TRANSFORMATIVE INVESTMENTS FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY (TI4E)

Mapping Brazil's industrial energy efficiency market, opportunities, challenges, and assistance requirements to determine how best to unlock the existing industrial efficiency potential.

September 2017

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

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EXECUTIVE SUMMARY

The Transformative Investments for Energy Efficiency and Renewable Energy (TI4E) programme intends to facilitate deals between potential investors and investment opportunities in industrial energy efficiency in Brazil. This document is the first outcome of the GIZ & Carbon Trust partnership to design the T14E and presents a market survey of ESCO-based energy efficiency opportunities in Brazil, along with a full understanding of regulatory drivers, available financial mechanisms, existing technical assistance initiatives and remaining barriers limiting the implementation of energy efficiency projects, leading to the identification of interventions to unlock the ESCO-based energy efficiency market in Brazil.

Using official government projections, this report shows that energy efficiency is expected to play a significant role in reducing Brazil's energy demand, and industries can save ~8 Mtoe per year by 2024 through efficiency interventions. A survey of the 80 members of Brazil's ESCO Association (ABESCO) reveals that most have very limited capacity to access finance and implement interventions on the basis of energy performance contracts, and therefore have limited reach into industries. Most ABESCO members are in fact equipment installers, maintenance providers, and suppliers with limited experience in energy performance contracting, which thrive under the energy efficiency obligation scheme imposed over electricity distribution utilities (ANEEL'S Energy Efficiency Programme) - a key driver of Brazil's energy efficiency market.

An assessment of the ESCO project pipeline is performed on the basis of ABESCO members' total reported energy-efficiency-related revenue of R$ 1.1 billion/year, but the lack of underlying data and evidence limits our capacity to assess the composition of such a pipeline. Using ANEEL's PEE as a proxy, we note that the ESCO pipeline is largely focused on electricity saving opportunities, leaving thermal savings largely unaddressed. The pipeline can be refined by removing the bits which are not relevant for energy performance contracts, decreasing the initial figure of R$ 1.1 billion down to R$ 530 million. Although a precise figure is unknown, our assessment indicates that 2/3 of this is however composed of equipment supply and maintenance, and hence not appropriate for energy performance contracts.

The attractiveness of this pipeline to foreign investors is therefore unclear, but evidence suggests that there is a small number of projects with attractive rates of return and a low risk profile. Specifically, the pipeline is concentrated in very few ESCOS (5-10) and limited in terms of the number of projects (likely 5-10 projects per ESCO) and the size of such projects (R$ 1-5 million on average), with further analysis required to identify their applicability for EPCs and their capacity to deliver high-IRRs.

An extensive mapping of supporting policy and regulatory drivers reveals that despite the number of overarching plans that mention energy efficiency, and some direct action led by these, Brazilian policy does not provide a significant push towards energy efficiency investments. Few government-led initiatives have significant success, but leave a range of barriers unaddressed, in particular they lack a holistic approach to build a pipeline of low risk projects and to connect these to finance sources. Sources of finance are also plentiful, but have little demand for energy efficiency interventions, limited by a number of financial barriers (that render products unattractive) and barriers that limit the formation of a pipeline in the first place. Technical assistance is scarce on this market and disconnected from financial mechanisms.

Desk-research and interviews with representatives of 10 key players in the market reveals that a range of barriers need to be addressed to unlock ESCO-based energy efficiency opportunities. Barriers are classified as (i) customer-related - that weaken demand from end users for ESCOs' services; (ii) ESCO-related - which limit Brazilian ESCOs' capacity to create a pipeline and service demand; and (iii) financier-related which hinder the attractiveness of existing finance mechanisms and hence the creation and implementation of a pipeline. Solutions to these barriers are summarized at the end of this report and are ranked on a scale of low, medium and high priority in terms of their importance to unlock market opportunities, guiding the TI4E's next steps.

INTRODUCTION & CONTEXT

The Transformative Investments for Energy Efficiency and Renewable Energy (TI4E) programme intends to facilitate deals between potential investors and investment opportunities in industrial energy efficiency in Brazil to increase the volume of implemented projects. The TI4E is structured in three phases: (i) identification of the most interesting ESCO projects; (ii) development of such projects and selection by an investment board; and; (iii) a refinancing stage in which the programme attracts external investors to an investment debt pool.

The purpose of the TI4E is therefore to create a de-risking mechanism blending international climate finance donor resources into a fund that attracts institutional investors into energy efficiency projects during stage (iii). The underlying assumption is that a sufficiently deep pool of high quality energy efficiency projects with high internal rates of return (IRR) currently exists in Brazil, and that the reason for the lack of implementation of these projects is because there are no debt instruments available to finance the early preparation stages of the projects. Relevant stakeholders, such as local ESCOs and technology suppliers also lack the technical skills required to bring these projects up to investable standards.

It is suggested that a combination of early stage Technical Assistance (TA), particularly targeted at ESCOs, plus the availability of debt from an Investment Debt Pool, would be sufficient to overcome these barriers and deliver a pipeline of quality high-IRR energy efficiency projects. Once proven, the mechanism could achieve considerable leverage of public resources by refinancing with funding from institutional investors, which would be brought in as the senior debt tranche in a blended investment vehicle (possibly a Special Purpose Vehicle or similar dedicated fund), with ESCOs acting as project developers and implementers.

GIZ and the Carbon Trust have joined forces to design the TI4E according to the needs of the Brazilian market, with the intention to submit joint bids to international climate financiers, such as the International Climate Initiative (IKI), the International Climate Fund (ICF) and the Green Climate Fund (GCF). This document is the first outcome of this partnership and intends to deliver a market survey of ESCO-based energy efficiency opportunities in Brazil, along with a full understanding of regulatory drivers, financial mechanisms existing technical assistance initiatives and remaining barriers limiting the implementation of energy efficiency projects, leading to the identification of Brazilian ESCOs' technical assistance (TA) needs. It was delivered through a combination of literature review, desk research and consultation with relevant stakeholders in Brazil (including representatives of financial institutions, end-users, sample ESCOs and Brazil's ESCO Association - ABESCO).

The project team is composed of a mix of UK and Brazil-based experts with programme design experience from the Carbon Trust, supported by a senior Brazilian expert from Ecoeficiência Energia.

This report is divided into four main sections:

(i) An evaluation of Brazil's energy efficiency market size, including the value of this market between now and 2024 and specific estimates of the energy efficiency potential which is attributable to ESCOs.

(ii) A market survey of the ESCO sector in Brazil, including: a survey of ESCO characteristics, according to data provided by ABESCO; an identification and characterization of Brazilian ESCOs' pipeline of projects, with estimates on the share of this pipeline that is most likely to be delivered through Energy Performance Contracts (EPCs); an evaluation of the relevant governmental plans, programmes and regulation driving the development of Brazil's energy efficiency market; a map of all relevant finance mechanisms available to support energy efficiency in Brazil; and an evaluation of existing technical assistance and awareness raising initiatives built to drive Brazil's efficiency market.

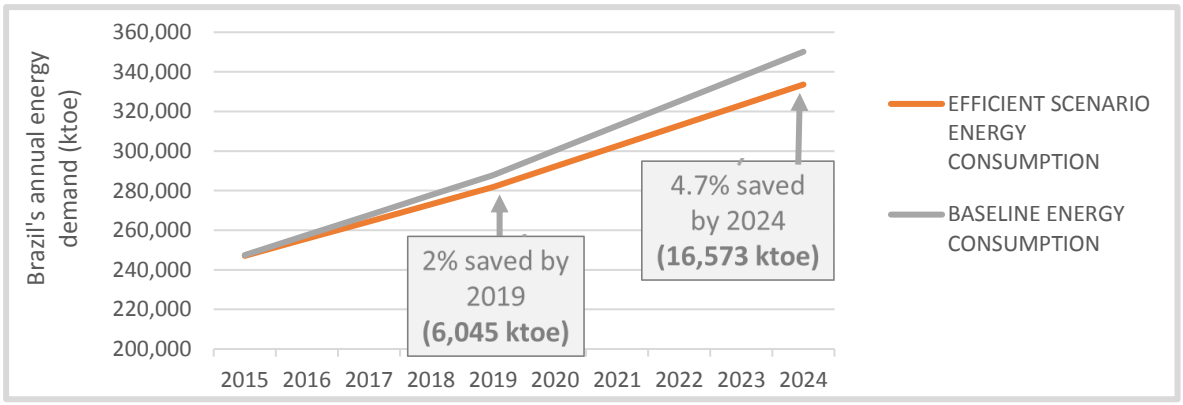
(iii) An analysis of assistance requirements to unlock Brazil's energy efficiency market, based on feedback gathered through interviews to identify remaining barriers hindering the development of this market and identify proposed solutions to each barrier.

(iv) Concluding this report is an assessment of the additionality of the TI4E and next steps. This section looks back into the initial assumptions to check how the analysis affects those, and concludes that the TI4E's support would be most additional if directed to solve barriers across the energy efficiency supply chain, from customer-related barriers, to ESCO-related ones, through to financial-related barriers. Solutions to these barriers are summarized and barriers are ranked on a scale of low, medium and high priority in terms of their importance to unlock market opportunities, guiding the TI4E's next steps.

BRAZIL'S ENERGY EFFICIENCY MARKET SIZE

Brazil's latest 10-year energy plan, launched in 2015, foresees significant energy savings to be delivered in multiple sectors by 2024, of which a significant share can be captured by ESCOs. Departing from a potentially optimistic baseline energy consumption scenario[1], in which the total energy demand rises from 247 Mtoe in 2015 to 350 Mtoe in 2017, the plan assumes 2.1% of the baseline can be saved by 2019 (6,045 ktoe) and 4.7% by 2024 (16,573 ktoe), as illustrated in Figure 1.

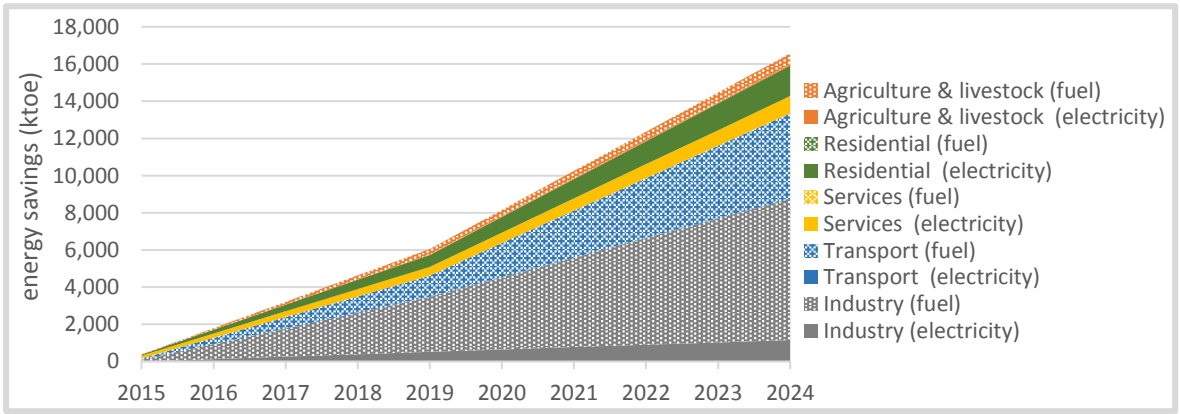
Figure 1. Brazil's total energy demand in baseline and efficient scenarios between 2015-2024 (ktoe)



Source: Derived from (EPE, 2015).

Focusing on the area in between the baseline and efficient scenarios, the bulk of energy savings are expected to occur in the industrial and transport sectors. As a result, about two-thirds of the energy savings are expected to come from increased fuel efficiency in both the industry and transport sectors, rather than through reductions in electricity consumption, as illustrated in Figure 2. Nonetheless significant power saving opportunities lie within the residential, industrial and service sectors, the latter including public sector saving prospects.

Figure 2. Brazil's fuel and electricity savings per sector 2015-2024 (ktoe)



Source: Derived from (EPE, 2015). Note: Public sector savings are included within the services category.

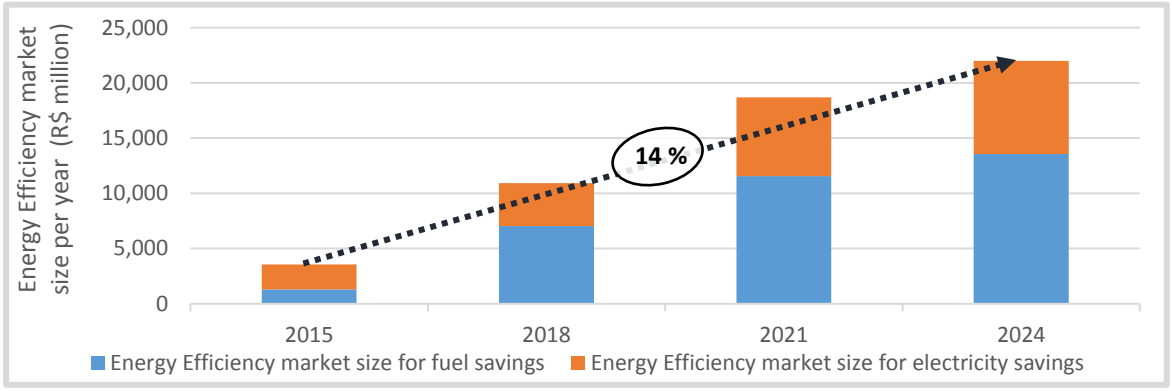
[1] Brazil's 10-year energy plan (2015-2024) assumed average GDP growth of 1.8%/year in between 2015 and 2019; and 4.5%/year between 2020 and 2024; well above the -3.8% registered in 2015 and -3% registered in 2016.

Despite the greatest opportunities lying with fuel efficiency, Brazil's key energy efficiency programs are primarily focused on electricity savings. For example, ANEEL's Energy Efficiency Programme (PEE) is the greatest source of energy efficiency finance and approximately 80% of its resources are dedicated to power savings. The National Energy Conservation Programme (PROCEL) and the Brazilian Labelling Programme (PBE) have focused their efforts almost entirely on defining minimum performance levels and labelling criteria for appliances such as refrigerators, fans, lightbulbs, and air-conditioning systems. This suggests there is an untapped potential in targeting fuel efficiency. Further details on these programmes and other national initiatives are described further below.

In line with the 10-year energy plan, a yet-to-be-published study delivered by the World Bank and Brazil's National Confederation of Industries (CNI) shows that ~60% of the energy efficiency opportunities identified within the 50 largest industries in Brazil are based on thermal efficiency. These projects are often more complex to deliver, measure and verify, which makes it harder for the companies to opt for performance contracts – even though thermal efficiency projects may have more attractive returns than the electricity saving ones.

Analysing the potential savings described above in more detail, and assuming values in R$/ktoe for the cost of fuel and electricity per sector (considering each sector's average fuel mix), it is possible to estimate the cost savings within the period per sector. Furthermore, assuming average lifetimes of energy saving measures per sector and cost savings from avoiding new installed capacity, it is possible to estimate the size of the market opportunity for energy efficiency per sector split across fuel and electricity savings, as illustrated in Figure 3 below.

Figure 3. Brazil's energy efficiency market is expected to grow on average by 14% per year between 2015 and 2024, amounting to more than R$ 22 billion in 2024



Source: Carbon Trust Analysis based on Brazil's 10-year energy plan (EPE, 2015). Notes: Estimates represent the cost savings from EE measures, but not of actual infrastructure investments. Assumes 2017 electricity and fuel price averages throughout the period. Increasing the cost of fuels and electricity in time would lead to greater market sizes.

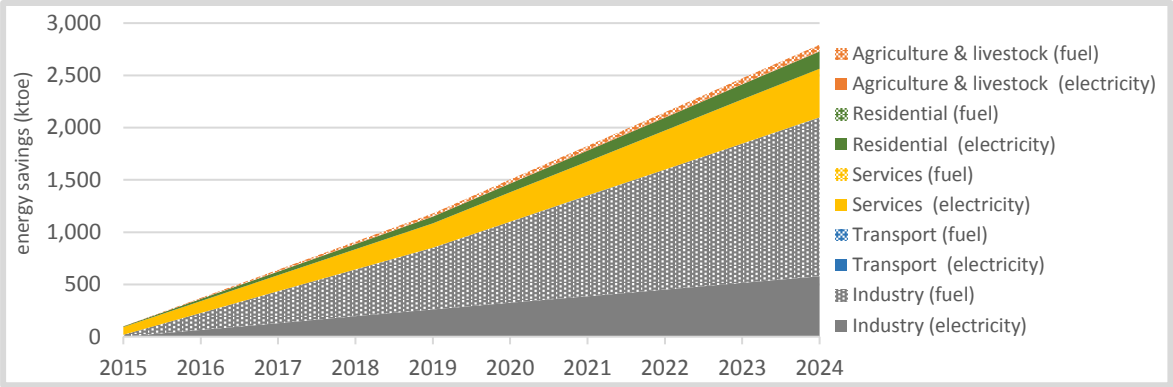
While on the one hand, the size of the opportunity described above can be said to be inflated by the optimistic GDP growth scenario foreseen in Brazil's 10-year energy plan, on the other hand, the estimated savings in the plan are modest - a reduction in 4.7% of total energy demand by 2024 - and are thus below the technical potential for energy savings in Brazil.

