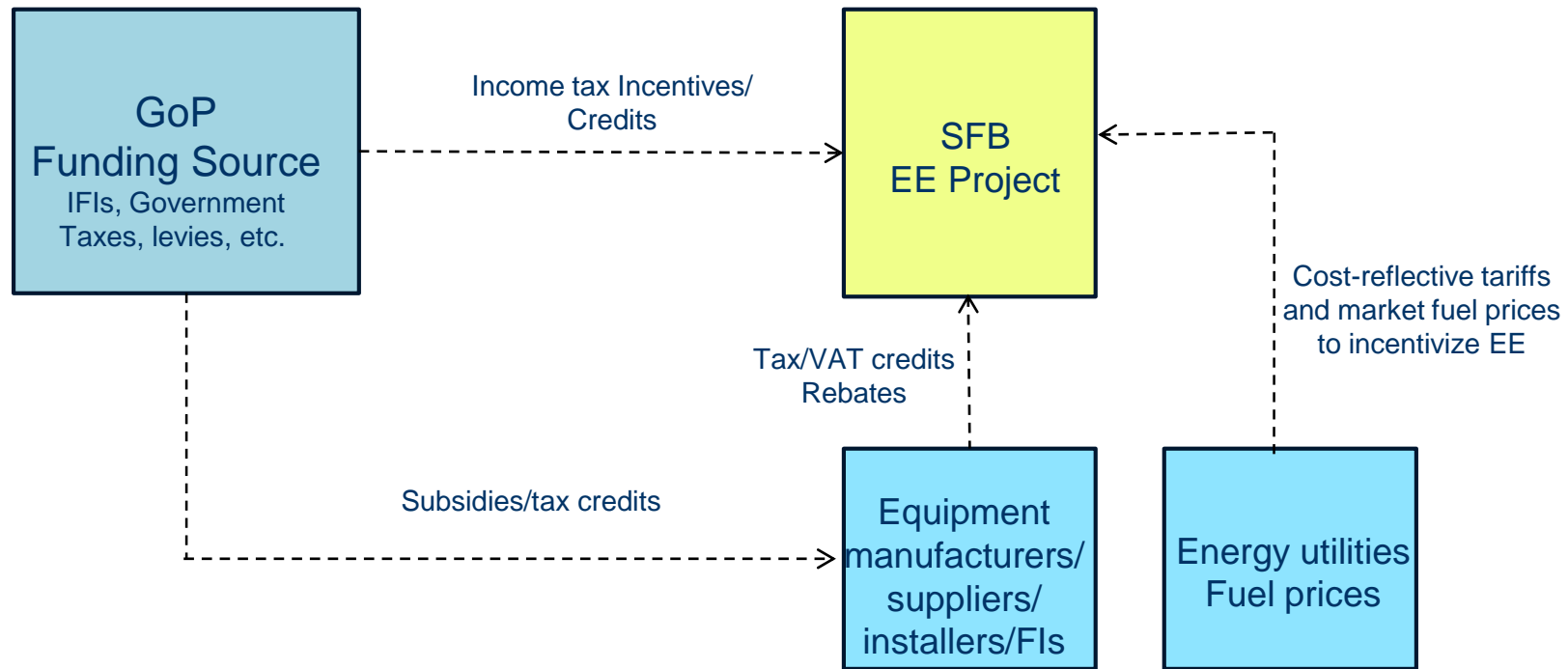
- Utilities may pass program costs to other customers through tariff increases
- Requires careful monitoring and verification systems and methodologies
- Utility needs to make upfront investments in case of utility implemented EE program
- Requires trained staff to manage the EE program

Utilities need to be authorized by the regulator to provide additional EE services or operate a standard offer program


Belgium, Denmark, France, Ireland, Italy, Netherlands, UK, USA
The applicability of Utility programs to Poland needs to be examined. Gas and electric utilities could potentially be interested in financing and implementing boiler replacement programs that promote gas boilers and heat pumps to expand their service offering and increase sales.



