Financing Energy Efficiency, Part 2: Credit Lines

How do EE credit lines work?

Energy efficiency promises huge economic returns, but market failures must first be overcome

Energy efficiency should be the “first fuel” of energy policy makers around the globe. It helps to meet growing energy demands cleanly and cheaply, increases competitiveness, generates employment, enhances energy security, reduces poverty, and protects the environment—thus contributing to the World Bank’s twin goals of poverty reduction and shared prosperity. According to the International Energy Agency, in the years 1974–2010, energy efficiency did more to meet growing energy demand in IEA member countries than any single energy resource. Harnessing the benefits of energy efficiency could facilitate more efficient allocation of resources across the global economy, potentially boosting economic output by $18 trillion through 2035 (IEA 2014).

However, the potential gains of energy efficiency have been difficult to realize due to prevailing market failures. Even though investments in energy efficiency are generally profitable and cost-effective, with energy savings repaying investment costs over time, many opportunities to invest in greater efficiency are overlooked because of systemic barriers, including:

- **Policy and regulatory issues**, such as low energy pricing, lack of codes or standards, failure to enforce codes and standards where they do exist, import duties on efficient equipment, and weaknesses within relevant institutions
- **The high project development and transaction costs** involved in conducting energy audits and measurement and verification (M&V), comparing alternative technologies, and making what are often small and dispersed project investments
- **Lack of awareness and information**, including of credible energy consumption data, information on energy efficiency potential and opportunities, and evaluations of energy efficiency programs and their costs/impacts
- **Lack of incentives to act**, perhaps because the entities making capital investment decisions are not the same as those that pay the energy bills and would benefit from energy efficiency, or because they have competing priorities (e.g., production expansion) or expect to see assured returns in a relatively short time frame
- **Behavioral inertia**, or people’s reluctance to do things differently, try new approaches, or take action in the face of perceived risk. This may be strengthened where consumers are not charged cost-reflective energy tariffs.

There are several ways to address these barriers. One involves creating incentives for business owners, public officials, and citizens to prioritize energy efficiency, whether through laws and regulations, taxes and subsidies, information, or a mix of these. A second involves developing effective and scalable financing and implementation mechanisms. These might include institutions and programs that match energy efficiency opportunities with financing and implementation, such as utility demand-side-management programs, energy service companies (ESCOs), and energy audit/management systems. Without these and other positive actions, national goals to scale up energy efficiency will remain out of reach.

Countries around the world have used various types of financing and delivery mechanisms to support energy efficiency investments. While some of these are best suited to certain types of markets (e.g., credit lines for large and mid-size industrial enterprises), others may
The World Bank’s global experience suggests that moving up the ladder of financing options too quickly may hamper the creation of market capacity to sustain energy efficiency investments in the absence of continued public support. As local markets evolve, energy efficiency programs can evolve apace, climbing the financing ladder.

The selection of appropriate mechanisms and their subsequent design will depend on several factors, including: (i) applicable legislative, regulatory, and institutional frameworks; (ii) the maturity of financial and credit markets; (iii) the current state of local energy efficiency service markets, including ESCOs and energy auditors; and (iv) the technical and financial capabilities of target end users. Once the basic mechanisms are selected, they must be carefully adapted to suit the local context and target market. Their design should also include elements to facilitate the transition to more commercial schemes further up the ladder, including studies and pilots. Of course, mechanisms may overlap, and governments need not use every step of the ladder.

How do energy efficiency credit lines work?

International donors loan funds to financial institutions, which then lend to project developers

Credit lines are among the most common financing mechanisms used by international financial institutions (IFIs) and governments to make funds available to local banks and financial institutions, which in turn provide debt financing for smaller investments. Under a credit line, a donor (such as an IFI, bilateral donor, or government) extends a low-interest or long-term loan to one or more financial institutions for a specific purpose (e.g., energy efficiency, renewable energy, clean production) or target market (e.g., small and medium enterprises, industrial parks, export industries, state-owned enterprises, commercial buildings). The recipient financial institutions then on-lend the funds at the market rate to subborrowers that implement eligible investments (figure 2). One main rationale for credit lines is that they provide a dedicated financing window for targeted investments, particularly in underdeveloped markets. While subborrowers are often commercial enterprises, credit lines dedicated to energy efficiency have been used to support residential building projects (e.g., in apartment buildings) and may be lent through other intermediaries (e.g., ESCOs, equipment suppliers, leasing firms, other banks) for eligible investments.