Not all the energy efficiency opportunities presented in Figure 2 can be captured by ESCOs in Brazil. For the purpose of creating a realistic ESCO-related scenario derived from Figure 2, capture factors have been assumed for electricity and fuel savings presented per sector in the 10-year energy plan. The result of this exercise is shown in Figure 4 and reveals that ESCOs could realistically save 2,800 ktoe by 2024 (17% of the 16.6 ktoe savings foreseen in Brazil's 10-year energy plan in that year).

Moreover, it becomes clear that ESCOs are more likely to capture electricity-related opportunities rather than fuel-related ones – given power savings are the focus of Brazilian ESCOs' business, as demonstrated by the analysis further below. In the transport sector for example, ESCOs are unlikely to capture any fuel saving

opportunities, as this refers to a modernization of the fleet which is not typically an area of ESCO focus. In the industrial sector, where fuel savings can be the greatest, ESCOs are unlikely to capture most opportunities because they have limited expertise and access to work within core industrial processes.

Figure 4. ESCOs can capture approximately 17% of the energy efficiency opportunity outlined in Brazil's 10-year energy plan, and are more likely to capture electricity-related opportunities.



Source: Carbon Trust analysis. Notes: Capture factors for each sector's electricity and fuel saving opportunities, and respective assumptions are presented in the table below.

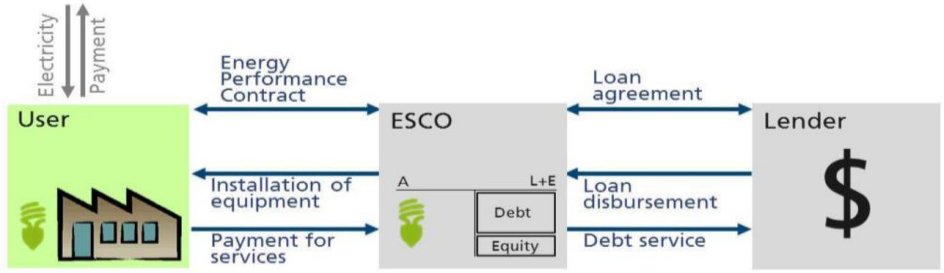
Sector	Capture factor	Rationale
Electric efficiency		
Industry	50%	• A large share of electric efficiency improvements in industries are bound to occur with industrial modernization and without the support of ESCOs. • ESCOs are well prepared to deliver electricity savings in industry.
Transport	10%	• Very few Brazilian ESCOs claim to have the electric transport sector (e.g. trams and subways) as a business focus. • ESCOs have limited expertise in this domain.
Services	50%	• ESCOs have the capacity and expertise to capture a large share of this opportunity.
Residential	10%	• ESCOs have limited focus on the residential sector, which tends to become more efficient on its own.
Agriculture	10%	• ESCOs have limited focus on the agricultural sector, which tends to become more efficient on its own.
Fuel efficiency		
Industry	20%	• ESCOs have limited expertise in fuel efficiency in core industrial processes and industries are reticent to open such opportunities to ESCOs.
Transport	0%	• Transport sector fuel efficiency is typically not an ESCO domain.
Services	0%	• There are no fuel savings forecasted in this sector in the 10-year energy plan.
Residential	0%	• There are no fuel savings forecasted in this sector in the 10-year energy plan.
Agriculture	10%	• ESCOs have limited focus on the agricultural sector, which tends to drive efficiency improvements on its own.

MARKET SURVEY OF THE ESCO SECTOR IN BRAZIL

This section presents a characterization of Brazil's ESCO market, based on data collected by questionnaires answered by the 80 active companies which form Brazil's ESCO Association (ABESCO). It includes data on the size of these organisations, their regional base, activity focus, business model, target audience and accreditation.

It is important to note that the concept of Energy Service Companies (ESCOs) is not consistently defined throughout the world, often leading to confusion. The main defining feature of an ESCO is its acceptance of an element of risk related to the provision of energy services. In other words, ESCOs trade on the promise of generating revenues through energy savings, generally using Energy Performance Contracts (EPCs) which split savings into revenues for the ESCO's own remuneration and savings to be kept by the end-user/client, as illustrated in Figure 5. In Brazil, the term ESCO has been used to define companies conducting energy saving assessments, implementing energy efficiency projects, or selling energy efficient equipment, regardless of whether the ESCO's revenue is directly linked to the performance of their products or services.

Figure 5. Energy Performance Contract model

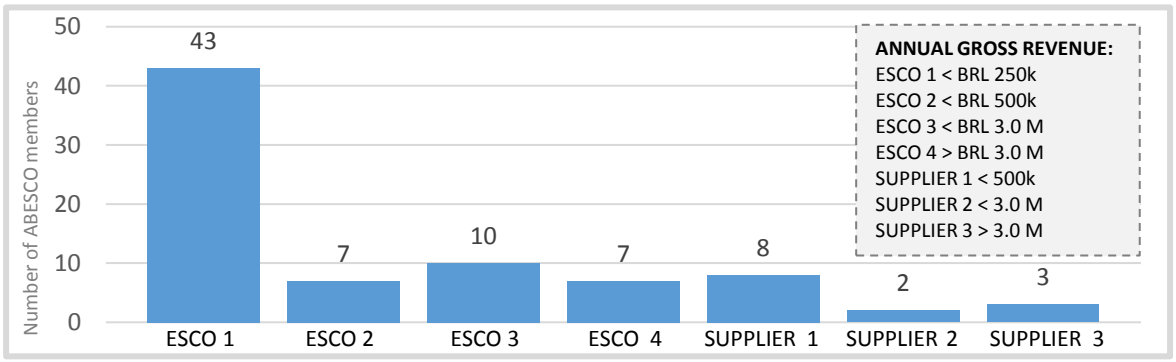


Source: Frankfurt School of Management, FS-UNEP Collaborating Centre for Climate & Sustainable Energy Finance

CHARACTERIZATION OF BRAZILIAN ESCOS

ABESCO subdivides its associates across annual revenue categories, and between ESCOs and suppliers. Figure 6 shows the number of ESCOs and suppliers by annual revenue, and reveals that most Brazilian ESCOs and suppliers are small (<R$ 3 million in annual revenue). Whilst ESCOs in Europe and the USA are generally subsidiary divisions/enterprises of larger companies with high turnovers, in Brazil, only seven ESCOs have annual revenues >BRL 3 million. Out of these, four are subsidiaries of electricity utility companies operating in major capitals and regions with high energy consumption, as listed in Table 1. Three other independent ESCOs are also within the highest revenue category, and again located in highly populated regions, namely: 3E Engenharia em Eficiência Energética (Sorocaba); Ação Engenharia e Instalações (São Paulo); and Multiempreendimentos Engenharia Consultiva (Recife). Amongst the category of suppliers, there are only three large companies: Siemens; Schneider Eletric; and WEG Equipamentos Elétricos – all of which operate or distribute their products across Brazil.

Figure 6. Number of ESCOs per annual gross revenue category - according to ABESCO's categories



Source: Carbon Trust analysis based on data from ABESCO's questionnaire responses.

Table 1. Five large power utilities have ESCO subsidiaries which offer energy efficiency opportunities

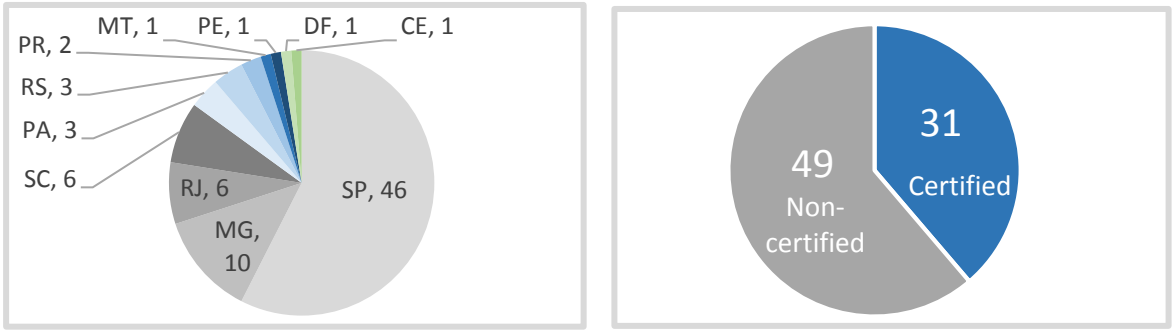
Utility name	Region of concession/operation	Subsidiary ESCO
CPFL	São Paulo	CPFL Eficiência Energética S.A.
AES Eletropaulo	São Paulo	AES Ergos
CEMIG	Belo Horizonte	Efficientia S.A.
Light	Rio de Janeiro	Light ESCO
EDP	São Paulo e Espírito Santo	EDP-AP

Source: Carbon Trust analysis based on data from ABESCO's questionnaire responses.

The geographical distribution of ABESCO's members is shown in Figure 7, and unsurprisingly ESCOs and suppliers are concentrated in the states with the highest economic activity and presence of energy intensive sectors. More than half of ABESCO's members are based in São Paulo, with a significant share of members based in the states of Minas Gerais, Rio de Janeiro and Santa Catarina. A smaller number of ESCOs operate in Southern states, Centre West, North and North-eastern states. Important energy consuming industrial centres such as Salvador, Recife and Manaus, which have more than 600 medium and large industries in its free trade zone, have very few ESCOs associated with ABESCO, which may be an additional barrier for developing energy efficiency projects in such regions.

Figure 7 also shows that 61% of ABESCO members do not hold the QualiESCO label, the only ESCO-specific certification available in Brazil. This label was created by ABESCO in 2011 to build capacity across ESCOs, as well as to assess and certify their technical capacity to deliver energy saving services and products. However, the QualiESCO label provides limited commercial value to ESCOs, as it is not linked to any form of financial incentives (e.g. certified ESCOs could be eligible for concessional loans). The main perceived value of the label by ESCOS is that they can demonstrate to their clients that they have been through a certification process.

Figure 7. Number of ESCOs per state and number of ESCOs with QualiESCO certification.

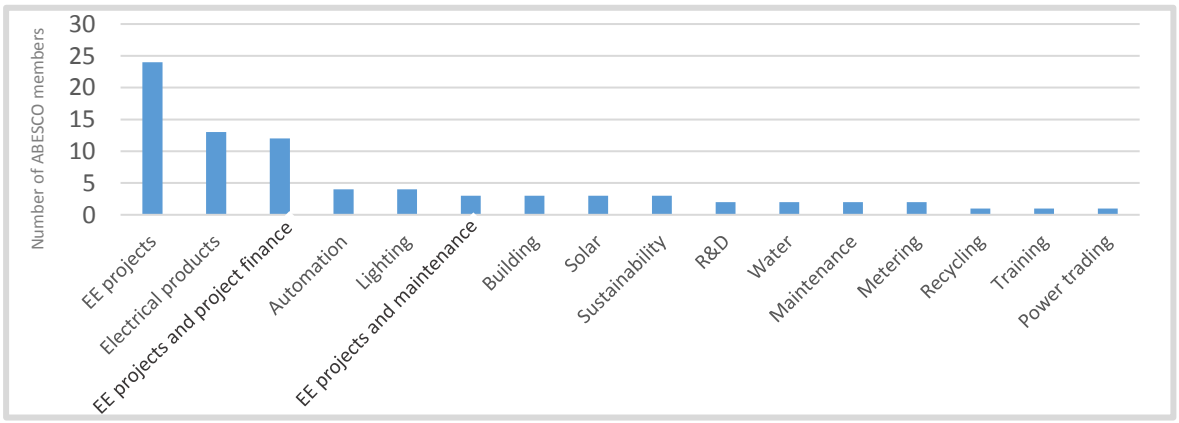


Source: Carbon Trust analysis based on data from ABESCO's questionnaire responses.

The core business of ABESCO's members varies across a range of energy-related products and services to end-users. Most ESCOs offer generalist EE-related services (including energy audits, project planning, sourcing suppliers, implementing interventions and monitoring impacts). Only twelve Brazilian ESCOs deliver EE projects along with project finance (primarily through EPCs), sixty-eight others provide multiple EE services with no financial solutions, many of which are specialized in services for specific technology fields (e.g. metering, maintenance and training services), or sell specific pieces of kit (e.g. automation equipment, lighting, and solar PV systems). Figure 8 shows the ESCOs' responses regarding their areas of expertise.

The limited number of ESCOs offering project finance suggests that only a small number of ESCOs are able to take loans to cover upfront investment costs of energy efficiency projects. Behind this is a clear link between the size of the ESCOs, their technical and financial structure, and their business model. The small number of large ESCOs are subsidiaries of large power distribution companies (listed in Table 1), initially created to comply with ANEEL'S PEE, which mandates utilities to invest 0.5% of their net operational income in energy efficiency projects – according to law 9,991 of 2000. These companies have larger balance sheets and assets that allow them to access low-cost funding if needed, and a robust technical structure to offer energy performance contracts (EPCs) to the market. However, such ESCOs are allowed to offer EPCs using PEE resources only within their parent utilities' concession areas, which significantly limits their portfolio of projects and consumer outreach.

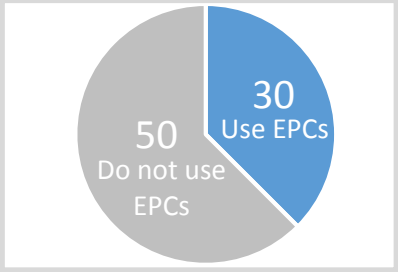
Figure 8. Only twelve Brazilian ESCOs offer general EE project services along with financial solutions. A large number of ABESCO members are suppliers or focused on specific technology areas and do not offer finance.



Source: Carbon Trust analysis based on data from ABESCO's questionnaire responses.

Given that only twelve ESCOs offer project finance solutions, it is not surprising that 62% of ABESCO members do not rely on EPCs to deliver their services, as shown in Figure 9. Thirty ABESCO members indicated they use EPCs, suggesting that eighteen ESCOs which do not offer project finance solutions are willing to take performance risks, but are not taking loans themselves to offer full financial solutions[2] - due to these being medium or small-sized ESCOs with limited capacity to take and back-up loans.

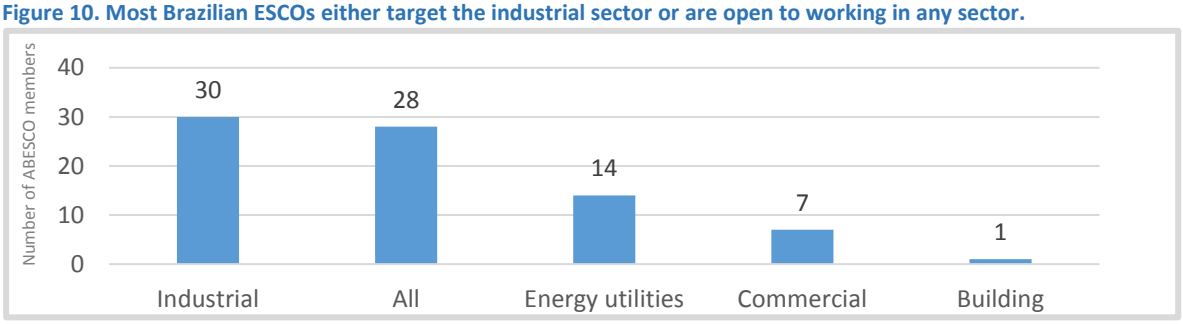
Figure 9. Most ABESCO members do not use energy performance contracts (EPCs).



Source: ABESCO's questionnaire responses.

Figure 10 shows that thirty Brazilian ESCOs are primarily focused on the industrial sector, while twenty-eight are exploring opportunities in all sectors. ESCOs targeting energy utilities focus on the energy efficiency finance opportunity that arises from Brazil's Electricity Regulator's Energy Efficiency Programme (ANEEL's PEE). Under this obligation scheme, utilities open annual public tenders to finance energy saving projects in their concession areas and select winning projects based on criteria established by ANEEL. Several ESCOs have thrived from developing projects with end-users and submitting bids to secure funding from the utilities under this scheme - a stable source of finance amounting to R$ 630 million in 2015, which is evaluated in detail further below.

Figure 10. Most Brazilian ESCOs either target the industrial sector or are open to working in any sector.



Source: Carbon Trust analysis based on data from ABESCO's questionnaire

CHARACTERIZATION OF BRAZILIAN ESCOS' PIPELINE OF PROJECTS

This section estimates the size of the current pipeline, characterizes this pipeline (to the extent allowed by the data available), and assesses how it compares to the ESCOs' potential opportunity identified in Figure 4 by matching data obtained from the questionnaires filled-out by ABESCO members, to data gathered from conversations with ABESCO, individual ESCOs and secondary research. The purpose of this section is to understand whether this pipeline can, in principle, be sufficiently attractive for external investors.