Fiscal Mechanisms: Tax incentives/credits/rebates for implementing EE



Fiscal Mechanisms: Tax incentives/credits/rebates for implementing EE

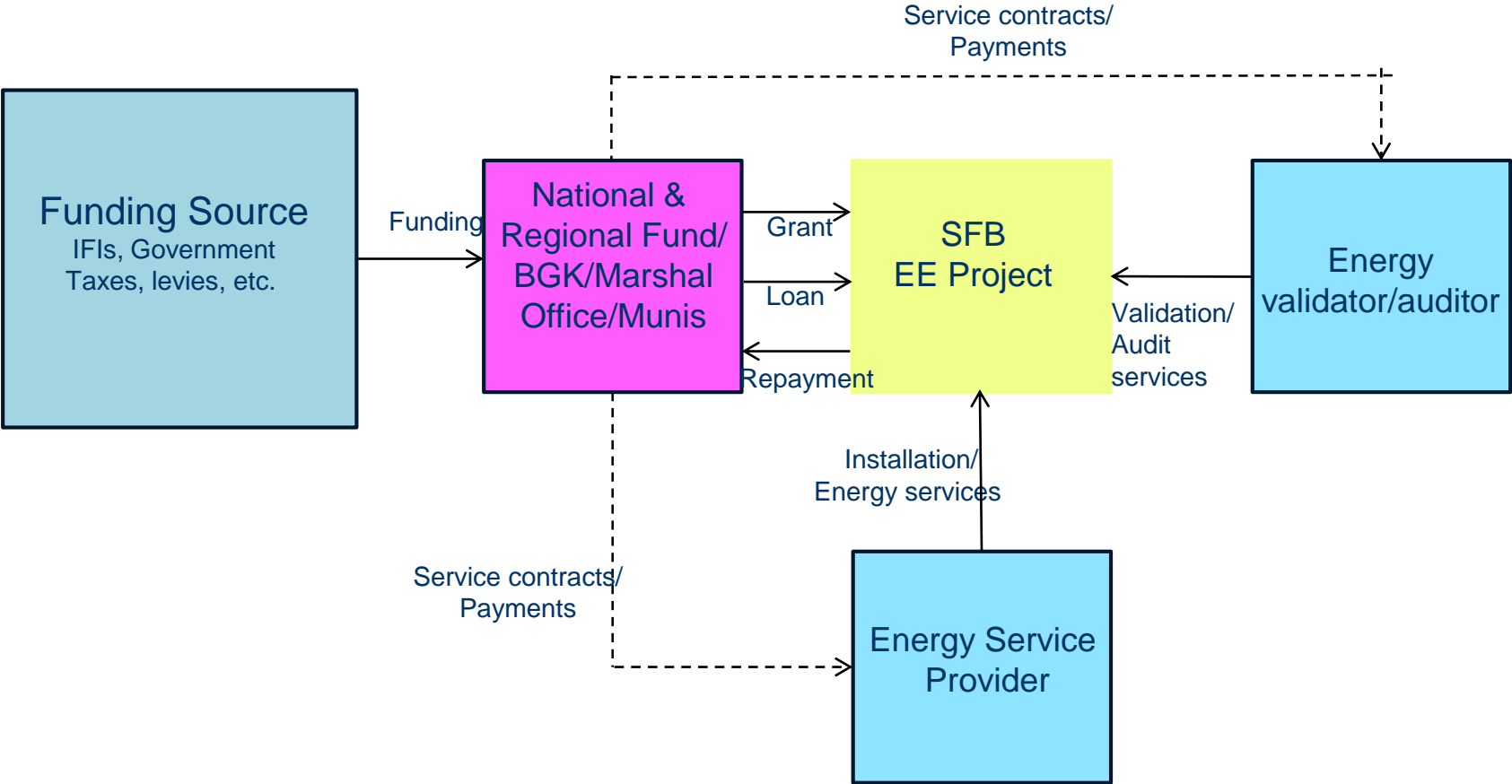
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- Effectively used in many countries
 - Funds may be channeled as income tax credits, property tax credits, VAT exemptions or differential VAT on equipment, etc.
 - Can be combined with other public and commercial financial instruments

Program channeled through suppliers and installers and verified


Attractive to customers depending on level of benefit
Program monitored through tax collections systems