Figure 1. Financing energy efficiency: A ladder of options

Figure 2. Typical design of an energy efficiency credit line

Source: Authors’ compilation.
Note: EE = energy efficiency; ESCO = energy service company.
Credit lines are not designed to address systemic issues in the banking sector or solve underlying inefficient public policies such as energy subsidies.

Credit lines are also used to help local financial institutions, both public and private, establish business lines by providing capital and technical assistance to help them develop financial products and support a portfolio of energy efficiency projects. This enables financial institutions to learn the common features of such projects firsthand, as well as how to market and appraise them, develop risk profiles, observe typical cash flows generated from the energy savings and repayment streams, and so on. This knowledge and experience will, in turn, help them continue lending once the credit line resources are fully utilized. In the process, they are introduced to and become familiar with energy efficiency technologies and market players—including energy auditing firms, design and construction firms, equipment suppliers, ESCOs, and leasing firms. Credit lines can eventually reduce the transaction costs of financial institutions by helping them standardize project appraisals and loan procedures, templates for energy audits, marketing and training materials, and energy saving tools/savings estimates for simple energy efficiency measures. Often this technical assistance is supported by grant funds from bilateral donors, the Global Environment Facility (GEF), and others.

For project developers, suppliers, and end users, credit lines can help expand the pool of commercial debt financing for their projects by establishing dedicated energy efficiency financing windows with bankers that understand the business. Technical assistance, prevalent in most credit lines, can further build capacity and support implementation by promoting subproject pipeline development and marketing, energy audits and technical appraisals, training, energy efficiency calculators, standardization of documents and templates, measurement and verification assessments, and case studies, among other things. Together, these elements collectively serve to lower the perceived technical and financial risks of energy efficiency investments and support the business line of financial institutions long after the credit line is completed.

The funds provided by donors or governments can be leveraged with additional funds provided by participating financial institutions to increase the total amount of the available credit line for energy efficiency investments. In most cases, financial institutions also require equity contributions from their subborrowers for each investment, typically 20–30 percent, allowing the original credit line to be further leveraged. Often, the time frame for repaying the loan to an IFI is much longer than for most subloans, enabling financial institutions to revolve the loan funds two to three times before the loan must be repaid, creating an additional multiplier effect. This amplifies the impact of a donor’s contribution by increasing investments and the corresponding energy and carbon savings. However, most IFIs do not have mechanisms to track or mandate uses of credit line reflows.

Where are credit lines a viable option?

Credit lines offer a solution where domestic banks are strong but are not lending to energy efficiency projects

Credit lines are not designed to address systemic issues in the banking sector or solve underlying inefficient public policies such as energy subsidies. But they can be an appropriate instrument where specific market barriers or information gaps prevent energy efficiency investments from being made. World Bank experience shows that credit lines have the potential to address a range of typical barriers to the financing of energy efficiency projects, including perceptions of high technical and financial risks, lack of liquidity, inadequate expertise and capacity, and high transaction costs. Table 1 illustrates how an energy efficiency credit line can address some of these common barriers.

Credit lines are most likely to achieve their desired objectives when:

- Financial institutions are financially strong, have sufficient capacity and willingness to take on energy efficiency as a new business line, have a solid client base with good potential for energy efficiency investment, and have well-established procedures for the appraisal and processing of loans.
- There is a strong commitment from management to an energy efficiency business line, to enhancing internal expertise, to marketing the credit line, and to ensuring a strong “deal flow.”
- The project units assigned to the credit lines have management support and authority to direct business units and branch offices as needed to effectively market the credit line, share lessons, institute procedural changes, and work together to ensure success.
- There are creditworthy subborrowers who meet the appraisal criteria of the financial institutions. (Credit lines are not designed
World Bank experience shows that credit lines have the potential to address a range of typical barriers to the financing of energy efficiency projects, including perceptions of high technical and financial risks, lack of liquidity, inadequate expertise and capacity, and high transaction costs.