VALUE AND CHARACTERIZATION OF THE ESCO PIPELINE – ESCO DEAL FLOW

The sum of all of ABESCO members' reported gross revenues, according to their questionnaire responses, amounts to R$ 1.1 billion per year. These revenues translate into 1,151 MWh/year in savings[3] (99 ktoe), estimated by summing the savings from: (i) the share of such revenues originating from ANEEL's PEE programme (R$ 633 million in 2016), or 578,000 MWh saved in 2016 at a unit cost of R$ 1,094/MWh avoided according to (ANEEL, 2015); and (ii) the share of revenues originating from privately funded projects (R$ 470 million in 2016), leading to 533,000 MWh saved in 2016 - assuming 20% lower unit costs for energy saved,

[2] Examples of such ESCOs are: Witzler; Union Rhac Tecnologia em Eficiência Energética; Qualilight Energia; P3 Engenharia Elétrica; KMR Energia e Meio Ambiente; Exper Soluções Luminotécnicas; Eficien Energia Comercial.

[3] To translate ESCO revenues into MWh savings we assumed realistic values per MWh per sector, noting for example that energy is cheaper for the industry than it is for street lighting.

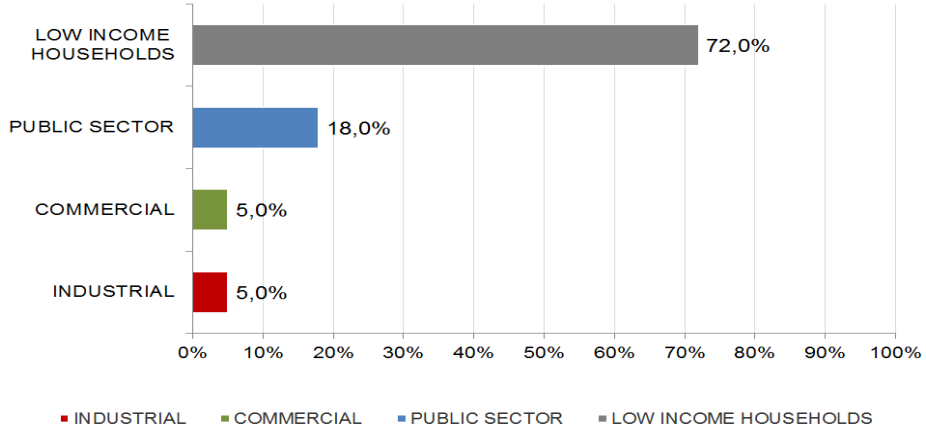
given large industrial and commercial clients pay less for electricity and fuels. Although it is not possible to attribute these savings to specific sectors (given the limitations of existing data), this number can be compared to the scenario of efficiency opportunities which can be realistically captured by ESCOs previously estimated in Figure 4. In our theoretical scenario, ESCOs could potentially deliver 370 ktoe of savings in 2016 (of which 54% in electricity and 46% in thermal savings). This suggests that ESCOs are currently capturing 27% of the theoretical potential.

The detailed breakdown of ESCOs' gross revenues (in terms of project categories, technologies, or clients) is not available within ABESCO or third party sources. To overcome this limitation, ANEEL's PEE programme statistics were used as a proxy to estimate the composition of the greater ESCO pipeline, given the programme's expenditures represent approximately 60% of this pipeline (R$ 633 million in 2016). In the paragraphs below, a breakdown of the PEE stats is shown, leading to conclusions around the composition of a revised ESCO pipeline.

An analysis of ANEEL's PEE stats, reveals that 72% (R$ 456 M) of the programme's budget is spent on low income household projects (namely free distribution of lighting, water heating and refrigerators), and 18% (R$ 112 M) on public sector projects (lighting and air-conditioning), as shown in Figure 11. In fact, until recently, the regulation underpinning the PEE determined that at least 60% of the utilities' PEE budget had to be allocated to low income household projects of this kind. However, in late 2016, the law 13,280 superseded that mandate stating that up to 60% of the utilities' PEE budget can be allocated to low income household projects - allowing utilities to decrease this allocation and transfer it to other areas from 2017 onwards.

Crucially, public energy efficient lighting projects and low income household projects are not suitable for the typical ESCO EPC contracting model. In fact, such projects are not executed by traditional ESCOs but rather by technology suppliers within ABESCO, which offer common technology warranties instead of performance contracts to public entities (in the case of public lighting) or to low income families (in the case of households).

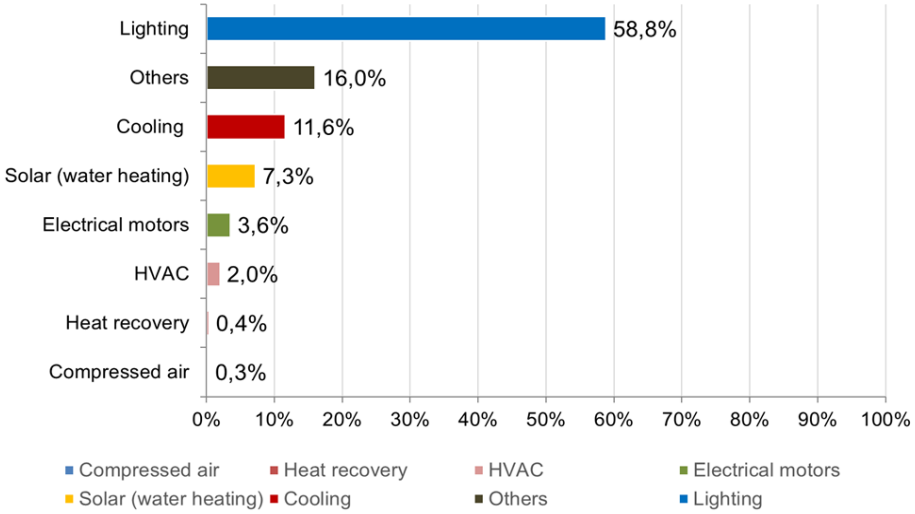
Figure 11. Power utilities' PEE budget is primarily directed to the public sector and to low income households



Source: ANEEL, 2016

A further analysis of PEE stats reveals that very few technologies are being incorporated into client facilities and most focus on power savings, rather than thermal savings - a clear misalignment with the opportunity that could be captured by ESCOs shown in Figure 4. ABESCO members are primarily providing efficient lighting technologies for public buildings and streets, as well as efficient lighting and refrigerators to low income households. Less than 20 ESCOs provide more advanced technology solutions (e.g. compressed air, heat recovery, energy integration and combined heat and power to commercial and industrial end users) as shown in Figure 12.

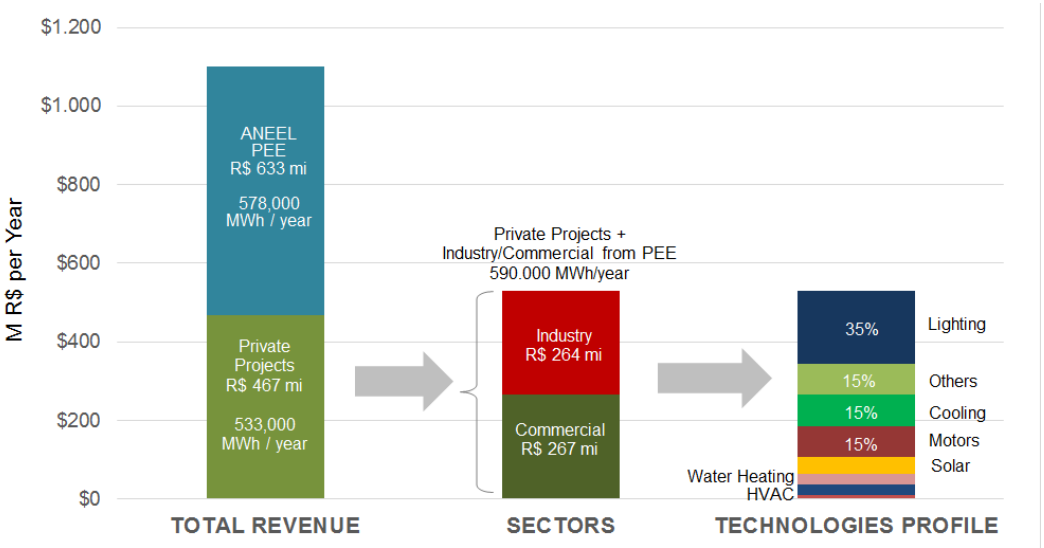
Figure 12. ANEEL's PEE project distribution per technology in 2016.



Source: ANEEL, 2016

The initial estimated pipeline of R$ 1.1 bn was hence adjusted to reflect two factors: (i) that annual ESCO revenues are mostly composed of efficient lighting and refrigeration provided by technology suppliers rather than ESCOs, within ANEEL's PEE; and (ii) that a large share of ABESCO member revenues are actually composed of equipment supply and maintenance (within and beyond ANEEL's PEE). In this revision, we assumed the non-PEE share of the pipeline follows the same technology breakdown than the PEE – due to a lack data on this aspect and interviewee confirmations that the PEE's technology focus is a good proxy. The revised ESCO pipeline, therefore considers only the share of projects that may fit under typical ESCO energy performance contracts and are hence most interesting from the perspective of external investors.

Figure 13. The revised ESCO pipeline has R$ 531 million/year



Source: Carbon Trust analysis based on data from ABESCO's questionnaire responses and (ANEEL, 2015) Notes: The breakdown of technologies is based on ANEEL's PEE projects profile, with adjustments considering energy efficiency projects database from (CNI, 2014).

Having re-assessed gross ESCO revenues, to derive the share which is most relevant for ESCO-based performance contracts, a new value of R$ 531 million/year is obtained - composed of the relevant[4] share of PEE projects and (R$ 64 million/year) plus the non-ANEEL-PEE share of the pipeline (R$ 467 million/year). Such revenues translate into 590,000 MWh/year (51 ktoe), roughly equally divided across industrial and commercial sectors. Comparing this figure to the efficiency opportunities which can be realistically captured by ESCOs - shown in Figure 4 - ESCOs can be said to be capturing 14% of the market assigned to them in 2016. Importantly, it is also clear that ESCOs are focused on electricity saving opportunities (largely driven by ANEEL's PEE) despite the largest opportunity highlighted in Figure 4 being related to industrial fuel efficiency.

Assuming the revised R$ 531 million/year ESCO pipeline is composed of projects with an average value of R$ 2 million, there could be approximately 265 ESCO-based projects operating with energy performance contracts in Brazil per year. The revised pipeline is dominated by Brazil's few large ESCOs, with small ESCOs being largely dependent on ANEEL's PEE. Large ESCOs have solid assets and good access to finance, but the extent to which these projects have been implemented with own finance from ESCOs or clients, or with banking finance, is yet unknown - as noted above.

ESCO CLIENT BASE

A closer look into ESCO clients allows us to reflect on how these influence ESCOs' capacity to take-up finance. Extensive desk-research on more than half of ABESCO members' websites reveals medium to large clients, some of which are listed in Table 2 below, split between the industry and commercial sectors. Whilst these should work in ESCOs' favour in terms of proving their pipeline's creditworthiness, the extent to which they do so is unclear because whether such clients have been won under ANEEL's PEE programme is so far unknown. Moreover, it is unclear if the finance paying for projects beyond ANEEL's PEE is coming from banks, end-users' own capital, or from ESCOs' own capital. ESCOs' capacity to take up finance to implement projects beyond the PEE is certainly very limited, as explored in a subsequent section of this report.

Table 2. Examples of clients in ESCO's pipeline

	Industrial	Commercial sectors
Large corporates	• Votorantim • Thyssenkrupp • Petrobras • Vale • Souza Cruz • Nestlé • Ambev • Fiat • Phillips • Natura	• Bradesco Bank • Honda • Infraero • Itau Bank • Burger king • Motorola • Pão de Açúcar • Banco do Brasil • Accor • Band TV
Medium companies	• Hidropan • Brose • Tecfil • Boehringer • Atlantica • Sabesp	• Andrade & Canellas • Albert Einstein Hospital • Cinemark • Anhanguera Schools • JFK Shopping • Ibirapuera Shopping

Source: Authors' analysis based on desk-research on sample Brazilian ESCO websites [5]

[4] The full ANEEL PEE pipeline minus the public lighting and low income household shares – which are not relevant for ESCO-based performance contracts.

[5] http://www.acaoenge.com.br/clientes.htm; http://www.aesergos.com.br/Paginas/Default.aspx; http://acxxus.com.br/clientes.php; http://www.animaprojetos.com.br/clientes.html;http://www.energias.com.br/;http://www.greenyellowbr.com/; http://indecoweb.com.br/clientes/

ATTRACTIVENESS TO EXTERNAL INVESTORS

The extent to which Brazil's ESCO-based project pipeline is attractive to external investors is yet unclear, and will require a further detailed assessment of the pipeline identified above. Three factors indicate that the attractiveness will be limited at this point:

(i) The pipeline is concentrated in very few ESCOS (5-10) and limited in terms of the number of projects (likely 5-10 projects per ESCO) and the size of such projects (R$ 1-5 million on average). Further analysis is required to identify their applicability for EPCs and their capacity to deliver high-IRRs.

(ii) ESCOs have been limited in their interaction with the industrial sector, where major opportunities lie. Brazil's industrial sector is responsible for 33% of the country's energy consumption, and the 50 largest industrial companies account for 20% of Brazil's national energy consumption. Brazil's Association for Energy-Intensive Consumers (ABRACE) indicates that less than 10% of its member companies have ever developed projects with ESCOs. This low level of interaction between the industries and ESCOs indicates that a large portion of the energy efficiency opportunities identified in Figure 4 is not availed by ESCOs, despite there being a clear need for energy efficiency within the industry. Rather than calling on ESCOs, the limited number of large companies deploying energy saving measures have resorted to their own technology teams, or in some cases, to international services companies to deliver energy saving interventions – such as Worley Parsons, Cofely and Shell Global Solutions.

(iii) Brazilian ESCOs lack thermal-saving-related expertise and the pipeline is focused primarily on power saving opportunities, leaving thermal saving opportunities largely unaddressed.

Whilst these points suggest a limited attractiveness of the existing pipeline, they also suggest there is a major business opportunity to further develop this market and generate investable projects. This opportunity lies particularly on projects that provide services, methodologies and technology solutions to address thermal efficiency within the industrial and commercial sectors - where there is little competition and a large performance gap to be closed. The technical and financial needs to develop this pipeline are discussed in a dedicated section further below.

In line with this conclusion, ABESCO has estimated that the ESCO market size could increase from R$ 1 billion to R$ 4 billion per year if ESCOs could tap into the full industrial energy saving opportunities (ABESCO, 2015). Converting this opportunity into real investments would, however, require significant efforts to develop Brazilian ESCOs' technical delivery capacity in this field - the topic of a dedicated section below. The availability of local finance to cover the electric and thermal energy efficiency gap is also explored in a dedicated subsection below.

SUPPORTING POLICY AND REGULATORY LANDSCAPE FOR ENERGY EFFICIENCY IN BRAZIL

The opportunity described above is relatively well known across government, financial institutions, large corporates and sector associations. A complex policy and regulatory landscape exists to drive Brazil's low carbon development, including national plans, federal and state level regulation, financial incentives and sector-focused plans. This section maps out this landscape, including all initiatives that directly or indirectly drive the energy efficiency market in Brazil. These items are listed in below from broadest to narrowest scope and are again listed and outlined in more detail in Annex 1.

Table 3. Supporting policy and regulatory landscape for energy efficiency in Brazil

FEDERAL PLANS
• National Plan on Climate Change
• National Energy Efficiency Plan
• Plano Brasil Mais Produtivo
• Plano Inova
CROSS-SECTOR FEDERAL PROGRAMMES
• ANEEL's Energy Efficiency Programme (PEE)
• Equipment Labelling Programme (PBE)
• National Programme for Electricity Conservation (PROCEL)
• National Programme for the Rational Use of Oil and Gas Products (CONPET)
• Urban Mobility Growth Acceleration Programme (PAC2 Mobilidade)
• Federal and state government's Sustainable Purchase Programme
CROSS-SECTOR FEDERAL REGULATION
• Energy Efficiency Law
TRANSPORT SECTOR PLANS AND REGULATION
• National Plan for Logistics and Transport (PNLT)
• National Urban Mobility Plan (PNMU)
• Automotive Pollution Control Programme (PROCONVE)
• Inovar Auto
INDUSTRIAL SECTOR PLANS AND REGULATIONS
• Petrobras' operational energy efficiency programme
BUILDINGS SECTOR PLANS AND REGULATIONS
• Building labelling for commercial, public and residential buildings
• Caixa Azul Label

Source: Carbon Trust analysis derived from multiple sources listed under each item's description in Annex I.