- Tax rebates are less attractive to customers than direct subsidies since it requires filing of taxes and additional paperwork.
 - High performance equipment rebates or VAT exemptions needs to be coupled with a standards and labeling program
 - May need policy or legislative changes to permit tax credits and incentives
 - Requires customers to be aware and educated to benefit from tax rebates
 - Transactions costs can be high depending on program design
 - USA, France, Belgium, UK, Austria, etc.
 - Poland could consider tax incentive schemes in combination with other financing mechanisms to channel fiscal rebates to customers. The viability needs to be examined.
- 


Public Financing for Energy poor and Low-income SFBs



Public Financing for Energy poor and Low-income SFBs

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- Financing may be channeled as grants, subsidies, loans or as hybrid financing
 - Grants and are attractive to customers
 - Subsidies are attractive to equipment manufactures/suppliers
 - Programs can be tracked and results can be monitored centrally and at regional/municipal levels
 - Quick uptake and positive energy and emission impacts

 - Poland, Bulgaria, Czech Republic, Slovenia, Armenia, Belarus, FYR Macedonia, Kazakhstan, Kosovo, Montenegro, Serbia have all undertaken grant programs for EE in SFBs
 - Poland has experience with grants and subsidies for EE. It should consider provision of subsidies/grants to specific customer segments such as energy poor SFBs to reduce free-riders

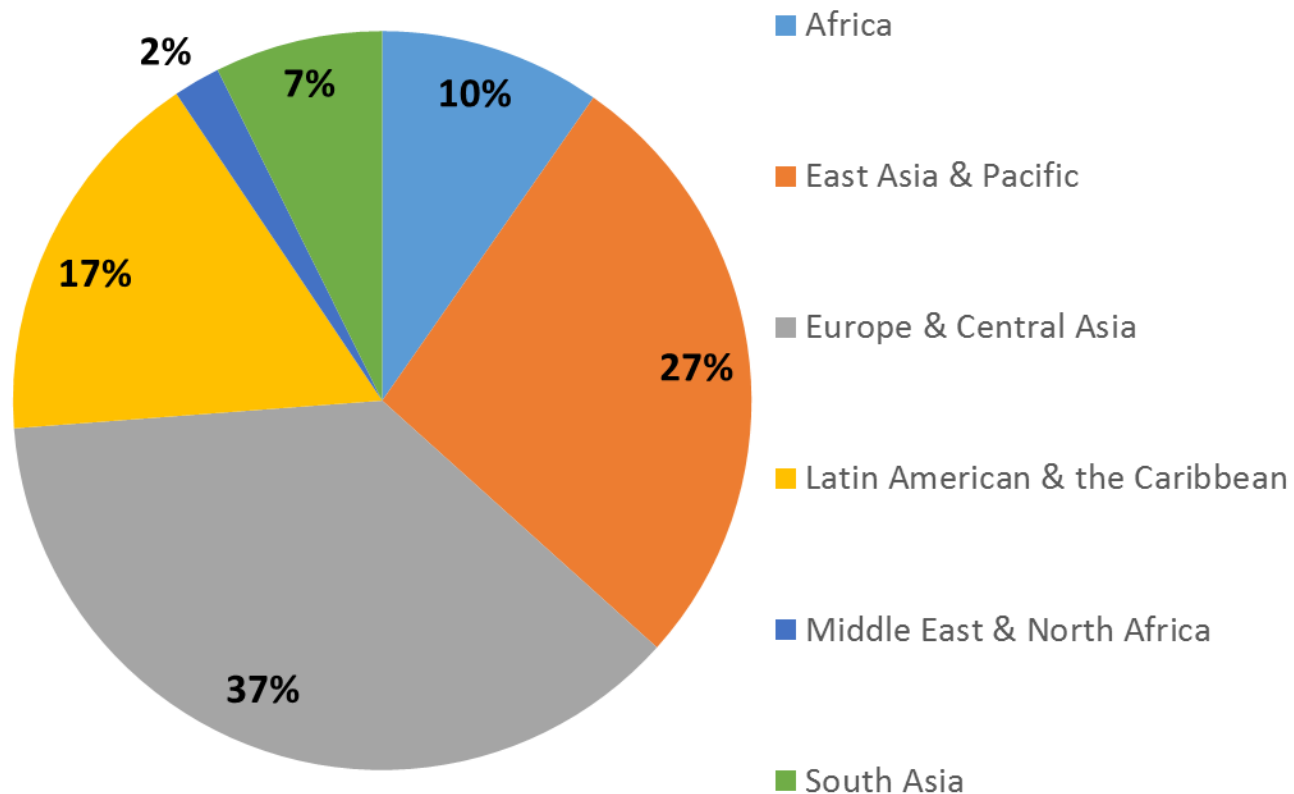
- Not sustainable - requires very significant funds to cover all SFBs
 - Loan programs require creditworthy customers and uptake is low
 - Grants and subsidies may distort the market for commercial financing and delivery of services (present experience in Małopolskie and Śląskie)
 - Significant program implementation and monitoring costs
 - Challenging to channel funds at the SFB level without incurring high transaction costs
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Outline