It is unlikely that credit lines will overcome all constraints on the commercial debt financing of energy efficiency projects, such as reliance on asset-based or balance sheet financing, overcollateralization, a bias toward lending to revenue-generating projects rather than cost-saving projects, and reluctance to finance small projects or lend to public sector subborrowers. In fact, relatively few energy efficiency credit lines have targeted the public sector. This could be due to commercial lenders’ reluctance to provide debt financing to public agencies, and also to a lack of interest among public agencies in borrowing commercial funds on market terms.

What does the World Bank’s portfolio reveal about credit lines?

**Under the right conditions, they can achieve dramatic results**

A review of the World Bank’s energy efficiency project portfolio over fiscal years 2008–18 turned up 12 credit lines (World Bank 2017a–i, 2018a–c). Table 2 presents data on all 12 credit lines. As of May 2018, five of the projects were closed, of which three had received additional financing or an additional loan amount to further their impact. Of the seven that remain active, five are more than half complete, while two were only recently approved. The 12 projects have been funded through the International Bank for Reconstruction and Development (IBRD), the International Development Association (IDA), or specific funds such as the GEF or the Clean Technology Fund (CTF).

<table>
<thead>
<tr>
<th>Table 1. How a credit line addresses barriers to energy efficiency financing</th>
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<tbody>
<tr>
<td><strong>Barrier</strong></td>
</tr>
<tr>
<td>Project developers have little demand for loans for energy efficiency (EE) projects</td>
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<tr>
<td>Lack of liquidity in the financial markets, or short loan tenors for commercial debt financing of EE projects</td>
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<tr>
<td>Lenders perceive EE projects as having high financial risk, while financial institutions lack adequate expertise and capacity to understand the financing needs of EE projects and how to market and appraise them</td>
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<tr>
<td>The transaction costs of EE financing are relatively high</td>
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<tr>
<td>Few EE projects are sponsored by small and medium enterprises (SMEs) and energy service companies (ESCOs)</td>
</tr>
<tr>
<td>Subborrowers have limited borrowing capacity or low credit ratings</td>
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</tbody>
</table>

Source: Authors’ compilation.
### Table 2. The World Bank Group’s energy efficiency credit line portfolio