SOURCES OF FINANCE AVAILABLE TO ESCOS AND ENERGY EFFICIENCY PROJECTS IN BRAZIL

At least 22 relevant financial mechanisms are available for energy efficiency in Brazil, from public and private sources, covering all major sectors of economic activity (and hence energy efficiency opportunities), as shown in Table 4 below. Finance originates from the following five main sources of capital: (i) Brazil's Development Bank (BNDES); (ii) federal commercial banks (*Caixa Econômica Federal* and *Banco do Brasil)*; (iii) other commercial banks; (iv) electricity distribution utilities operating under ANEEL's PEE; and (v) other international development banks, e.g. Inter-American Development Bank (IDB).

These credit lines disburse BRL billions each year but the precise figure directed towards actual energy efficiency is not clear, as: (i) most finance mechanisms are not targeting energy efficiency, but general 'modernization' of sectors or end-user groups, which includes services, investments in increased production capacity, new (not necessarily efficient) equipment, and renewable energy, e.g. BNDES' FINAME credit line, which disburses ~R$23bn/year; and (ii) financial institutions (especially private ones) do not publish their independent disbursements for energy efficiency.

Despite the availability of approximately R$ 10 billion in finance, which can in theory fund energy efficiency projects, Table 4 provides evidence that financial institutions have limited focus on capturing the energy efficiency opportunity highlighted in Figure 2 and seldom account for energy efficiency finance achievements. The barriers limiting energy efficiency finance from demand and supply sides are explored in the following section.

Table 4: At least 22 financial products were identified as being available to support energy efficiency investments in Brazil.

	Credit line/ program name	Total budget available (R$ million)	Yearly disbursement (R$ million/yr)	Solely energy efficiency?	Route to recipient	Target clients/sectors	Loan size range	Payback time limit (years)	Approx. Interest rate (per year)
BNDES	**FINEM**								
	Energy Efficiency Credit Line	Undisclosed	~ R$500	Yes	Direct (>R$20M) or via commercial banks (>R$5M<R$20M)	ESCOs, end-users, and utilities	>R$5M <R$ 50M	**Public lighting**: 15 y **Other projects**: 10 y	**>R$20M for companies**: 9.1%-13.5% **>R$20M for local governments**: 9.7% **<R$20M**: 9.1%-15% (depending on commercial banks' risk perception)
	Industrial Productive Capacity		~R$ 200	No (equipment modernization)		Industry	>R$10M – <R$ 100M	6	5.1% -15% (depending on commercial banks' risk perception)
	Fundo Clima								
	Efficient transport	R$20	Not available	Yes	Via commercial banks	Transport	>R$1M – <R$10M	20	2.5 - 9.5%
	Efficient machinery	R$20				Industrial and commercial		8	
	Other								
	Cartão BNDES	Undisclosed	R$5,636	No (any form of investment for SMEs)	Via commercial banks	SMEs in all sectors	<R$1M	4	10.82%
	BNDES Automático		R$7,436				>R$500k – <R$5M	Undefined	5.1% -15% (depending on commercial banks' risk perception)
	Fundo de Garantia para Investimentos (FGI)	Undisclosed	Undisclosed	No	Via commercial banks	All sectors (companies with turnover <R$90M)	<R$10M	Undefined	Cost depends on: (i) value of guarantee, (ii) percentage of loan guaranteed, (iii) length of tenor.
	FINAME								
	FINAME Industrial	Undisclosed	R$ 1,314	No	Via commercial banks	Industrial	>R$1M – <R$10M	**Public transport vehicles**: 6 - 9 y **Transformation industry**: 10 y **Equipment acquisition in other sector**: 3 y	3.5%-15% (depending on commercial banks' risk perception)
	FINAME Agricultural		R$ 6,982	No		Agricultural			
	FINAME Infrastructure		R$ 1,128	No		Public sector or private initiatives			
	FINAME Transport		R$ 6,760	No		Public sector or private initiatives			
	FINAME Other		R$ 1,460	No		Several			

FINEP & BNDES	Inova Energia	R$ 1,200	Undisclosed	No	Direct (>R$20M) or via commercial banks	Renewable micro generation and automotive EE	>R$1M <R$10M	20 y	7%-15% (depending on commercial banks' risk perception in case of indirect operations)
	Inova Sustentabilidade	R$ 2,000	Undisclosed	No		Industrial and sanitation EE			
Desenvolve SP	Linha verde	Undisclosed	R$ 30	No	Direct	Multiple sectors	>R$ 500k <R$ 3M	10 y	12%-13%
Caixa Econônica Federal	Crédito Verde	Undisclosed	Undisclosed	No	Direct	Housing and transport	>R$100k <R$5M	4.5 y	1.3% -
	Proger Urbano Empresarial	Undisclosed	Undisclosed	No (any form of investment for SME development)		SMEs in any sector with revenues below certain thresholds	>R$400k <R$1M	6y	9-15% (depending on Caixa's risk perception)
Banco do Brasil	BB Crédito Empresa	Undisclosed	Undisclosed	No (any form of investment for SME development)	Direct	SMEs in any sector with revenues below certain thresholds (only in Centre-West States in case of FCO Empresarial)	<R$1M	5y	9-15% (depending on BB's risk perception)
	FCO Empresarial	R$ 9,700	Undisclosed				>R$1k– <R$100k	10-20y	
	Proger Urbano Empresarial	Undisclosed	Undisclosed				>R$400k <R$1M	6y	
Commercial Banks (including Itaú, Bradesco, Santander)	Working Capital Credit lines	Undisclosed	Undisclosed	No	Direct	All	No limit	Usually <5y	17 - 25%
Electricity Distribution Utilities	ANEEL's Energy Efficiency Program	R$ 630	R$ 630	Yes	Direct to end-users or ESCOs	All sectors within each utilities' concession area	<R$ 20M	Usually <5y	not applicable
InterAmerican Development Bank	Energy Efficiency Guarantee Mechanism	R$50	<R$ 20	Yes	Via commercial banks	ESCOs and building constructors	Undisclosed	7	not applicable

Source: Carbon Trust analysis; BNDES statistics contained in: FINAME disbursements; BNDES Statistics; BNDES total disbursements; FCO Credit line budget; FINEP & BNDES Inova Programmes.
Notes: All subsidized credit lines under BNDES and FINEP are limited to 70%-90% of full project values, requiring borrowers to find alternative sources of finance to fill in the remaining gap. BNDES' indirect disbursements (R$ 48 billion in 2016) are chiefly made by: Bradesco (16%); Banco do Brasil (14%); Santander (11%); and Itaú (9%). It's worth noting that BNDES' total disbursements have decreased severely since 2013, moving from R$ 190 billion in 2013 to R$ 88 billion in 2016.

Subsidized loans | Credit enhancement mechanism | Market rate loan | Regulatory obligation scheme

EXISTING TECHNICAL ASSISTANCE INITIATIVES TO PROMOTE ENERGY EFFICIENCY

There are few technical assistance initiatives that work in tandem with the financial mechanisms outlined above to encourage energy efficiency investments in Brazil. The exact amount of technical assistance available to catalyse the market for energy efficiency in Brazil is unknown since the initiatives are decentralized, often combined with broader programmes/budgets and there is limited or no data available on their expenditures and performance. All major technical assistance initiatives identified to promote the energy efficiency market in Brazil are listed in Table 5, including basic information on their focus, delivery agents and key activities.

Table 5: Multiple initiatives provide awareness raising and/or technical assistance on energy efficiency.

Name of initiative	Focus municipality and state	Target sector/ audience	Implementing partners	Funder	Key activities
Plano Brasil Mais Produtivo	Country-wide	Industrial SMEs	SENAI & SEBRAE	MDIC, ABDI, PROCEL	Advice package and face-to-face technical support for industrial SMEs to render their activities more efficient. A particular emphasis is given to SMEs in metal works, clothing, shoes, furniture, food and drink industries.
PROCEL sub-programmes	Country-wide	Buildings, industry, commerce, public sector, public lighting	PROCEL and	PROCEL	PROCEL's sub-programmes for industries, commerce, buildings, public sector and public lighting have delivered a range of publications on EE advice, funded energy audits in multiple sectors, and directly financed the enhancement of EE specialist laboratories in a range of universities.
CNI & SENAI 'soft support'	Country-wide	Industries	SENAI	CNI and SEBRAE	CNI and SENAI have jointly published a range of technical reports on EE opportunities, delivered courses and workshops to support investments on EE in multiple sectors. To some extent (figures unknown) it has also contributed with face-to-face support for specific industries over the past decades.

Aliança Programme	Country-wide	Energy-intensive industries	CNI; ABRACE; and independent consultants	UK's Foreign Commonwealth office, CNI; ABRACE; and co-funding from industrial beneficiaries	CNI's most hands-on initiative, the Aliança Programme has spent ~R$ 1 million with contributions from CNI and the UK's FCO to deliver energy saving assessments in the facilities of two major industrial corporations (GM & Clariant). Having demonstrated the potential to identify 'low hanging' efficiency opportunities, it expects to move onto a scaled-up phase in 2018, at the cost of R$ 9 million. CNI estimates the delivery of a pipeline worth R$ 1 billion in 2018. Further detail on the Aliança Programme is provided in Annex II.
Off balance sheet financing initiative	Country-wide	Energy-intensive industries	CNI; ABRACE; and independent consultants	World Bank; CNI; and ABRACE.	Since 2015, CNI has worked with ABRACE and the World Bank to develop an off-balance sheet finance mechanism to deliver energy saving interventions in energy-intensive industries. Further detail on the Aliança Programme is provided in Annex III.
SEBRAE	Country-wide although few state offices of SEBRAE run independent programmes	SMEs in all sectors	SEBRAE	SEBRAE	Since its inception, SEBRAE provides advice to support SMEs in a range of sectors to render their activities more productive and competitive, with EE being a key component of its support.

Source: Carbon Trust research, adapted from: (PROCEL, 2017); (MDIC, 2017); (SENAI, 2017) and interview with representative of CNI.

ASSISTANCE REQUIREMENTS TO UNLOCK BRAZIL'S EE MARKET

Despite the existence of numerous regulatory drivers, finance mechanisms and technical assistance initiatives, most of Brazil's energy efficiency opportunity is yet to be realised. This section seeks to define how the TI4E can best use donor funds to unlock opportunities in Brazil's energy efficiency market. To do so, it looks through an initial understanding of barriers restraining the market from the perspective of end-users, ESCOs and financiers. These barriers, in addition to the analysis of the regulatory and financial landscape outlined above, were sense-checked with 10 interviewees from relevant institutions composing Brazil's energy efficiency market (including the government, ABESCO, ESCOs, public and private financiers and an expert consultancy). The interviews also discussed in detail how best to overcome such barriers. In the process of doing so, the initial understanding of

barriers was refined, leading to what is presented below, along with interviewees insights into how best to use donor funds to deliver opportunities in Brazil's energy efficiency market – i.e. the technical assistance requirements to unlock this market.

BARRIERS AND SOLUTIONS TO SCALING UP ESCO ACTIVITIES IN BRAZIL

An array of barriers has so far limited the commercial exploitation of the energy efficiency opportunities in Brazil and are outlined in this section. The initial insights used to build this section draw on the Carbon Trust and local consultant's expertise and engagements in Brazil for the past 4 years on the topic of energy efficiency, including past interviews with the private sector, government, regulatory agencies, associations, public and private financial institutions. These insights were tested and refined through ten interviews conducted with representatives of key Brazilian institutions - as listed in Table 6 below. Interview transcripts are presented in their entirety in Annex II.

Table 6. Summary of interviews.

Institution	Type of Organization	Name of interviewee	Position
Ministry of Mines and Energy	Federal Government	George Soares	EE Coordinator
ABESCO	Association	Marcelo Sigoli	Technical Director
Desenvolve SP	Financial institution	Alvaro Sedlaceck	Financial Director
Santander	Financial institution	Jorge Ball	Asset Based Finance
Atla Consultoria	Financial consultancy	Alvaro Silveira	Partner
Ação Engenharia	ESCO 4	José Starosta	Director of Engineering
Power Energia e Sustentabilidade	ESCO 3	Pedro Brunoro	Partner
INDECO	ESCO 1	Otavio Santoro	Partner
CPFL Eficiência Energética	ESCO 4	Rodrigo Guedes	Comercial Manager
Vitalux-ECO	ESCO 4	Eduardo Moreno	Partner

Notes: ESCO categories defined on the basis of annual gross revenues declared to ABESCO as: ESCO 1 <R$ 250k; ESCO2 <R$ 500k; ESCO 3 < R$ 3 million; ESCO 4 > R$ 3 million.

The result of such interviews is presented below, and reveals that barriers holding back Brazil's energy efficiency potential are interlinked and create a complex conundrum, although they may apply differently for different types of end-users, large and small ESCOs, public or private banks. Table 7 summarizes existing barriers and classifies them according to the following categories: (i) customer-related barriers that weaken demand from end users for ESCOs' services; (ii) ESCO-related barriers which limit Brazilian ESCOs' capacity to create a pipeline and service demand; and (iii) financier-related barriers which hinder the attractiveness of existing finance mechanisms and hence the creation and implementation of a pipeline.

Table 7. Summary of barriers limiting energy efficiency finance in Brazil

Customer-related barriers
• **Lack of awareness of the commercial benefits of energy-efficiency**, best practice and available finance.
• **Lack of time and resource to manage implementation**, such as to select suppliers, run feasibility studies etc. Energy efficiency is typically allocated to maintenance teams, even though it is an increasingly significant cost that should be managed at a more senior level.
• **Lack of resource consumption data and benchmarking**; leading to poor visibility of energy costs and relative performance.
• **Lack of trust** in technologies, technology suppliers and project implementers.
• **Significant up-front investments to undergo energy audits and establish the loan business case**, limit end-users from even putting forward loan requests (in particular SMEs).
• **End-users often have high levels of debt,** limiting their ability to take on additional loans.

• **Lack of regulatory drivers and political instability** limits end-users' willingness to invest.
ESCO-related barriers
• **Lack of accepted contractual risk allocation framework**, hindering project 'finance-ability'.
• **Limited technical expertise to identify opportunities (primarily thermal efficiency ones) and limited access to end-user facilities**, across the majority of ESCOs.
• **Lack of administrative and financial capacity to adequately fulfil financiers' basic requirements and make compelling investment cases**, across the majority of ESCOs.
• **SMEs (including most ESCOs) struggle to provide the required collateral to secure loans,** limiting their interest in most finance mechanisms.
• **Existing regulation limits ESCOs' capacity to deliver public-private partnerships,** within or outside ANEEL's PEE.
Financier-related barriers
• **Small projects increase transaction costs**; leading financial institutions to increase interest rates, or simply to reduce their interest in energy efficiency loans.
• **Bureaucracy**, associated with obtaining subsidized financial mechanisms.
• **High risk perception of financial institutions,** leading to higher cost of finance.
• **Intrinsic difficulties in settling potential disputes,** leading financial institutions to demand marketable asset collateral for each loan.

Source: Carbon Trust analysis gathered from interviews outlined above.

These barriers are elaborated on below, along with interviewees' views on solutions to them. Crucially, they demonstrate that enabling the ESCO-related energy efficiency opportunity in Brazil requires a solution that goes beyond supporting ESCOs themselves, and includes: (i) supporting the creation of a pipeline across consumers; (ii) supporting ESCOs' to build a better pipeline and enhance their capacity to offer more attractive solutions to end-users and financial institutions; and (iii) supporting financial institutions to render their products more attractive to ESCOs and a range of end-users.

CUSTOMER-RELATED BARRIERS WEAKENING THE DEMAND FOR ESCO SERVICES

Lack of awareness of the commercial benefits of energy-efficiency, best practice and available finance

Lack of awareness about energy efficiency is often identified as a common barrier in the literature and in all of the stakeholder interviews, and its effects span across both the demand and supply of finance. From the perspective of end-users, not knowing how energy efficiency can increase productivity and revenues, or the means through which to finance and implement energy saving interventions leads to lack of demand for energy efficiency products and services.

In Brazil, a range of awareness raising campaigns have been carried out to highlight the potential and benefits of energy efficiency in multiple sectors – usually targeting end-users. These have been primarily led by PROCEL, CNI, SENAI and SEBRAE and to some extent by local industry federations, governmental arms and private sector associations in multiple sectors, all of which have had limited results[6] in terms of unlocking a widespread existing potential. Few or no initiatives have sought to raise awareness across banks, other than BNDES and the Business

[6] A detailed analysis of the results achieved by existing awareness raising initiatives is not included in this report due to its scope limitation. Stakeholders unanimously point to the fact that such initiatives have not unlocked the widespread adoption of Brazil's energy efficiency potential.

Council for Sustainable Development's efforts to engage commercial banks in working groups to discuss potential improvements of existing credit lines.

All interviewees agree on the importance of this barrier, and several had similar ideas for solutions to it, involving ramping-up marketing and awareness raising efforts across end-users in target sectors, such as through workshops with target sectors to build the basis of a pipeline. Interviewees unanimously agree that this type of effort would only reap real change if several other barriers below are simultaneously addressed – that is, there would be no point in raising awareness if the regulatory drivers for energy efficiency were not in place. With regards to the content of such workshops, interviewees generally agree that Brazil's efficiency market is too focused on power saving opportunities and that there should be more effort to raise awareness around the major savings potential of thermal efficiency measures. There is some debate however on the extent to which awareness raising efforts could unlock thermal-saving-related interventions alone, due to these often coming at a higher cost, and therefore requiring a stronger emphasis on solutions to the limitations of the financial mechanisms and regulatory drivers that are discussed below.