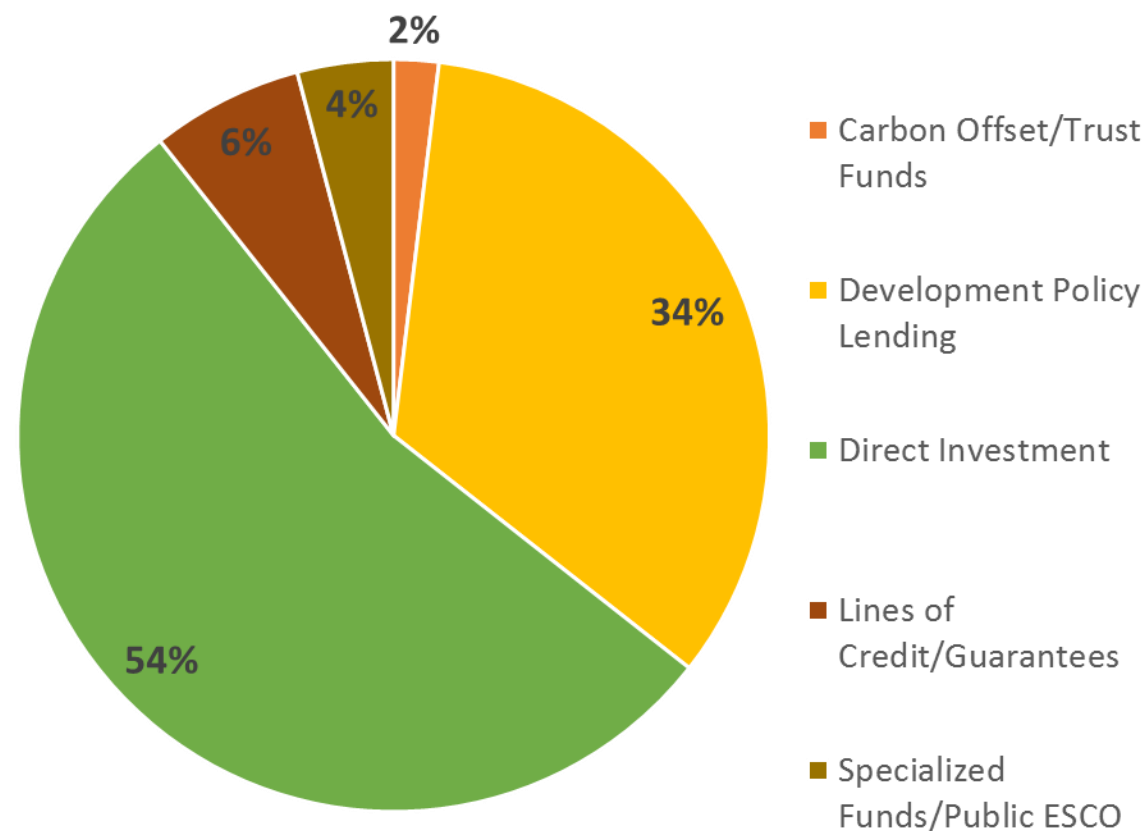
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WBG EE investment portfolio (by region, product)