<table>
<thead>
<tr>
<th>Project name</th>
<th>WB loan size ($m)</th>
<th>Number of partner FIs</th>
<th>Co-financing ($m)</th>
<th>Months to commit first 10% of CL</th>
<th>Average project size ($m)</th>
<th>Project restructuring</th>
<th>Primary subproject sectors</th>
<th>Lifetime energy savings in MWh (lifetime CO(_2) savings in tons)</th>
<th>Technical assistance included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China EE Financing I &amp; III (CHEEF)</td>
<td>312</td>
<td>2</td>
<td>1,128</td>
<td>25</td>
<td>35.1</td>
<td>1 restructuring: S27m in AF (CHEEF III)</td>
<td>Waste heat, iron and steel manufacturing</td>
<td>309,030,250 (97,650,000)</td>
<td>GEF funded TA</td>
</tr>
<tr>
<td>China EE Financing II (CHEEF)</td>
<td>46</td>
<td>1</td>
<td>180</td>
<td>24</td>
<td>75.0</td>
<td>Cancelled</td>
<td>Waste heat, iron and steel manufacturing</td>
<td>28,489,430 (9,099,000)</td>
<td>TA provided through CHEEF I</td>
</tr>
<tr>
<td>Turkey Private Sector Renewable Energy and EE (PSREEE)</td>
<td>1,050</td>
<td>2</td>
<td>2,050</td>
<td>12</td>
<td>37.8</td>
<td>1 restructuring: US650m in AF</td>
<td>Renewable energy, heavy industry (cement, steel, chemicals)</td>
<td>45,359,167* (48,218,745)</td>
<td>Funded by German Development Bank (KfW)</td>
</tr>
<tr>
<td>Uzbekistan EE I and II (UZEEF)</td>
<td>109</td>
<td>3</td>
<td>70</td>
<td>36</td>
<td>2.4</td>
<td>2 restructurings with AF: US153m (UZEEF II); US333m (UZEEF III)</td>
<td>Oil and gas, chemicals, cement</td>
<td>5,378,805 (8,748,405)</td>
<td>IDA funded TA and capacity building</td>
</tr>
<tr>
<td>Ukraine EE</td>
<td>200</td>
<td>(2)</td>
<td>339</td>
<td>24</td>
<td>4.5</td>
<td>1 restructuring: 12 month extension and one partner FI removed</td>
<td>Agriculture, construction materials, food and beverage</td>
<td>115,817,355 (8,560,965)</td>
<td>No TA</td>
</tr>
<tr>
<td>Tunisian EE</td>
<td>34</td>
<td>2</td>
<td>9</td>
<td>48</td>
<td>3.6</td>
<td>2 restructurings: cut US15m in funds and removed a partner FI; 16-month extension</td>
<td>Cogeneration at industrial facilities</td>
<td>1,019,137 (280,840)</td>
<td>No TA</td>
</tr>
<tr>
<td>Ongoing—forecasted results</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Shanghai Low-Carbon City</td>
<td>104</td>
<td>2</td>
<td>152</td>
<td>48</td>
<td>0.6–3.5</td>
<td>No</td>
<td>Building retrofits</td>
<td>12,211,500 (3,240,000)</td>
<td>Funded by GEF and district government</td>
</tr>
<tr>
<td>Turkey Small-Medium Enterprises EE</td>
<td>205</td>
<td>3</td>
<td>29</td>
<td>24</td>
<td>N/A</td>
<td>2 restructurings: first cut co-financing requirement; 12-month extension</td>
<td>Metals, textiles, food and beverage, buildings</td>
<td>7,500,000 (3,300,000)</td>
<td>GEF funded TA</td>
</tr>
<tr>
<td>Vietnam EE (VEEIE)</td>
<td>102</td>
<td>2</td>
<td>56</td>
<td>N/A</td>
<td>2.6</td>
<td>Risk guarantee to increase FI lending is awaiting approval</td>
<td>Cement, steel</td>
<td>4,639,000 (75,405,000)</td>
<td>IDA funded TA</td>
</tr>
<tr>
<td>Jamaica—Energy Security and Enhancement</td>
<td>6</td>
<td>(1)</td>
<td>1</td>
<td>12</td>
<td>0.15–0.3</td>
<td>1 restructuring: 22-month extension and US1m diverted from another component to the CL</td>
<td>Lighting, insulation, solar water heaters</td>
<td>N/A</td>
<td>IBRD funded TA</td>
</tr>
<tr>
<td>Ethiopia—Network Reinforcement &amp; Expansion</td>
<td>65</td>
<td>1</td>
<td>10</td>
<td>24</td>
<td>N/A</td>
<td>2 restructurings: US25m in AF; 12-month extension</td>
<td>Solar home system, solar lamps, lighting, biogas units</td>
<td>N/A</td>
<td>IDA funded TA</td>
</tr>
<tr>
<td>China P4R—Innovative Financing for Air Pollution Control in Jing-Jin-Ji</td>
<td>500</td>
<td>1</td>
<td>500</td>
<td>11</td>
<td>N/A</td>
<td>No</td>
<td>Renewable energy, industrial and building efficiency</td>
<td>122,115,000** (36,915,000)</td>
<td>TA provided through CHEEF and a non-CL Chinese project (CRESPP)</td>
</tr>
<tr>
<td>Uzbekistan EE III (UZEEF)</td>
<td>200</td>
<td>6</td>
<td>133</td>
<td>10.1</td>
<td>N/A</td>
<td>No</td>
<td>Waste heat recovery, cement, chemicals</td>
<td>5,790,000 (11,985,000)</td>
<td>IBRD funded TA</td>
</tr>
</tbody>
</table>

Source: Authors’ compilation from World Bank (2017a–i and 2018a–c).