Regardless of the technology emphasis of workshops, ESCO interviewees particularly stress the need to engage with the right individuals within the target audience (those with the decision-making power on investments such as CEOs or CFOs), to convey tailored success stories of energy efficiency projects for each sector that provide a real grasp of what efficiency projects can deliver in cost savings to their business. Interviewees have generally noted that workshop engagements to date are often too theoretical and lack a practical view of the benefits of rendering businesses more efficient. One interviewee affirmed that end-users would be more likely to listen and engage with presentations from their peers (ESCO clients) rather than from ESCOs themselves. The yearly Congress on Energy Efficiency organized by ABESCO was cited in a few interviews as an event that was originally planned to serve as a platform to share experiences with clients, but has mostly lost its purpose because ESCOs avoid taking their clients to it, fearing that other ESCOs might poach them.

Interviewees across ESCOs, government and financial institutions also noted the possibility of creating a government-backed energy efficiency agency or special purpose vehicle to coordinate an awareness raising programme, as well as the delivery of the solutions to some of the barriers discussed below. The extent to which this institution would be hands-on enough to effectively deliver an awareness raising programme, or would operate hands-off, subcontracting the delivery to other institutions, requires further discussions with government representatives.

A brief assessment of global efforts to generate energy efficiency pipelines shows that successful initiatives have invested heavily in awareness raising and marketing. Examples include the Carbon Trust's 0% Interest Loans Scheme, and the European Bank for Reconstruction and Development's Sustainable Energy Finance Facilities (SEFFs), which dedicated 15-25% of each SEFF's total budget to technical assistance and awareness raising efforts[7]. Regional utility energy efficiency obligation schemes in the USA (in particular California, New York, Connecticut and Massachusetts) have also allocated significant efforts to marketing and report a clear correlation between such efforts and the number of projects delivered (Carbon Trust, 2015).

Lack of time and resource to manage implementation

Somewhat overlapping with the barrier described above is the fact that energy efficiency is a low priority for businesses in most sectors (except for energy intensive sectors). Whilst energy increasingly represents a significant cost to businesses, it is still not seen as a priority, resulting in limited human resource dedicated to this topic. Experienced ESCO interviewees indicate that most end-users allocate the responsibility for energy

[7] According to Carbon Trust interview with EBRD SEFF representative in 2013

efficiency to maintenance teams that often lack expertise in energy management. Tasks such as selecting suppliers, running feasibility studies, or just hiring an ESCO to identify and implement opportunities, are therefore unlikely to happen.

Engagements with the Brazilian Confederation of Industries (CNI), and the National Energy Efficiency Institute (INEE) indicate that this issue is not exclusive to SMEs. Most large industries throughout Brazil regard energy efficiency as a low priority, instead perceiving their productive capacity as the number one priority. Within large industries, the benefits of energy efficiency projects are often understood, but are frequently dismissed when competing for annual CAPEX budgets against other investment opportunities.

Interviewees generally agree that solutions to this barrier somewhat overlap with the solution to the barrier above, in that raising awareness of opportunities and benefits to end-users helps them justify a greater allocation of time and effort to this topic. Incentivizing the adoption of the ISO 50001, whether through corporate commitments or regulation, was also mentioned more than once as a means to induce companies into greater allocation of resources to the energy management topic. In fact, the penetration of the ISO 50001 Energy Management certification is relatively recent and limited in Brazil, with only 30 companies certified by the end of 2015 (ABESCO, 2016). ESCO interviewees confirmed that their experience with end-users shows that finance teams are often disconnected to technical teams, and that technical teams are recurrently restricted in terms of their size and expertise. The maintenance teams which are frequently allocated the responsibility for the energy efficiency topic by end users are typically overburdened and have limited capacity to identify saving opportunities, especially thermal savings. ISO 50001 is noted as being ideal to address this barrier, because it demands that companies have energy teams and commit to continuous improvements.

Aligned with the above, a couple of interviewees highlighted the importance of voluntary public commitments to enhance efficiency (especially common across large corporations) as a way to drive company departments (technical, financial, purchase) to jointly prioritize energy saving opportunities. Trade bodies and sector associations are often cited as those which would be best placed to induce such commitments.

Lack of energy consumption data and benchmarking

Linked to the point above is the fact that end users, in particular those in sectors where energy costs are relatively marginal, often lack an understanding of their relative performance against their peers. Energy use is frequently misunderstood through utility bills that do not allow end-users to see the performance of individual equipment, neither how pieces of kit, or their whole facility, compare against best practice equipment.

Interviewees generally perceive this barrier as one of the least problematic, with few addressing it specifically. Interviewees who did raise it suggested the solution to this barrier must again involve awareness raising efforts targeted towards end-users, but it is most likely to be effective across financial executives who can appreciate the cost and financial benefits of investing in energy savings. It is therefore important to adapt the language of awareness raising messages, marketing, events, workshops, to this specific target audience in priority sectors, to highlight how individuals can understand their performance against benchmarks. Solutions may also involve technical efforts that allow end-users to see electricity consumption split by key equipment or departments, e.g. energy metering campaigns or stock tacking of a sectors' kit - whether these are delivered by the private sector or mandated by law (e.g. delivered by utilities under ANEEL's PEE).

Lack of trust in technologies, technology suppliers and project implementers

End-users often distrust energy efficiency products and services, given this is an early stage market where players are relatively small or unknown to the broad public, and technologies are new or not well known. As a result, there is a general limitation on the demand for energy efficient products or services. This barrier is also relevant from the perspective of financiers and is therefore re-mentioned below.

Interviewees unanimously agreed that this is one of the key barriers to address in Brazil, and that forms of accreditation (of suppliers, technologies and ESCOs) would work to create trust within the energy efficiency market. ESCO interviewees in particular, highlight that an accreditation system should be delivered by a trusted and independent party that conveys credibility to end-users and financiers, such as a special purpose vehicle, a public financial institution or the government.

Interviewees indicate that the success of accreditation mechanisms would largely depend on how these could demonstrate commercial value, e.g. for technology suppliers to be enticed to accredit their technologies, they must see a commercial advantage in doing so, such as if accredited technologies are eligible for a preferential finance mechanism and hence lead them to sell more equipment. Likewise for ESCOs to pursue and pay for an accreditation, they have to see the potential return in doing so, e.g. that end-users are familiar with such a label and that effectively opens doors for them so sell more projects than they otherwise would have.

For an accreditation mechanism to achieve such value, it is fundamental that it benefits from sufficient marketing to make it a well-known and trusted brand amongst end-users; and that it is linked to other mechanisms (often the solutions to other barriers), e.g. an attractive financial mechanism that would only be eligible for accredited technologies and accredited ESCOs, or a regulatory mandate that public tenders for energy efficiency (within and beyond ANEEL's PEE) demand that ESCOs and suppliers are accredited.

Three accreditation-type mechanisms exist in Brazil, but have not managed to effectively build trust across the efficiency supply chain. These are:

(i) ABESCO's QualiESCO accreditation for ESCOs was mentioned across several interviews as a label that does not have a clear commercial driver (e.g. no linkage with financial mechanisms or with regulation); does not push ESCOs towards continuous improvement; is not well known to clients; and that may be perceived as having low credibility, given that it is run by the ESCO association, rather than by an independent party. Interviewees noted that a government-backed energy efficiency agency or special purpose vehicle would be better placed to coordinate an accreditation programme.

(ii) BNDES has a list of accredited technologies eligible for FINAME finance. Efficiency is not a criteria within the list, which instead focuses on the local content of products, but nonetheless it is an accreditation list, clearly linked to a financial driver, which encourages technology suppliers to be part of the list. A change in such criteria to include efficiency would likely promote the efficiency market with the FINAME clients (particularly aimed at loans within the R$1M – R$10M range).

(iii) Finally, ESCO interviewees have noted that the Technical Certificates of Experience (CATs) provided by local engineering councils have served as a means to build trust, and are often required in public tenders, as a means for ESCOs to evidence experience in specific fields. CATs are however seldom known across the private sector, where ESCOs have used client testimonials to raise their credibility and earn the trust of new clients.

Significant up-front investments to undergo energy audits and establish the loan business case

Designing an energy efficiency project requires a high-quality energy saving assessment and the establishment of a compelling business case - both at a cost. ESCO interviewees indicated that an investment grade audit oscillates between R$ 20,000 – R$ 500,000, and that end-users are mostly unwilling to cover such costs, preventing a large number of projects moving beyond an initial conversation with potential clients, especially more complex projects where the large potential savings lie.

ESCO interviewees however largely differ on their approach to this barrier, with i) some being completely unwilling to cover the cost of an energy audit for clients (perceiving the risk of clients not moving from there

towards implementation); ii) others being completely willing to cover the cost of audits on their own (understanding that they are able to measure the risk of projects not going through and can select the projects which are worth investing in, ultimately factoring in the cost of audits in the clients' repayments); and iii) others yet designing legal solutions that allow them to cover the cost of audits and get clients to commit to moving these forward into implementation or paying such costs back to the ESCOs.

"Clients won't do anything if they have to pay something upfront. I therefore end up doing a lot of lighting projects because it's easier and cheaper to do such audits."

Partner, medium ESCO

The first approach is common to most Brazilian ESCOs, typically small companies that can't afford to take the risk of covering the costs of energy assessments that may not end-up becoming an actual project. Examples of large ESCOs taking this first approach were also found amongst interviewees. This approach is seen to lead to a general stagnation of the market.

Those ESCOs adopting the second approach tend to be medium-sized ones willing to take on some risk, but often limiting themselves to do so with simple projects, e.g. lighting, where audit costs are low and they feel relatively safe to make a compelling business case for end-users. Again, there is a sense of stagnation, where only very low-hanging fruit is converted into actual investments.

Adopting the third approach are medium and large ESCOs that are able to cover upfront audit costs with their balance sheets and count on sophisticated legal structures to mitigate risk. Crucially, these legal structures were developed independently by different ESCOs and legal teams, and seem to largely differ across this group. In essence, these solutions usually involve the ESCOs doing a preliminary walk-through assessment of energy saving opportunities (a low-cost audit) to provide clients with a sense of the scale of potential savings. If clients are interested in a full assessment, ESCOs will cover the costs of a full audit on the basis of a contractual commitment that binds clients to taking these projects into implementation, or paying ESCOs back the cost of the full assessment. One ESCO interviewee noted a further nuance to re-assure clients in between audits, by stating that if savings identified in the full assessment are less than 90% of those forecasted in the walk-through assessment, clients could decline the project at no cost. If savings prove to be at least 90% of those initially forecasted, clients would then have to either move ahead to implementation or pay back the cost of the energy audits.

The approach for energy audits is slightly different when ESCOs are operating under ANEEL's PEE. On the one hand, ESCOs perceive less risk under the PEE and are often willing to cover the cost of audits, because the clients are not expected to pay for the bulk of project investments (which in that case are paid for by the local utility under the PEE's mandatory levy). This gives ESCOs the reassurance that if they put forward a compelling project in line with ANEEL's criteria, they will be able to recover the investments made in an energy audit. On the other hand, one ESCO interviewee noted that there is a double risk when applying for ANEEL's PEE funds together with a public-sector beneficiary because even if the proposal is accepted by the PEE tender, the public beneficiary is mandated by its contracting regulation to open a tender for any company to deliver that project (even though it has been designed by a specific ESCO), meaning an ESCO that originally designed a project may lose it in this second tender.

"We are winning ~90% of our applications for the PEE, so we're comfortable to pay for those audits."

Director of large ESCO

The simplest solution to this barrier, often mentioned in the interviews with ESCOs, financiers and government is that a dedicated programme should fund an initial set of audits in priority sectors and companies, to create a demonstration effect. Whilst there is argument about the extent to which such support should cover the whole cost of an audit or not, the principle of directly supporting end-users is the same.

However, the effectiveness of this model is dependent on how this support links-up to the solutions to other barriers, as illustrated by two example initiatives within Brazil. First, CNI's Aliança Programme, described in the technical assistance section above, directly funded 50% of the costs of detailed energy saving assessments, totalling ~R$ 1 million, in two large industrial players over 2015 and 2016. The initiative identified a pipeline of R$ 1 billion in investments, most of which has not yet been implemented, justifying the programme's current efforts to raise funds for a second stage of support implementation. That is, despite these large corporates' willingness to co-fund expensive energy audits, actual investments remain mostly locked.

In a second example, regional SEBRAE offices and local industrial associations have sought to directly support small enterprises with low cost energy audits, but very few SMEs have converted audits into actual loans to implement interventions. In both examples, the target audiences find themselves constrained due to the set of barriers described above and below. Both initiatives could benefit from links to an attractive finance mechanism; to continuous technical assistance support throughout implementation; and to regulatory drivers that require them to gain efficiency - to cite a few examples.

Interviewees have also noted additional suggestions to get audits converted into loans across large industrial players: (i) Publishing audit results widely in a comprehensive database, anonymising companies, as a means to allow end-users in different sectors to see realistic examples of the savings identified by their peers; (ii) taking interested company leaders to field-days in which proven energy saving assessment methodologies are used to identify opportunities – noting that this provides an opportunity of interacting with decision makers that often leads to action. CNI notes that a proven method-based energy assessment in a large industry in Brazil usually identifies more than 10 intervention opportunities, with investments needs of about R$ 10 million and payback lower than 2 years at a cost of EUR 50,000 and EUR 150,000.

Other than the direct support to audits, alternative approaches have been deployed in Brazil, again with limited success. BNDES' flagship credit line for small players, Cartão BNDES, includes energy audits within its list of eligible measures of credit < R$ 1 million. However, the small number [8] of disbursements for such purposes reveals that clients are unwilling to take-up loans to implement energy audits - likely due to the inherent uncertainty at that stage.

"Most small and medium ESCOs are unwilling to take loans to cover energy auditing and business case structuring, as it's a highly uncertain project stage"

Owner of small ESCO

Providing balanced, hands-on support with the right incentives is therefore suggested as the most effective solution to this barrier. That is, to partially subsidize the cost of standardized energy audits, delivered by highly capable auditors throughout a target audience, providing incentives to convert audits into investments - e.g. to subsidize part of audit costs, and reimburse end-users for their audit costs if they actually implement the interventions identified. This solution can be further enhanced by interviewee suggestions to engage private decision makers in field-days and to widely publish audit results in a comprehensive online database. Alternative

[8] Specific number not disclosed by BNDES.

approaches to hands-on support may also be considered, such as that deployed in the Carbon Trust's Industrial Energy Efficiency Accelerator, in which a number of pilot energy efficiency projects are selected through a competitive application process to receive full funding and implementation advice (Carbon Trust, 2016), thereby creating a demonstration effect in priority sectors.

End-users often have high levels of debt, limiting their ability to take on additional loans

Brazil's National Industries' Federation (CNI) and the Association of Large Energy Consumers (ABRACE) have been strong advocates that Brazilian industries have high levels of debt and are therefore unable or unwilling to take additional loans for energy efficiency. As a reference, CNI stated that approximately 50% of Brazilian industries (large organisations and SMEs) have borrowed to their credit limit and further debt on balance sheets would lead to negative credit ratings according to International Financial Reporting Standards (IFRS)[9] and are thus bad for business. This barrier is further exacerbated as efficiency investments compete for annual CAPEX budgets against other investment opportunities.

"Within companies with limited capacity to acquire new debt, leveraging CAPEX through new loans becomes unviable even if loans have 0% interest."

Energy Efficiency specialist in National Industries Federation

Solutions to this barrier have been widely discussed globally, and usually revolve around off-balance sheet financing solutions. Throughout the interviews, few had insights about this issue (since it is only relevant for large corporate clients with open capital). Off balance financing was thought to in fact be a useful solution to unlock a part of the efficiency opportunities in large industries, but not a solution for SMEs. One interviewee also indicated that an iminent change in Brazilian accountancy regulation, due in 2019, will force companies to report loans even if they are off their balance sheets, undermining this solution's effectiveness. For that interviewee, a real solution to drive efficiency investments in large corporates must revolve around corporate commitments and regulatory drivers, which render investments interesting against the penalty of non-compliance.

Despite the above, off-balance sheet financing is a popular topic amongst large industrial corporates in Brazil, leading CNI, ABRACE and the World Bank to jointly engage in the 'Off Balance Sheet Initiative' which has sought to design a special purpose vehicle (SPV) to deliver industrial energy efficiency investments. Based on a member structure, in which corporates jointly contribute to this SPV's balance sheet with sufficient assets and an annual fee, the SPV is intended to take up loans and implement energy efficiency measures across its members' facilities. Further detail on this initiative is provided in Annex III.