By Region



By Financial Instrument

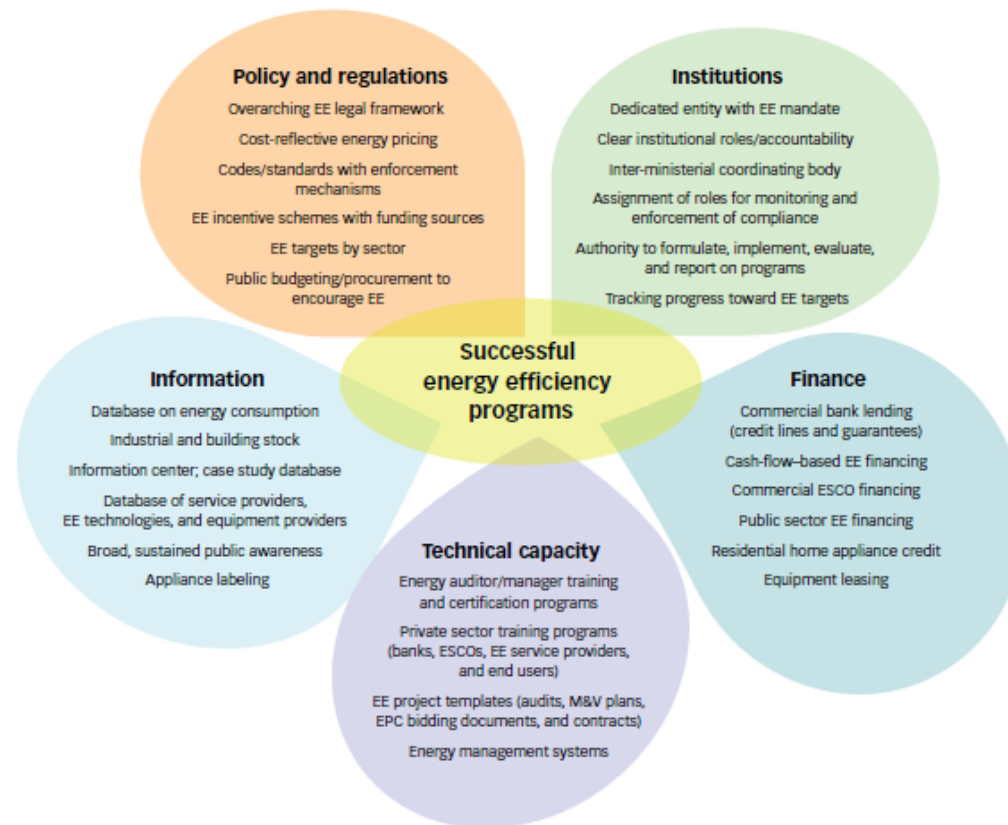


World Bank EE Lessons Learned: EE Brings Great Value to Countries....but EE Implementation is Complex

- ✓ **Enormous EE potential in all sectors in all countries**
- ✓ **EE is a financially attractive “energy resource”**
 - Most EE “negawatts” are cheaper than supply costs
 - EE enables greater energy security
 - EE could also help countries tap into concessional climate finance
- ✓ **Multiple benefits of EE**: Reduces consumer energy bills, facilitates tariff reform
 - Eases pressures on national budgets
 - Increases competitiveness of industries and services, creates jobs
 - Improves system reliability by reducing energy demand, peak loads
 - Quicker to implement than many supply options
 - Contributes to reductions in GHG and local air pollution emissions
 - Cross-sectoral benefits (urban, education/health, transport, water)



Figure 4. Framework for successful energy efficiency programs at the national level



Source: World Bank 2015.

EE = energy efficiency; EPC = energy performance contract; ESCO = energy service company; M&V = measurement and verification.