Note: AF = additional financing; CHEEF = China Energy Efficiency Financing; CL = credit line; CO\(_2\) = carbon dioxide; CRESP = China Renewable Energy Scale-up Program; EE = energy efficiency; FI = financial institution; GEF = Global Environment Facility; IBRD = International Bank for Reconstruction and Development; IDA = International Development Association; MWh = megawatt-hour; P4R = Program for Results; PSREEE = Private Sector Renewable Energy and Energy Efficiency project; RE = renewable energy; TA = technical assistance; UZEEF = Uzbekistan Energy Efficiency Facility for Industrial Enterprises; VEEIE = Vietnam Energy Efficiency for Industrial Enterprises; WB = World Bank; N/A = not available.

* Energy savings tracked only for EE investments.

** Energy savings are from both EE and RE subprojects.
The review shows that the World Bank has approved more than $2.9 billion for energy efficiency credit lines since FY2008, including a share for renewable energy. This amount includes external funds managed by the World Bank, such as of the CTF, the GEF, and the Energy Small and Medium Enterprises Trust Fund (ESME). These credit lines were able to leverage $4.7 billion of cofinancing, leading to total expected investments of $7.6 billion (159 percent leverage ratio).

The portfolio is concentrated in Europe and Central Asia (Turkey, Ukraine, Uzbekistan) and East Asia and Pacific (China and Vietnam). The three smallest credit lines were in Sub-Saharan Africa (Ethiopia), Latin America and the Caribbean (Jamaica), and the Middle East and North Africa (Tunisia). No credit lines focused on South Asia (although there was one credit guarantee program). With the exception of Uzbekistan and Ethiopia, these projects were in high-income countries with developed banking sectors, a fact that further underlines how enabling economic, policy, and regulatory environments are needed for credit lines to function properly.

Credit line design. Several other key attributes of the credit line portfolio include the following, organized by topic.

- **Size.** This varied greatly, from $7 million in Jamaica to support household appliances (implemented alongside an electricity access credit line), to $3.1 billion in Turkey (for the Private Sector Renewable Energy and Energy Efficiency project, PSREEE), which included $1.05 billion in financing from the World Bank and CTF, and the rest from financial institutions, private developers, industrial clients, and others. The credit lines’ differences in size reflect differences in the characteristics of the financial institutions, sectors, and measures involved.

- **Financial institution partners.** The World Bank worked with 24 financial institutions that included state-owned firms, development banks, and private banks, many with a particular focus on industrial clients. The credit lines in Ukraine and Jamaica involved only one bank; however, the World Bank allowed them to on-lend to partner banks with expertise in one slice of the market. Those credit lines involving three or more financial institution partners tended to disburse smaller loans to more customers.

- **Technical assistance** was included as a project component in all but two of the credit lines. This assistance was backed by GEF grants, IDA credits, IBRD loans, and funds from other donors. All the Chinese and the Turkey SME EE credit lines relied on the GEF. An initial GEF grant for the China Energy Efficiency Financing (CHEEF) I was expanded in scope to train financial institutions added in later projects, supplemented by district government funds in the case of Shanghai. Three projects used IDA funds from the World Bank to support technical assistance and capacity building, and two more used IBRD funds. The Turkey PSREEE credit line was able to secure technical assistance funds from the German Development Bank (KfW) to focus on training staff engineers at industrial-focused banks. Two credit lines (Ukraine and Tunisia) included no dedicated technical assistance funds. While both these credit lines struggled in their early years, their implementation occurred during a time of political and economic uncertainty, so it is unclear to what extent the lack of technical assistance contributed to the credit line performance.

Eligibility requirements. Each credit line contained subloan eligibility requirements. Below is a summary of key criteria for subprojects under the credit line portfolio.