Lack of regulatory drivers and political instability limits end-users' willingness to invest

Aligning regulatory drivers is crucial to render energy efficiency investments more attractive. Brazilian ESCOs and financiers regularly point to the fact that current regulation does not provide a strong incentive for businesses to invest in energy efficiency, leading to a sparse pipeline of projects across sectors. In fact, counterproductive regulation, such as government subsidies that hold down electricity and fuel prices are seen as preventing multiple sectors' appettite for energy efficiency - even though such subsidies have recently been reduced.

[9] The IFRS are a set of international accounting standards stating how particular types of transactions and other events should be reported in financial statements or balance sheets. The amount of debt in balance sheets entails a decreased company rating which reflects negatively on companies' stock values and on their ability to acquire new debt.

Most interviewees emphasised this as a key barrier, and amongst those that did, all noted that solutions require regulatory interventions that complement the development of the pipeline and the supply of finance for energy efficiency investments further downstream. This may include a mix of 'stick' measures, such as economy-wide efficiency targets, minimum energy efficiency obligations per sector, penalties for least efficient facilities and carbon pricing; as well as 'carrot' measures, such as tax exemptions linked to best performing equipment or to best performers. Interviewees highlighted that existing incentive programmes, such as PROCEL and ANEEL PEE do not address gaps in the ESCO EE delivery model supply chain (e.g. the lack of trust in market players and limited capacity across the supply chain to build and serve a pipeline) and could learn from international models in which the government provides hands-on support, often through special purpose vehicles, or the so-called Super-ESCO[10] approach. To defend ESCO interests on the regulatory front, prominent ESCO interviewees argued that ABESCO needs to be strengthened with a higher annual fee for members, allowing it to hire commercial-driven executives with the adequate capabilities to open doors within the government.

One government interviewee highlighted the regulatory barrier that limits the interest of federal-level public institutions in energy efficiency, explaining that "the laws which govern federal administration are old and inadequate". More specifically the laws enforced by the Ministry of Planning and supervised by the Union's Accounting Court (TCU) splits federal expenditures between independent categories that cannot be mixed - meaning that if a public institution manages to save money under its energy bill category, it is not allowed to shift the surplus into another category, but will simply receive a smaller energy budget the next year. According to this interviewee, this creates a major disincentive for federal-level institutions to seek efficiency solutions and only a regulatory change coming from the Ministry of Planning would be able to change this. Further on the importance of regulation, this interviewee highlighted that Brazil often has regulations that are not adopted by the actors in focus, simply because they are not overseen and enforced – indicating that additional budget allocations are required to enhance the regulatory bodies' capacity to enforce the law.

"If a federal-level public institution saves money on its energy bill it won't be able to utilize savings to its benefit. It will only receive a smaller energy budget the next year."

Government official

Relevant international examples of policy drivers include Thailand's policy target to reduce the country's energy intensity by 25% between 2005 and 2025, including command and control measures (IIP, 2012a); China's commitment to support energy efficiency in the industrial and building sectors in its 2006 Five Year Plan, with a target of reducing energy consumption by 20% across the five-year period (IIP, 2012b); France's mandatory requirement for large companies to perform energy assessments every three years; and the Turkish target for reducing energy intensity by 20% by 2023 on 2008 levels (CIF, 2014). In terms of hands-on programmes, relevant international examples combine energy efficiency technical assistance, to standard procedures for energy saving assessments, and specific resources for target sectors - such as Germany's Lernende EnergieEffizienz-Netzwerk (LEEN) or the American Energy Star Programme.

[10] A Super ESCO is a special purpose vehicle, usually established by the government, to identify and deliver most cost-effective energy efficiency opportunities (or priority opportunities – such as those in hospitals, schools, and other public facilities). To do so, a Super-ESCO is usually created with the capacity to take up loans (i.e. with a sufficiently large balance sheet) or with a funding source of some kind (e.g. a tax-backed revenue, or private contributions). Super ESCOs can also support building capacity throughout the market, e.g. other ESCOs; facilitate access to project financing; and act as a leasing or financing company to provide ESCOs and/or customers with EE equipment on lease or on benefit-sharing terms.

Ultimately, if drivers are not favourable to energy efficiency, or not strong enough, the energy efficiency market, and the purpose of an acceleration programme will be undermined**necessitating remedial action through high-level government engagement**

ESCO-RELATED BARRIERS - LIMITING ESCOS' CAPACITY TO CREATE AND SERVICE DEMAND

Lack of accepted contractual risk allocation framework

An intertwined problem involving end-users, ESCOs and financiers is the absence of a well-accepted risk allocation framework, which undermines ESCOs' capacity to land contracts with end-users, and hence their capacity to present financially attractive loan requests to banks. On the former side of this conundrum, neither end-users nor most ESCOs in Brazil have long-term experience negotiating workable energy service agreements or performance contracts. As a result, ESCO interviewees frequently indicate that EPCs leave room for disagreement with their clients, in particular during a project's operational and MRV period, when ESCOs need to demonstrate the savings achieved against a baseline scenario. End-users will frequently disagree over ESCOs' calculations, jeopardizing an ESCO's cash flow projections. ESCO-financier relationship is hampered by financiers' risk perception of EPCs - as discussed within the financier-related barriers further below. Altogether, this creates resistance to EPCs in Brazil - as shown in Figure 9 - and gives rise to adaptations of the typical EPC contracting model.

"Financial institutions are rightfully concerned about the payment uncertainty when performance contracts are poorly structured."

Partner, medium ESCO

ESCO interviewees, from large to small ESCOs, highlighted the need to improve EPCs in Brazil, and standardize them by working closely with end-user associations and financiers, as a means to reduce the risk perception around them at both ends of the supply chain. ABESCO in fact has a standard EPC model that is publicly available to support ESCOs in building such contracts, but ESCOs criticize its adequacy for sharing savings and its capacity to favor ESCOs in potential court battles. According to specific interviewees, the standard EPC should use measurement and verification parameters established by the Efficiency Valuation Organization's International Protocol for Measurement and Verification (IPMVP)[11]; and requires specialist legal advice to better ensure ESCO cash-flows.

"We have improved the legal aspects of our contracts and are very satisfied with it. We place the saving calculations method clearly in there and the client's engineer has to sign that off before the project starts. It leaves no room for misunderstandings."

Partner, large ESCO

To overcome limitations around shared savings contracts a range of contractual alternatives have flourished in Brazil[12]. Whilst most ESCOs operate with presumed savings contracts which avoid the need to measure savings

[11] Available at http://evo-world.org/en/

[12] Other forms of EPCs, such as the Guaranteed Savings Contract model (in which customers finance the assets and ESCOs guarantee the savings); and the Chauffage Contract model (in which ESCOs finance the assets and sell the energy output to customers) seem to be uncommon in Brazil.

ex-post implementation, others (primarily the ~10 large ESCOs in Brazil), have invested to subcontract legal specialists to adapt EPCs to their specific needs, according to their target markets, clients, etc. Much of this legal progress is however confidential, although it is clear that it involves enhancing the demonstration of baseline, calculation agreements, baseline correction and real savings calculation.

Santander has taken a pro-active approach among financiers and supported at least one client to design a contractual solution that mitigates risks of legal disputes at the ESCO-end-user level. To do so, they have created two separate contracts between the ESCO and the end-user: (i) a simple agreement with objective criteria (e.g. lumens per m2 for a lighting retrofit project) that can be easily demonstrated and binds the end-user to pay a monthly fee, which ensures the ESCO can pay the bank; and (ii) an additional service provision contract which will include a full MRV method and baseline calculations. The logic behind this idea is that end-users' payments to ESCOs should depend on simple criteria where possible, avoiding resorting to the second contract and jeopardizing ESCOs' ability to pay. Santander however notes that these contracts are confidential.

"The history of EPCs in courts is not good in Brazil. ESCOs tend to lose court battles and this makes us feel unsafe (…) we are trying to separate the risks ESCO-end-user contracts from our contracts with ESCOs."

Financier

In light of the above, interviewees agree that the solutions to this barrier must involve an effort to better understand and evaluate the advantages and shortcomings of EPCs and potential alternatives, identifying where each contract model best fits (e.g. EPCs may not be the most adequate contracting form for simple retrofits). Looking further into EPCs, a hands-on improvement of ABESCO's EPC model in partnership with legal specialists, financiers and end-users should be delivered to ensure that this outcome is embraced by all parties. Seeking to build long-term impact, it is important to nurture the capacity of a larger number of ESCOs and financiers around the utilization of EPCs (and/or adequate alternatives), ultimately aiming to create a consistent flow of bankable loan requests.

Limited technical expertise to identify opportunities (primarily thermal efficiency ones) and limited access to end-user facilities, across the majority of ESCOs.

Brazilian ESCOs lacks the qualified workforce to identify and implement most of the energy saving opportunities highlighted in Figure 2. Out of ABESCO's 80 members; 13 are equipment suppliers (mostly electric-related equipment); 50 are small companies providing mostly electric efficiency retrofits and maintenance services; and less than a handful of the 17 remaining companies have the required skills to identify and deliver thermal energy saving opportunities.

Both the analysis above and the interviews suggest that Brazil's energy efficiency market is in fact centred around power saving opportunities (given this is the emphasis of ANEEL's PEE) and that key technical gaps for ESCOS revolve around: combined heat and power (CHP); heat recovery; energy integration; software for energy optimization; and furnaces (burners & automation). A particular emphasis is given to software that enable the optimization of industrial core-processes in the fields of thermos-dynamics, fluid-dynamics, chemical reactions, heating, industrial automation and energy integration.

Interviewees unanimously agree on the existence of this barrier, but not so much on its relative importance, or on means to overcome it. On the one hand, two prominent ESCO interviewees highlight that building ESCOs' capacity is not necessary, arguing that their capacity will grow naturally with time, following the pace at which regulation pushes end-users to act on energy efficiency. That is, the solution to other barriers should naturally

lead to a solution to this barrier. On the other hand, most interviewees agreed that ESCOs would benefit from some level of technical capacity building.

Interviewees generally agreed that the best option to deliver this capacity building is the creation of a government-backed energy efficiency agency or special purpose vehicle that is designed to support ESCOs. However, the extent to which this institution should be 'hands-on' or 'hands-off' is arguable. On the one hand, interviewees claim that a hands-off independent institution should solely enhance the capacity of ESCOs to do business, but not deliver energy efficiency itself, e.g. by providing capacity building courses; standardization of energy saving assessments; standardization of project procedures; standardization of measurement and verification procedures; and accreditation solutions highlighted above to build trust in the market. On the other hand, interviewees defend a similar institution to be created with a hands-on approach, in which it would not only build ESCOs' capacity to do business, but would have experts of its own to build and deliver a pipeline of projects – also referred to as a 'Super-ESCO' model. A further analysis of the variables underlying both options is required to fully understand the pros and cons under each.

"It's important to build ESCOs' capacity to address broader EE opportunities, e.g. in thermal efficiency, power saving software, CHP, etc. but end-users need to be more inclined to implement those in the first place. Thermal saving energy audits are typically more expensive and so are the investment costs."

Partner, medium ESCO

Lack of administrative and financial capacity to adequately fulfil financiers' basic requirements and make compelling investment cases, across the majority of ESCOs.

Beyond the technical gap highlighted above, albeit linked to it, is the fact that most ESCOs lack the administrative and financial expertise to fulfil financier requirements (e.g. balance sheet formatting and maintaining an updated company credit profile within financial institutions) and to present compelling investment cases around opportunities identified. This in turn reinforces a range of other barriers above and below, as it decreases end-users' trust in ESCOs; increases financiers risk perception; increases financiers' due diligence requirements (to grapple with ESCO loan requests); and hence increases the perceived bureaucracy around loans (with financiers report spending ~30 days to update ESCO credit profiles when these are outdated).

Interviewees unanimously agree that ESCOs would greatly benefit from administrative and financial capacity building, although smaller ESCOs would tend to struggle with maintaining high quality standards in these fronts. Before designing capacity enhancement solutions to ESCOs a thorough analysis of actual ESCO loan propositions and of financiers' lending procedures and due diligence would have to be undertaken to arrive at an accurate conclusion of where the problem lies and how best to solve this barrier, i.e. the extent to which the problem lies solely on ESCOs' capacity is unclear, as it could be that financiers could also simplify their lending procedures.

SMEs struggle to provide the level of security required by available financial mechanisms

With most Brazilian ESCOs falling in the SME category, these are mostly unable to provide the level of security required by available financial mechanisms. Credit products listed in the section above typically require 100%-130% of loan values in guarantees, but SMEs are inherently unable to provide such collateral when requiring loans of R$ 1-3 million (a typical project size), especially when their limited assets are compromised with other loans - as might be required to build a portfolio of projects.

"SMEs will always struggle to provide the level of security required by commercial banks, it is not a problem inherent to energy efficiency financing."

Head of Energy Department at Development Bank

Interviewees generally agree that the collateral requirements of loans available in Brazil are a major barrier to the development of the efficiency market, and also concurred that the solution to this barrier must revolve around alternatives to asset-backed-loans, whether in the form of cash-flow-backed loans; guarantee mechanisms; insurance mechanisms; or de-risking strategies - or most likely a mix of all the above.

All interviewees agreed that the acceptance of cash-flows as collateral would be an effective way of allowing small and medium ESCOs to take loans. Interviewees however disagreed on the extent to which this is actually happening in Brazil. Whilst financiers say that they are ready to accept cash-flows as collateral, and at least one ESCO interviewee confirmed that they have managed to secure loans on this basis, most ESCOs interested in taking loans claim that they have tried to offset collateral requirements with project cash-flows but have been unable to do so. Further analysis into financiers' due-diligence and ESCOs' loan requests will be required to better understand the extent to which this problem lies within financiers' procedures or within ESCOs.

"We have to abide to central bank rules and request a significant amount of collateral to end-users. Essentially, the law makes us more risk averse than what I'd wish to be."

Financier

Interviewees generally agreed that guarantee mechanisms can be a solution to this problem, in that they can substitute (at least part of) banks' request for collateral, but there are mixed opinions about such mechanisms' effectiveness. Development banks (national and regional) are particularly fond of the idea of a first loss guarantee mechanism to reduce their risk and that of commercial banks, but commercial banks often argue that guarantee mechanisms alone would not be able to fundamentally change their assessment of energy saving projects because such mechanisms seldom cover 100% of the loans - leaving commercial banks exposed on the uncovered loans share. ESCO interviewees argue that such mechanisms are often too expensive, rendering loan products unattractive once that additional cost is factored into their calculations. The IDB's Energy Efficiency Guarantee Mechanism (EEGM), for example, was cited by only one ESCO as a real alternative to offset collateral requirements, but that interviewee noted the high cost of accessing the EEGM; a reflection of the IDB's risk pricing. The same ESCO notes that the commercial banks themselves (where ESCOs have often sought commercial funding rather than ear-marked efficiency loans) offer loan guarantee mechanisms that are cheaper to access.

"A regular insurance product in Itaú is cheaper than an energy-efficiency-specific insurance."

Partner, medium ESCO

Insurance mechanisms are on the rise globally[13] and can be used as an alternative to cover risk of poor project performance. These can be designed to cover the risk of poor project performance (in case there are less savings than expected) but they only come into play when borrowers (e.g. ESCOs) would actually default on loan repayments. A key advantage of such mechanisms is that they do not require financiers to mobilize capital for a guarantee facility, but rather mobilize insurance companies to build a suitable product to cover ESCOs. Again, such mechanisms add to the total costs for ESCOs wishing to take loans. One financier interviewee however noted that insurance mechanisms tend to be harder to setup than regular first loss guarantee facilities because insurance providers have complex risk assessment frameworks that are burdensome to the lending process. Further analysis of the setup process of insurance vs. guarantee mechanisms would be required to better understand the extent to which either option would be effective in Brazil.

Interviewees also expressed their views on de-risking loans by other means rather than asset-backed collateral or guarantee mechanisms, such that financiers feel comfortable enough with the low risk of the pipeline so as to reduce their pricing of risk. Whilst this discussion overlaps with several of the barriers discussed above and below, several interviewees agreed that closely involving financiers in the process of creating a low risk pipeline (e.g. through standardization of energy assessments, improving EPCs, and accreditation mechanisms) should allow banks to reduce their risk perception and hence their collateral requirements. One financier interviewee specifically indicated that if the technical due diligence of ESCO projects could be shifted away from his team and onto a technical expert organization (at no cost to his bank or the ESCO – e.g. what a special purpose vehicle could deliver with public funds) he would be able to reduce their pricing of risk.

At least two mechanisms exist as attempts to resolve this barrier exist in Brazil, albeit not created specifically for energy efficiency loans. BNDES's *Cartão BNDES*, tries to overcome this barrier by offering pre-approved loans (below R$ 1 million) to SMEs. Most ESCOs however mentioned that this is unsuitable and insufficient for their business plans, which require loans greater than that threshold to create viable pipeline. BNDES also offers a guarantee fund for investments (FGI[14]) eligible to be contracted by lenders utilizing specific credit lines, (such as FINAME, *BNDES Automático*, and *BNDES Soluções Tecnológicas)* or commercial credit lines. Interviewees however indicated the uptake of the FGI is rare.