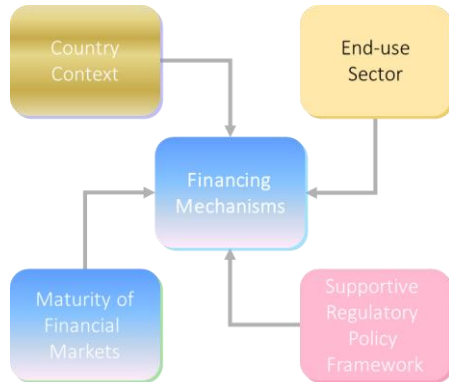
World Bank EE Lessons Learned: How EE Helps Tackle Different Country Objectives and Challenges?

Development challenge	Energy efficiency can ...	Costs and opportunities—examples
Infrastructure bottlenecks and shortfalls	... mitigate impacts of supply constraints by better managing system peak loads and easing demand during shortages, minimizing productivity losses.	In Turkey, a seven-hour blackout in March 2015 resulted in an estimated US\$700 million loss in production. The United States has saved 150 GW in peak demand over the past 30 years through refrigerator efficiency standards alone.
Fiscal constraints	... ease fiscal limits through reduced energy and fuel subsidies, fiscal transfers to distressed public utilities, and energy costs for publicly owned assets (e.g., buildings and street lighting).	Energy accounts for 8 percent of Serbia's fiscal deficit due to energy subsidies, direct transfers to state-owned energy utilities, and guarantees for utility borrowing. An initial evaluation of the European Union's advanced buildings directive expects €30–40 billion in direct benefits to the public budget. The addition of tax revenues and reduction of unemployment benefits increases the estimate to €67–128 billion.
Energy security	... enhance energy security by easing the need for energy imports, making local energy resources last longer, and reducing volatility in energy supply and prices.	Vietnam's energy consumption has tripled over the past decade, making it one of the most energy-intensive economies in East Asia. It has, as a result, become increasingly reliant on imported coal after having been virtually energy independent (1997–2007). Japan has replaced half of its missing nuclear power capacity since the March 2011 earthquake, tsunami, and subsequent nuclear disaster at Fukushima, solely with energy efficiency measures.
Economic growth, competitiveness, and jobs	... develop new industries from the reduction of energy waste (e.g., energy service companies), improving industrial productivity and creating employment opportunities.	Small and medium-sized enterprises, which constitute over 80 percent of industrial firms in India, face high and rising electricity costs coupled with supply shortages (about 10 percent overall; 17 percent at peak times), undermining their global competitiveness. A study on the impacts of energy efficiency programs in Canada shows a net increase of Can\$234–580 billion in GDP, with 1 dollar of spending yielding 5 to 8 dollars in GDP and the creation of 30–52 jobs.
Poverty reduction	... lower overall energy bills and the percent of household income devoted to energy, thereby decreasing energy poverty.	The lack of cost-reflective tariffs cost countries in Europe and Central Asia 0.5–1 percent of GDP. Effective social assistance programs and energy efficiency could alleviate these losses. An electricity connection regularization program in the slums of Sao Paulo, Brazil, promoted energy efficiency measures and formal connections. Nonpayment was reduced by 67 percent and customer energy use by 40 percent.
Environmental stewardship	... reduce local and global pollution in a most cost-effective manner.	Russia is the third largest energy-consuming country, but it is more energy-intensive than the top 10 energy-consuming countries. Through energy efficiency, it could eliminate almost 800 million tons of CO ₂ per year—equal to the total energy consumption of France. China has embarked on one of its most ambitious energy efficiency programs. From 1980–2010, energy intensity declined by 70 percent, resulting in CO ₂ emission reductions of 24.4 billion tons.
Energy access	... support reductions in energy losses that increase energy access or lower upfront costs for off-grid energy services.	Under a national grid extension initiative, Rwanda is distributing more than 900,000 compact fluorescent lamps to new household connections, enabling it to reduce the load on the grid and connect to more homes.