- **Focus.** Eight credit lines were dedicated solely to energy efficiency; the other four (in Turkey, Jamaica, Ethiopia, and for air pollution in China) also financed renewable energy investments. The targeted subborrowers were mainly state-owned and private industries, especially energy-intensive factories for cement, metal/steel, and chemicals. More recent credit lines have expanded to include SMES, commercial buildings, and household appliances, despite the challenges posed by the small size of the subprojects. None has focused on public sector clients. Credit lines are also doing more to promote lending to ESCOs and their customers, as in Turkey and Uzbekistan. The Ethiopia credit line provides loans to private enterprises and microfinance institutions to promote efficient off-grid energy solutions for residential users. A credit line for SMES in Turkey helps vendors offer credit to their customers and leasing companies.

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1. The Uzbekistan Energy Efficiency Facility for Industrial Enterprises (UZEEF) II project, for example, had three financial institution partners in its initial two phases and added three more in the last phase. All were required to provide 20 percent cofinancing for subprojects.
• **Financial criteria.** For subprojects to be eligible to borrow under the credit lines, most had to meet certain financial criteria. These included specified subborrower equity/cofinancing levels, minimum financial rates of return (FIRRs), payback periods, and a debt service coverage ratio\(^2\) (DSCR). Five projects set co-financing minimums for subborrowers, although the Turkey SME’s minimum of 25 percent was waived in restructuring after an economic downturn and currency devaluation limited the ability of subborrowers to provide finance. The other four ranged from 10–20 percent in Jamaica to 40 percent in UZEEF, which required 20 percent from subborrowers in addition to the 20 percent from financial institutions mentioned above. Furthermore, the UZEEF subborrower requirement was increased to 25 percent for the third phase of the credit line. Three had minimum FIRR thresholds: both Turkey credit lines required an 8 percent FIRR; UZEEF had a 10 percent minimum. Three projects specified a maximum payback period: Shanghai was set at 12 years; air pollution in China at 10 years; and the Turkey PSREEE at 4 years for the IBRD loan and 7 years for the CTF credit for emerging clean energy technologies. Finally, three projects set a minimum DSCR—UZEEF was set at 1.1:1, Ukraine was lowered from 1.3:1 to 1.1:1 after restructuring, and the Turkey SME was lowered from 1.2:1 to 1.1:1 after the credit line was restructured.

• **Energy and technical criteria.** To ensure minimum levels of energy savings, most credit lines included energy, emissions, and technology criteria, while some technical criteria were added to eliminate potential free riders. The Ukraine credit line limited the FIRR indicator to benefits accruing from energy cost savings (and not other financial benefits such as increased production/sales, the sale of renewable energy power to the grid, reduced maintenance, etc.). Both Turkey credit lines stated that subprojects must either achieve at least 20 percent energy savings (based on energy per unit of output or specific energy consumption, SEC), or at least 50 percent of the FIRR indicator must be derived from the energy cost savings. UZEEF required at least 20 percent energy savings, and Shanghai required at least 10 percent emission reductions. For some projects, a payback period with energy savings as the only revenue stream was also included in the technical criteria. The general objective is to ensure that the funds from multilateral development banks are spent on energy efficiency rather than on production/capacity expansion or other investments only remotely associated with energy efficiency. Finally, five credit lines introduced specific lists of technologies or products that would be eligible under the credit line. Some credit lines also specified the scope of eligible EE investments and subborrowers—for example, whether greenfields are allowed and how energy efficiency should be measured.

**Implementation experiences and adjustments.** In almost all cases, committing the credit line’s first 10 percent took time. For some, it took a year; most took two years. This reflects the time needed to plan for deal flows, identify a pipeline of eligible subprojects, and refine the appraisal and approval processes. While in some cases the delay was prolonged by external economic and political factors (e.g., in Tunisia, Turkey), a slow start is typical and should be considered when developing realistic implementation and disbursement projections. Only three credit lines were able to disburse their initial 10 percent within the first year.