Leveraging the existing mechanisms where possible and learnings from the perspective of end-users, ESCOs and financiers, the solution to this barrier should therefore involve simultaneous efforts to: enhance banks capacity to accept cash-flow-backed loans; ESCOs' (particularly small ones) capacity to present cash-flows as collateral; improve existing guarantee mechanisms where possible or create better demonstration mechanisms if necessary, potentially including insurance alternatives; and involving financiers in the development of de-risking strategies that effectively reduce their collateral requirements (especially for small ESCOs) in the first place.

[13] The IDB's Energy Savings Insurance Mechanism is currently being piloted in a few Latin American countries and has been drawing attention from Multilateral Development Banks, and regional Development Banks as a way to provide safety to financial institutions without actually mobilizing capital into a guarantee facility.

[14] Further information on the FGI is available at: http://www.bndes.gov.br/wps/portal/site/home/financiamento/bndes-fgi/bndes-fgi/!ut/p/z0/fY5LC4JAFEZ_SwuXcsewoKVG9HCkoBZ2NzLaqLfyjub0-vdZBO1aHs7H4QOEBJDVjUplybA697zHcSon0Wzhr4Wcb2UoAhl5m3A59PzdCFaA_wd9YXiJp3EJ2ChbucSFgSTjg-7coqS3p2PbYgCYG7b6Yb82Je4s2Wv-eeKIytTaEQWx4pxUrdmarueSHPGrNSfMnvdg8ALOJDjx/

Existing regulation limits ESCOs' capacity to deliver public-private partnerships (PPPs)

Interviewees noted that the regulatory regimes (federal, state and municipal) underpinning public institutions are often unfavourable for energy efficiency projects, limiting ESCOs' appetite to develop public-based projects. Whilst this barrier overlaps with the above on 'lack of regulatory drivers' hindering end-users' interest in efficiency projects, this barrier specifically refers to the perspective of ESCOs and was brought up by one particular ESCO interviewee with experience in public efficiency contracts.

Brazilian PPP structures for energy efficiency projects are typically constrained to 15 year contracts. ESCOs are required to cover investment costs, provide guarantees to financiers, and manage operation and management activities over partnership periods, often pushing breakeven points to 10 years or beyond. Given the limited amount of years in such contracts, this interviewee expressed that the 15 year timeframe impedes a large amount of opportunities to become commercially viable in the public sector.

"We'll take at least 10 years to break even in the PPPs we've seen, so the 15 year timeframe limit is not sufficient to allow us to make a profit."

Partner, medium ESCO

Within ANEEL's PEE, ESCOs confront a regulatory barrier that makes them face two risks when they submit projects for public sector beneficiaries (e.g. schools, hospitals, and public housing buildings). ESCOs will typically take the risk of paying for and delivering energy audits to be able to submit the project cases to the utility tenders under ANEEL's PEE procedures, where projects may or may not be accepted. When such projects involve public sector beneficiaries, the regulation demands that even if they are successful under the utility tenders, such beneficiaries have to open tenders to secure delivery entities. That is, an ESCO which designed the project, paid and delivered the energy savings assessment, risks not being the ESCO selected to deliver the project, in case a competitor offers a lower implementation cost in a tender.

The solution to this barrier necessarily requires policy changes at the levels governing state and federal public entities. An in-depth discussion with relevant public playersand regulators would be required to adequately define the extent to which policy changes could be done, at which level, and how should these be conducted.

FINANCIER-RELATED BARRIERS LIMITING THE ATTRACTIVENESS OF EXISTING MECHANISMS

Small projects increase transaction costs

Financial institutions have significant transaction costs when dealing with energy efficiency projects given these typically are relatively small in size (R$ 100,000 to R$ 2 million) and require more due-diligence than an average loan, given financiers' lack of expertise with this topic. From a project financing perspective this overburdens the due-diligence process and renders such projects uninteresting to banks. As a result, financial institutions will often increase the cost of finance or dismiss such opportunities altogether. However, the representative of Desenvolve SP indicated that they are used to assessing loans <R$ 1 million, and that this is not perceived as a problem in their institution.

"Relative to their size, the required administration takes too much time and would restrict our ability to engage in other activities."

Financier

ESCO interviewees indicated that the solution to this barrier has often been to take loans from alternative sources of finance which do not require such due-diligence – for instance, working capital loans from commercial banks, taken by individual ESCO partners, rather than by ESCOs as companies. According to the interviewees,

the cost of finance with such credit lines is much higher than with government-backed energy efficiency loans, but the process is significantly easier and makes it worthwhile.

Conversely, financier interviewees brought up the possibility of rendering loan requests more interesting by grouping similar small projects together to create a portfolio approach worth >R$ 10 million that justifies the due diligence of financiers and dissolves the perceived project risk.

"Working capital credit doesn't incur in this transaction cost because the branch manager can approve it himself. I've taken loans of R$ 1-4 M without half the due diligence of an energy efficiency credit line. We prefer that, even though interest rates are higher"

Partner, medium ESCO

Bureaucracy associated with obtaining subsidized financial mechanisms

Interviewees across the energy efficiency market often refer to bureaucracy as a key factor restraining the demand for government-backed financial products. Commercial bankers have declared they would not even offer such products to their clients because of their burdensome processes, whilst ESCO interviewees often declared they prefer loans with higher interest rate and less bureaucracy over subsidized energy efficiency credit lines. Government and public bank interviewees, conversely argue that the perceived bureaucracy is caused by a mix of the regulation established by the Central Bank; the fact that Brazil does not have a central database of basic company data; and due to end-users not presenting acceptable loan propositions, slowing down financiers' usual due-diligence.

From the perspective of the majority of ESCOs, applying for BNDES loans is unthinkable - as confirmed by several interviewees - due to what is described as a burdensome process of 6-12 months. Only one major ESCO (a major utility subsidiary) reported frequently utilizing FINAME loans. Regional development banks, such as Desenvolve SP seem to have streamlined their loan evaluation processes and are judged better by ESCOs. However, interviewees confirmed that less than a handful of ESCOs in Brazil are able to access Desenvolve's loans. ESCO interviewees that attempted to do so and failed, noted that they were not able to pass Desenvolve's initial screening due to complaints about their balance sheets.

However, Desenvolve SP asserted that it outsources the basic credit evaluation of ESCOs (and their balance sheets) to SERASA and that well-structured ESCOs should be able to pass through that screening (overlapping with the above-described barrier of ESCO limitations). Desenvolve also affirmed that it has streamlined its application process to the minimum possible within the Central Bank regulations, and noted that its screening process is particularly burdensome for institutions who have never borrowed with them because they must request a series of basic documents for newcomers. Still according to this interviewee, Brazil does not have a central database of basic company data that could be accessed by the company's registration number (or the individual's social security number) meaning there is no way Desenvolve could source this information, other than by directly requesting all basic company documents from a new loan applicant.

"The Central Bank requires us to run quite a due-diligence and I've managed to reduce it to a minimum. Even so, most ESCOs' won't pass our screening process."

Financier

Commercial banks are known to be more agile with their due-diligence, largely because they do not need to abide by the legal hurdles linked to subsidized credit lines, and have provided complementary solutions to clients seeking loans from Desenvolve SP. One interviewee highlighted that commercial banks have provided 'bridge-loans' (a first tranche of credit) to clients that are in the process of pursuing subsidized credit as a means to get projects started and overcome the time hurdle – given Desenvolve's loans can take ~2-4 months to be disbursed.

Defining the best solution to this barrier, like others above, requires a closer evaluation of: (i) the underlying regulation and the extent to which it can be sensibly improved to decrease the burden for loan applicants; (ii) financial institutions' lending procedures and the extent to which these can be streamlined; and (iii) ESCO application examples, to better understand whether this could be addressed by enhancing ESCOs' capability of submitting adequate loan propositions.

Crucially, the solution to this barrier can draw on lessons learnt from international players, such as the Carbon Trust and the European Bank for Reconstruction and Development, who have proven the benefit of simplified loan procedures. In these international examples, streamlined procedures include online application systems with quick responses to loan requests; standardized spreadsheets with pre-defined parameters to be checked by bank branch managers, leading to quick responses to loan requests; and reducing due-diligence to certain project categories with standard loan application sheets.

High risk perception of financial institutions leading to high collateral requirements

From the perspective of financiers, energy efficiency is typically perceived as a high-risk operation due to a mix of factors listed above (such as their own lack of awareness of efficiency projects, lack of trusted players, high perceived risk around small players, and the fact that energy savings are not considered as feasible guarantees). Ultimately, banks translate all of the above into higher capital costs, whether through higher interest rates and/or higher collateral requirements.

All interviewees saw this as a major barrier to be addressed, and the proposed solutions are linked to those recommended for several of the barriers above, involving a mix of: (i) acting on the part of the problem which is beyond the banks' remit (e.g. creating trust amongst players, creating a low risk pipeline, guaranteeing first losses, a super-ESCO approach, standardizing loan requests and reducing transaction costs); and (ii) acting within the banks through measures that help them improve their understanding of energy efficiency projects, their due-diligence processes, and their capacity to de-risk the loans (e.g. building capacity within banks to help them better assess energy efficiency business cases, simplifying lending procedures and creating ways to de-risk loans).

With regards to this second category of measures, a commercial bank interviewee noted an interesting example of how to mitigate the risk of their efficiency loans by supporting an ESCO client to build a safer contract structure with its end-client. Aiming to separate the ESCO-risk from the project-risk, this financial institution designed a (confidential) contract model in which end-users pay ESCOs an additional monthly fee in each month of a typical EPC, creating a 'credit reserve' between the end-user and the ESCO. In case that project doesn't perform as expected in time, the ESCO can draw from that reserve to pay back the bank and deduct these credits from the end-clients' payments due towards the end of the contract, once the loan is already repaid. The extent to which this model would hold for EPCs generally is however unclear and requires further analysis (to the extent the confidentiality of such models allows).

A government interviewee also noted that banks are more comfortable to lend to end-users than to ESCO intermediaries, highlighting that models which avoid the intermediation of ESCOs may also reduce banks' risk perception and are worth considering.

A few attempts have been deployed to mitigate this barrier within the groups of solutions (i) and (ii) above, such as the technical assistance initiatives outlined in Table 5, including working groups in the Business Council for Sustainable Development and the Banking Federation, and the commercial bank example above. An alternative approach by BNDES to limit financiers' reaction to risk perception by capping the spreads of commercial banks, has largely failed, leading commercial banks to not even offer such credit lines to their clients.

"Commercial banks won't even offer subsidized finance to clients because their spread is limited by the government. They're better off offering their own credit lines"

Financier

Intrinsic difficulties in settling potential disputes

Energy efficiency projects are known to generate legal difficulties in case the ESCO-end-user relationship, or the ESCO-financier relationship, is driven to litigation. Concerning the former, the ESCO-end-user relationship is governed by the quality of EPCs, and can be improved by enhancing EPCs' capacity to avoid or settle court disputes as discussed in the 'lack of an accepted risk framework' barrier above.

Regarding the latter, financiers are used to backing-up loans with marketable asset collateral, which can be appropriated and sold in case of defaults, but energy efficiency projects are typically complicated in this sense because energy efficient assets: (i) represent only a share of the loans (which are also composed of service costs); (ii) often have low second-hand value; or (iii) cannot be clearly identified or even appropriated. Financiers therefore translate all of the above into higher capital costs because they lack confidence in settling disputes through repossessing collateral.

Several interviewees mentioned this is a problem, although it is not perceived as a core barrier. This problem is intrinsic to energy efficiency projects (assets being only a share of the loans; difficult to recover; and have a low second hand value), so the solution to this issue is interconnected with the solutions to barriers above - e.g. finding alternatives to asset-collateral, such as project cash-flows or guarantee funds; de-risking the pipeline so that financiers can rely less on collateral; and generally reducing financiers' risk perception.

ADDITIONALITY OF PROPOSED CONCEPT

As noted above, the TI4E intends to facilitate deals between potential investors and investment opportunities for ESCO-based energy efficiency in Brazil to increase the volume of implemented projects. The initial concept assumes that there is a significant quantity of high-quality projects in ESCOs' pipeline that can be unlocked with a combination of early stage technical assistance targeted at ESCOs and the availability of debt from an Investment Debt Pool. It also assumes that this pipeline would deliver high-IRR projects which could then be used to attract funding from institutional investors as the senior debt tranche in a blended investment vehicle.

The analysis above suggests the TI4E concept is in principle correct, in the sense that support is needed to create a high-quality pipeline of energy efficiency projects through ESCOs. However, it also provides evidence that two key aspects need to be reviewed in the TI4E's initial premises to ensure it is highly additional.

First, the underlying assumption that a sufficiently deep pool of high quality energy efficiency projects with high IRR exists in Brazil, requires further analysis. Interviews with ESCOs, ABESCO, financiers and the ESCO market assessment presented above, indicate that the existing pipeline is concentrated in very few ESCOS (5-10) and

limited in terms of the number of projects (likely 5-10 projects per ESCO), the size of such projects (R$ 1-5 million on average), their applicability for EPCs, and their capacity to deliver high-IRRs. A thorough case-by-case analysis of this pipeline must be conducted to obtain definitive conclusions in this respect. Whilst this indicates that this selected group of ESCOs could bring up to 25-100 projects worth R$25-500 million in total, the limited number of ESCOs would quickly reach a saturation point in their borrowing capacity. It is also important to acknowledge that there is a pipeline of energy efficiency projects beyond ESCOs in Brazil, as identified for example, within CNI & ABRACE's Aliança Programme – where projects requiring over R$ 1 billion in investments have been identified.

Secondly, more than early stage technical assistance is needed to push ESCO-based projects forward to an investable grade. The findings suggest that a comprehensive support programme should address the three groups of barriers identified (customer-related; ESCO-related; and financier-related). Altogether, this package of interventions would seek to ensure that: (i) consumers are incentivized to create a pipeline of bankable projects; (ii) ESCOs are capable of building and delivering a low risk pipeline which is attractive to financiers; and (iii) financiers (in particular development banks) offer adequate finance to allow ESCOs and end-users to implement such opportunities. Specific interventions in these three domains are described below.

To conclude with a set of actions to deliver the TI4E, Table 8 lists the barriers identified above, along with summary action-focused bullets of how these could be overcome. In some circumstances clear actions are not defined and require further research or stakeholder input. Drawing from interviews, these barriers are classified according to their importance, effectively providing a prioritisation based on their potential to unlock the ESCO-based energy efficiency market, ranging from high, to medium, and to low priority barriers. Prioritization rankings can be perceived differently if different target sectors are considered, e.g. unlocking SME energy efficiency or industrial energy efficiency whether or not through ESCOs.

Table 8. Summary of proposed actions and prioritization

Barrier prioritization key:

Low priority
Medium priority
High priority

Barriers per category, solutions and prioritization
Customer-related barriers
Lack of awareness of the commercial benefits of energy-efficiency • Deliver workshops to share a practical view of the benefits of EE to private sector decision makers. • Get clients to convey success stories for target sectors, highlighting cost savings. • Discuss with ABESCO the potential improvements to COBEE. • Engage private sector decision makers in field-days (site visits) to undergo walk-through energy audits in sample sites within priority sectors. • Consider the creation of an energy efficiency agency or special purpose vehicle to deliver the above.
Lack of time and resource to manage implementation • Discuss with government and private players how best to foster greater adoption of ISO 50001. • Discuss with trade bodies and private associations (e.g. CEBDS) the possibility of advancing voluntary public commitments to enhance efficiency. • Raise awareness around ISO 50001 within the private sector.

Lack of resource consumption data and benchmarking • Raise awareness of benchmark performance and financial benefits of investing in energy savings to financial executives. • Adapt the language of awareness raising messages, marketing campaigns, events, workshops, etc. to this specific target audience in priority sectors.
Lack of trust in technologies, technology suppliers and project implementers • Consider the creation of an accreditation mechanism with key government and supply chain players. • Deliver accreditation mechanisms for ESCOs technologies and suppliers governed by independent and trusted bodies ensuring these demonstrate commercial value to ESCOs and suppliers, e.g. by linking accreditation to regulation and a preferential finance mechanism. • Deliver marketing campaigns on accreditation mechanisms to raise awareness amongst end-users. • Consider an energy efficiency agency or special purpose vehicle to deliver the above.
Significant up-front investments for energy audits and to establish the loan business case • Select proven and standardized energy audit approaches for priority project categories and sectors • Subsidize part of energy audit costs throughout key target audiences. • Provide financial incentives to convert audits into investments. • Create a comprehensive online data-base of publicly available energy audits. • Consider running competitive tenders for companies in priority sectors to receive full energy audits and implementation support (to create a demonstration effect).
End-users often have high levels of debt, limiting their ability to take on additional loans • Assess potential to support CNI, ABRACE, World Bank's off-balance sheet initiative, which intends to create a private-backed special purpose vehicle to deliver energy efficiency investments
Lack of regulatory drivers and political instability limits end-users' willingness to invest. • Secure high-level government engagement and commitment to align drivers. • Review regulatory drivers along with Ministry of Mines and Energy and other relevant parties to better understand where changes can be made. • Define a workplan to implement potential regulatory improvements along with the Ministry of Mines and Energy and other relevant parties, e.g. the creation of mandatory efficiency targets throughout sectors and/or incentives for players to achieve such targets.
ESCO-related barriers
Lack of accepted contractual risk allocation framework, hindering project 'finance-ability' • Better understand and evaluate the advantages and shortcomings of EPCs and alternatives. • Improve ABESCO's EPC model in partnership with legal specialists, financiers and end-users to include: agreement on dispute settlement committee (e.g. in industries association) before heading to litigation; enhanced MRV section including clarity on baseline to avoid disputes; splitting initial energy saving assessment costs and contracts from investment-grade assessments and project delivery contracts (to limit risks from the perspective of ESCOs). • Nurture the capacity of a larger number of ESCOs and financiers around the utilization of EPCs (and/or adequate alternatives).
Limited expertise to identify opportunities and turn them into compelling investment cases, and lack of administrative structure in most ESCOs • Build technical capacity of ESCOs around: combined heat and power (CHP); heat recovery; energy integration; software for energy optimization (thermos-dynamics, fluid-dynamics, chemical reactions, heating, industrial automation and energy integration); and furnaces (burners & automation).