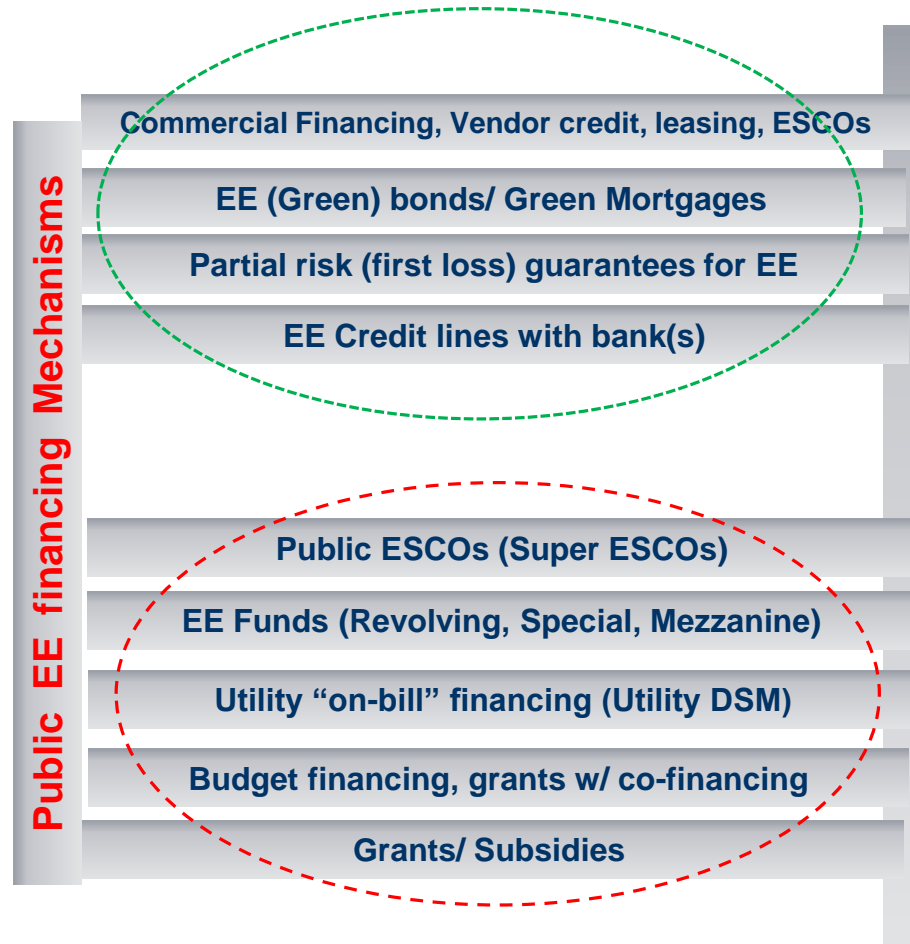
Sustainable EE Financing and Delivery Mechanisms

The Energy Efficiency Financing Products Ladder

Determining Factors for the Choice of EE Financing Mechanisms



Market Maturity ↑



Commercial Financing ↑

Public Financing ↓

- >Globally, USD 400 billion/year investment required to meet the Paris Goals
- Public, Multi-lateral, Climate Finance not enough
- Private Sector Capital Influx into EE is Required (>85% of future needs)
- **LEVERAGE IS CRITICAL!**

World Bank's EE Delivery Instruments: Recent Examples

- ✓ **Specialized EE Funds (mostly for public buildings, some using public ESCOs)**
 - Armenia, Bulgaria, Mexico, Romania
 - Pipeline: Kosovo, India (through Public Super ESCO), Macedonia, Montenegro, Turkey, Mexico
- ✓ **EE Credit Lines (through financial intermediary banks, mostly for industry)**
 - China, Turkey, Vietnam, Ukraine, Uzbekistan
 - Pipeline: Russia, Brazil
- ✓ **EE Risk Sharing Mechanisms/Guarantees (through FIs, some targeted for supporting ESCOs)**
 - Bulgaria, China, Croatia, India, Poland
 - Pipeline: Colombia, Vietnam
- ✓ **Utility EE/Demand-Side Management –DSM Programs (mostly EE Lighting {CFL} programs, some with carbon finance)**
 - Brazil, Bangladesh, Ethiopia, Mexico, Rwanda, South Africa (standard offer), Vietnam, Uganda, Uruguay
- ✓ **EE-related Program for Results loans**
 - China, Serbia
 - Pipeline: Bulgaria, India
- ✓ **EE-related Development Policy Operations**
 - Indonesia, Mexico, Poland , Turkey, Vietnam