Developing a robust subproject pipeline is necessary for successful implementation. Under these projects, governments, financial institutions, and other entities (e.g., industrial associations, energy agencies) have partnered to educate potential subborrowers and high-demand energy users about energy efficiency and the availability of credit lines to help finance such investments. Efforts have included:

• Directives or incentives from the government (e.g., mandating that large energy consumers appoint energy managers and undergo energy audits, as in Turkey, or oblige large industrial users to implement energy efficiency measures in the government’s national development plan, as in China)

• Incentives from financial institutions’ management (e.g., rewards for employees to meet lending targets)

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\(^2\) In corporate finance, DSCR is a measure of the cash flow available to pay current debt obligations.
All the completed credit lines achieved or exceeded their performance indicator targets for energy savings and reductions in carbon dioxide emissions. Overall, the completed credit lines will save 505 terawatt-hours over the lifetime of investments made and avoid 172.6 million tons of carbon dioxide equivalent.

Experience also illustrates that continued close monitoring and periodic adjustments based on changing market conditions are necessary. Every completed credit line in the portfolio had to be restructured and extended at least once (except CHEEF II, which was cancelled). Three of the ongoing projects were restructured. Across restructured projects, eligibility requirements, cofinancing amounts, or the sizes of the credit lines were adjusted to reflect market demand. CHEEF, Turkey PSREEE, UZEEF, Jamaica, and Ethiopia all received additional financing, while Vietnam is awaiting approval for a guaranteed facility to increase lending by $250 million. On the other hand, the Tunisia credit line was reduced due to low demand, the withdrawal of one financial institution, and political/economic conditions.

- Beyond changes in credit lines’ implementation period and financing, various adjustments have been made to strengthen implementation, including:
  - Broadening the scope of the credit line, such as expanding the geographic coverage (as in Turkey and Shanghai) or eligibility criteria
  - Introducing more flexibility in the credit line manuals, such as by lowering the minimum DSCR (as in Ukraine and for SMEs in Turkey), reducing cofinancing requirements (SMEs in Turkey), increasing the maximum subloan size (SMEs in Turkey, Uzbekistan), and simplifying environmental and social management frameworks and procedures (e.g., Shanghai)
  - Removing nonperforming financial institutions (as in Ukraine and Tunisia)
  - Specifying a minimum share of the credit line to be used for energy efficiency (for credit lines that also financed renewable energy) as in Turkey PSREEE
  - Intensifying marketing, including through outreach events at industrial parks and among associations, equipment suppliers and ESCOs, as well as through online outlets, including social media.

**Cost-effectiveness.** All the completed credit lines (except CHEEF II, which was cancelled) achieved or exceeded their performance indicator targets for energy savings and reductions in carbon dioxide (CO₂) emissions. Overall, the completed credit lines will save 505 terawatt-hours (TWh) over the lifetime of investments made and avoid 172.6 million tons of carbon dioxide equivalent (tCO₂e). Forecasts from ongoing credit line projects indicate energy savings of 152 TWh and 130.8 million tCO₂e. The CHEEF I credit line in China, including its additional financing, achieved greater carbon and energy savings than all the other completed projects combined. It was also the most cost-effective, with a savings rate of $14.75/tCO₂e. The CHEEF I and Ukraine credit lines tied for the most efficient energy savings rate of $4.66/megawatt-hour (MWh).

The reported results of energy efficiency projects were all considered cost-effective (in dollars per kilowatt-hour). Tunisia spent $152.08 for every ton of carbon abated, the highest cost in the portfolio, but its energy savings were comparable to the others at $41.91/MWh. Turkey’s PSREEE credit line involved the highest cost for energy savings, at $68.33/MWh. The ongoing Shanghai project, the only one targeting building efficiency through retrofits, expects to achieve energy savings at $31/MWh and carbon reduction at $79/ton.

**Project implementation management.** In most of the credit lines, energy efficiency investments were implemented by financial institutions, often with oversight from a government agency. In Uzbekistan, Turkey, and Ukraine, project implementation units (PIUs) were established within each financial institution, with designated staff responsible for marketing and managing the credit line. The PIUs usually consisted of a director, safeguards expert, engineer, procurement specialist, and financial management specialist. In Turkey and Ukraine, the PIUs were also responsible for day-to-day supervision, management, monitoring and evaluation (M&E), marketing, and/or implementing technical assistance.

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1. The ongoing Jamaica and Ethiopia credit lines measure their results in terms of units sold.
For those projects that included a government agency as an implementing agency or project partner, PIUs were also created to support the project’s overall coordination as well as the government’s oversight responsibility, and the implementation of capacity building, technical assistance, and monitoring and reporting.

In Turkey (in the project focused on SMEs) and Vietnam, government agencies also collaborated with financial institutions to complete technical appraisals, ESCO contracts, and energy audit reports. For the CHEEF credit line, the PIU functioned mainly in an advisory and coordinating capacity. In Shanghai, steering and executive committees were set up to coordinate day-to-day operations at the municipal and district level.

What are the key lessons learned?

The commitment of governments and domestic banks is critical

Key experiences and lessons from our review of the World Bank’s portfolio of credit lines for energy efficiency projects are summarized below:

Policy support and high-level government commitment are key. A conducive policy and regulatory environment can help boost industry demand for energy efficiency investments, which in turn will generate interest among financial institutions. In China and Uzbekistan, the government provided regulatory support and clear guidance on energy efficiency measures and encouraged industrial enterprises to undertake such investments.

Financial institutions must show commitment and have strong organizational structures. The commitment of financial institutions’ management is critical from the beginning to direct staff and align the actions of various departments. This includes the formation of long-term support for dedicated teams and PIUs, provisions of incentives to PIU staff and high-performing loan officers, willingness to market and brand the credit line, and flexibility and innovation in developing and adapting financial products to suit the energy efficiency market. For the most recent credit line (Vietnam), financial institutions were competitively selected.

The capacity of financial institutions to undertake technical and financial assessments of energy efficiency investments must be enhanced. Some early credit lines split the work of conducting technical assessments and energy audits (generally with energy agencies or ministries) and credit appraisals (with financial institutions). Several technically eligible subprojects ultimately could not be financed because borrowers were not creditworthy. As financial institutions build their internal capabilities to conduct technical and financial due diligence, they can begin standardizing their processes and assessments, which will eventually allow them to lower transaction costs, particularly for smaller investments. Tunisia’s National Agency for Energy Conservation supported screening and technical reviews in the early years, until the financial institutions built up their internal capacities and were able to take on this function.

A project pipeline should be built up and sustained.

Financial institutions and host governments should use multiple channels to market the credit lines to potential subborrowers, foster strategic partnerships, and replicate successful projects. Financial institutions can also use technical assistance to increase the knowledge and capacity of their business departments and subborrowers, and to expand their network and channels for business development.

Flexibility is needed. Most successful credit lines have made adjustments to their eligibility criteria and procedures over the course of project implementation, as market conditions and policies evolve. Feedback loops should be set up between loan officers and the PIUs so that marketing strategies and credit line criteria, among other things, can be adjusted based on the responses of potential clients.

Capacity building and technical assistance are important.

Both are vital components of credit lines and should go hand in hand with lending, in order to address the many institutional and market barriers noted here. As is evident from the World Bank’s credit line portfolio, technical assistance has clarified unfamiliar market segments, raised awareness of new market opportunities, and informed the design of new products to take advantage of those opportunities. Strong capacity for fiduciary safeguards will help financial institutions meet the requirements of the World Bank and other IFIs.
Sustainability should be considered throughout. Credit lines are meant to develop a commercially viable energy efficiency lending business in the long run. Thus, it is critical to design them to be self-sustaining once the credit line is depleted. A good internal setup, technical capacity, continued pipeline development, and proper internal systems for appraisals and monitoring are needed. These provisions will help ensure that efforts to expand energy efficiency grow even after the credit line closes.

References and sources

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