- Consider the creation of a government-backed energy efficiency agency, special purpose vehicle, or 'Super-ESCO' approach to either directly deliver a pipeline or to build ESCOs' capacity to do so.
- Standardization of energy saving assessments, and project procedures all the way through to measurement and verification.
- Engage industrial end-users to open their facilities for ESCOs.

Lack of administrative and financial capacity to adequately fulfil financiers' basic requirements and make compelling investment cases, across the majority of ESCOs

- Develop ESCO's legal and financial capacity to present balance sheets and basic parameters to meet the requirements of financiers.
- Consider the creation of a government-backed energy efficiency agency, special purpose vehicle, or 'Super-ESCO' to deliver the point above.
- Standardization of energy saving assessments, and project procedures all the way through to measurement and verification.

SMEs (including most ESCOs) struggle to provide the required collateral to secure loans

- Enhance banks' and ESCOs' capacity to utilize cash-flows as guarantees (e.g. models in which cash-flows of ongoing contracts are provided as guarantees during a first year, switching to the cash-flow of the project to which the loan is directed in the second year), based on a detailed assessment of why cash-flows are sometimes accepted as collateral and other times not.
- Discuss the creation of a first loss guarantee mechanism or an insurance mechanism to take up the risk of an initial set of projects de-risked with parallel solutions.

Existing regulation limits ESCOs' capacity to deliver public-private partnerships

- Deliver deeper assessment of limitations within PPP's regulation in consultation with relevant public players.
- Deliver changes where possible, including: raising awareness of public institutions around the feasibility of utilizing EPCs to deliver energy savings and providing practical guidance for public players to be able to utilize EPCs.

Financier-related barriers

Small projects increase transaction costs

- Support ESCOs to group or aggregate sufficient and similar small projects together to create a portfolio worth >R$ 10 million that justifies the due diligence of financiers and dissolves the perceived project risk.

Administrative burden associated with obtaining subsidized financial mechanisms

- Further evaluate:
  (i) The underlying Central Bank regulation and the extent to which it can be sensibly improved to decrease the burden for loan applicants;
  (ii) Financial institutions' lending procedures and the extent to which these can be streamlined with simpler application processes; and
  (iii) ESCO application examples, to better understand whether this could be best sorted by enhancing ESCOs' capability to submit adequate loan propositions.

High risk perception of financial institutions (FI), leading to higher cost of finance

- Consider the creation of a first loss guarantee mechanism or an insurance mechanism to reduce the risk of an initial set of projects de-risked with parallel solutions.
- Create a technical assessment committee for loans, removing the responsibility of the technical due-diligence from banks.
- Create trust amongst FIs through accreditation mechanisms.
- Consider the potential adoption of a super-ESCO approach with government and private sector representatives.

• Work with FI and ESCOs to standardize loan requests. • Build capacity across FI to better assess energy efficiency business cases.
Intrinsic difficulties in settling potential disputes • Discuss the feasibility of banks accepting alternatives to asset-collateral such as project cash-flows or guarantee funds as a way to reduce chances of legal disputes. • De-risking the pipeline so that FI can require less collateral and hence reduce the chances of legal disputes.

Beyond the prioritization of barriers in terms of their importance to unlock market opportunities, other factors must be considered when defining the optimal delivery strategy for the TI4E, in particular: (i) the degree of difficulty to implement the proposed recommendations; (ii) the relative costs of implementing the interventions; and (iii) how these solutions are interconnected.

As next steps in the TI4E's design, specific discussions with relevant players in the Brazilian market are required to define which recommended actions to take forward. Key points to be considered in these discussions are outlined below for reference and should serve as a starting point to guide the programme's next steps:

- As part of the customer-related barriers, designing and delivering an awareness raising campaign is relatively 'easy' to deliver, although the costs of a widespread effort can be ranked as medium or high.

- Creating trust in the market is a key priority, but also one that requires significant effort, resources and perseverance. This might require the coordination of various institutions such as MME, PROCEL, INMETRO, financiers, and potentially the creation of a new energy efficiency agency to leverage existing labelling and accreditation systems and create a new product which is commercially attractive and linked to preferential financing conditions.

- Addressing the lack of regulatory drivers is a major priority, albeit one that may prove extremely challenging given the need to secure high-level government support and to design adequate incentives with careful consideration of their impacts.

- Addressing the lack of an accepted risk allocation framework may also prove to be challenging, even though it might have a relatively lower cost compared to other interventions, as EPCs could remain largely unutilized if they carry a negative connotation across end-users and financiers.

- Finally, addressing FI's high risk perception may require a relatively complex construction of a demonstration programme that helps de-risk the project pipeline and features a risk sharing facility, in such a way that FIs are engaged and gradually decrease the level of risk perceived.

ANNEX I - SUPPORTING POLICY AND REGULATORY LANDSCAPE FOR EE IN BRAZIL

FEDERAL PLANS

National Plan on Climate Change

As an overarching umbrella the National Plan on Climate Change justifies much of Brazil's climate-smart regulations, finance mechanisms and other initiatives. The Plan was launched in 2008 during the COP 15 by Brazil's Interministerial Committee on Climate Change and lays out the country's first ever nationally agreed GHG emission mitigation targets, including ambitious goals to reduce GHG emissions between 36% and 39% by 2020 - based on an optimistic baseline growth scenario. Energy efficiency features modestly in the plan, with no specific targets or roadmap for delivery, but is listed as an important national focus. However, Brazil witnessed low economic growth patterns held back by the global economic recession in the years that followed, requiring a revision of such targets which eventually occurred within the announcement of Brazil's NDC.

More important than the targets, the National Climate Change Plan demonstrates the capacity of multiple government ministries to work together to produce a commitment and lay down the common agreement that curbing emissions is a priority in Brazil.

National Energy Efficiency Plan

Launched in 2011, the National Energy Efficiency Plan announced a commitment to reduce the electricity demand forecasted to occur by 2030 by 10%, through energy efficiency measures. The projected baseline consumption for 2030 was 1,027 TWh/year, with the plan aiming to reach 2030 with a national power demand of 921 TWh/year (MME, 2011). This translated into accumulated savings of 106 TWh between 2010 and 2030, and ~30MtCO2eq avoided assuming Brazil's electricity emission factors. The plan describes how potential savings could occur in each of the key sectors of the economy and identifies areas for improvement in the regulatory and financial environment to enable the realization of efficiency opportunities.

As described above, this baseline projection was also affected by the global economic downturn and by an unfavourable political scenario whichhave led to low and even negative GDP growth between 2011 and 2017, indicating that reaching 2030 with a demand of 921 TWh is now an optimistic growth scenario for Brazil. The energy efficiency plan has not been revised yet to reflect the current economic situation, although the 10-year energy plans launched periodically by Brazil's Energy Planning Company (EPE) have shown a more realistic baseline and energy saving scenarios.

P+B Plan (Plano Brasil Mais Produtivo)

Launched in April 2016, Brazil's federal flagship industrial development Plan (P+B) is led by the Ministry of Development, Industries and Commerce (MDIC), and focuses on enhancing the productiveness of industrial SMEs through enhanced efficiency and better technologies. The two fronts work in parallel, with MDIC dedicating different sets of budget to run pilot programmes and full-scale implementation through different delivery partners. In the energy efficiency front, MDIC allocated R$ 1 million over 2016 and 2017 to test a methodology of specialist advice and support delivered by SEBRAE consultants to a pilot group of 48 SMEs. From mid-2017, MDIC intends to scale-up the support to 400 SMEs, at the cost of R$ 8 million to be shared with the Agency for Industrial Development (ABDI) and the PROCEL programme. In the technology front, the pilot phase is focused on the digital enhancement of SME processes and is being delivered by CNI's technical delivery arm – SENAI – at the cost of R$ 2 million between 2016 and 2017 (MDIC, 2017). In early 2018, this front is also expected to be scaled-up, although the upcoming budget is not clear, as well as the number of companies to be supported.

The P+B plan does not provide any form of finance to SMEs, and does not include any adaptation of regulatory drivers to enhance the adoption of efficiency measures or discourage low efficiency. SMEs can apply to receive the programme's support over its website, although the programme's limited budget justifies MDIC's target to

support at most 5,000 SMEs – assuming these are able to co-fund a share of the interventions proposed by the programme.

Plano Inova

Launched in 2013, the Inova Plan seeks to join up efforts across Brazil's Development Bank (BNDES) and the Federal Financier of Innovation and Research (FINEP) to accelerate innovation and modernization of specific sectors, mixing different forms of credit and grants offered in public tenders announced periodically. Amongst the full range of Inova Plans, those most relevant to energy efficiency opportunities are *Inova Energia* and *Inova Sustentabilidade*, offering credit and grants to end-users seeking to deploy efficient vehicle technologies and renewable microgeneration (Inova Energia), as well as energy efficiency projects in industries and sanitation sectors (Inova Sustentabilidade). Inova Energia will also enable for investments in smart grids, energy transmission and renewable energy projects as a whole. Each plan has a total budget of R$ 3 billion, out of which R$ 1.2 billion are offered through credits; however, there is no data available on the disbursements of credit or grants under either Plan or on their results to date.

CROSS-SECTOR FEDERAL PROGRAMMES

ANEEL's Energy Efficiency Programme (PEE)

Enacted in 2001 by the law 9,991, ANEEL's PEE programme mandates that electricity distribution utilities invest 0.5% of their net revenues in end-user energy efficiency projects adding to an annual revenue of approximately R$ 600 million in 2016. The PEE is the main source of energy efficiency finance in Brazil and the main funder of the ESCO pipeline.

After multiple amendments to its original design, the PEE scheme has led to significant results, saving roughly 3.9 TWh/year (ANEEL, 2015). The scheme is frequently criticized for its low cost effectiveness (ranking lowest in this sense across similar programmes worldwide (Carbon Trust, 2015) primarily due to an obligation on utilities to invest at least 60% of the resources to provide free efficient appliances to low income households. As a result, a large portion of the programme has historically led to marginal energy savings, especially since old appliances are not surrendered to utilities. In its most recent amendment enacted in congress (law 13,280 in 2016), the regulation underpinning the PEE has changed to allow utilities to decide whether to allocate resources to low income households– thereby increasing the amount of finance available for large-scale energy efficiency projects in other sectors from 2017 onwards, such as industry and commerce. The results of this change are yet to be fully assessed and published by ANEEL.

Equipment Labelling Programme (PBE)

Enacted by the law 10,925 in 2001, Brazil's equipment labelling programme provides mandatory labels to communicate the relative efficiency performance of certain equipment to consumers, ranging from A (most efficient) to E (least efficient) categories. Delivered by a consortium between the national metrology testing network (INMETRO) and state-owned companies Petrobras (within CONPET) and Eletrobras (within PROCEL), the label is widespread across electricity and fuel combustion equipment used in households and industry. There is no published data on the results of the PBE.

National Programme for Electricity Conservation (PROCEL)

Enacted in 1985 by the Ministry of Energy (MME) and executed by the state-owned power utility Eletrobras, PROCEL subdivides itself into a range of sub-programmes that split its annual budget to drive energy efficiency in multiple sectors. These programmes are: The PROCEL Label, PROCEL Education, PROCEL Info, PROCEL Edification, PROCEL Public Buildings, PROCEL Municipal Energy Management, PROCEL Industry, PROCEL Lighting and PROCEL Sanitation.

Amongst all the above, the PROCEL Label stands-out as a renowned electric appliance label, well known amongst consumers. Building on the PBE, it is assigned to the top performing products under each product category evaluated - e.g. the most efficient air-conditioner amongst the 'A' category models. The label reaps significant results since its inception and claims to save approximately 11TWh/year.

Beyond the label, other PROCEL programmes have led to significant advances in making all classes of consumers aware of energy saving opportunities across sectors. Actions within such plans are funded by regulated budget allocations directed to PROCEL (e.g. 20% of ANEEL's PEE budget has been allocated into the PROCEL from 2016 onwards) and executed entirely by Eletrobras - the programme therefore does not offer any form of credit and does not create an opportunity for ESCOs to operate in.

National Programme for the Rational Use of Oil and Gas Products (CONPET)

Brazil's CONPET exists since 1991 and provides voluntary labels to communicate the relative combustion efficiency performance of fuel consuming equipment to consumers, classifying these from A to E categories. Coordinated and executed by Petrobras, CONPET made significant achievements in the industry and transport sectors, getting most large equipment manufacturers, virtually all vehicle and tyre manufacturers to voluntarily apply for the label. Whilst there is no official publication of CONPET's results or additionality, the adherence across the industry is a clear signal of the programme's relevance, although it cannot be seen as a testament to its success.

Urban Mobility Growth Acceleration Programme (PAC2 Mobilidade)

Launched in 2014 by former President Dilma Rousseff, and coordinated by the Ministry of Planning, the second phase of Brazil's Growth Acceleration Programme included a dedicated subcomponent for urban mobility - intrinsically linked to transport efficiency. With a total budget of R$ 611 million (of which R$ 306 million in grants and R$ 305 million in long term finance with a 30-year tenor and a 5.5% annual interest rate) (Portal Planalto, 2014), the plan sought to fund subway and modern tram systems in multiple capitals, with private project implementers seeking for complimentary finance for each project. To date there is no available data demonstrating the Programme's disbursements and results.

Federal and state government's Sustainable Purchase Programme

Sustainable procurement has been on the agenda of federal ministries since 2003, primarily captained by the Ministry of Environment (MMA) and the not-for-profit international entity Local Governments for Sustainable Development (ICLEI) under the Sustainable Procurement Programme Initiative named Procura +. ICLEI has launched a sustainable procurement guide[15] in 2005, with support from GIZ and execution by Getúlio Vargas Foundation (FGV), followed by subsequent editions in 2009[16] and 2013[17]which to some degree formed the basis of the only related regulation launched in 2010. Law 12,349 of 2010mandates that sustainability criteria are considered upon governmental buying decisions (Planejamento, 2013) - e.g. favouring equipment with level A labels under the PBE, PROCEL and CONPET - but still allows 'non-sustainable' products to be purchased with simple justification. A central Federal Government Purchase Portal is available online[18] under the Ministry of Planning and Management's website and allows ministerial departments to search and purchase products under a 'sustainable' category, as well as under a 'non-sustainable' category. Few states have gone through similar

[15] http://archive.iclei.org/fileadmin/user_upload/documents/LACS/Portugues/Programas/Compras_Publicas_Sustentaveis/Guia_Compras_Sustentaveis.pdf

[16] http://archive.iclei.org/fileadmin/user_upload/documents/LACS/Portugues/Servicos/Ferramentas/Manuais/Compras_publicas_2a_ed_5a_prova.pdf

[17] http://cpsustentaveis.planejamento.gov.br/assets/conteudo/uploads/manualprocurabrfinal.pdf

[18] http://comprasnet.gov.br/acesso.asp?url=/Livre/Catmat/Conitemmat1.asp

steps and launched state-specific guidance, such as São Paulo (SEMA SP, 2013), but again on a non-compulsory basis.

CROSS-SECTOR FEDERAL REGULATION

Energy Efficiency Law

The Energy Efficiency law 10,295 was enacted in 2001 outside of any programme or plan, although in consonance with many of the above. Jointly put forward by the ministries of energy, science and technology, industries, and regulatory agencies for power and fuels, it determines minimum efficiency standards for a range of energy consuming product categories (electric or fuel powered) as well as of buildings. Minimum efficiency thresholds are set by a National Committee of Energy Efficiency Indicators and sector specific working groups formed by the aforementioned entities, academics and civil society. These are meant to propose and updated minimum standards regularly, in line with medium-term targets set by each working group for specific equipment categories. Sample tests to enforce such standards are realized leveraging the network of labs accredited under the PROCEL and CONPET programmes (PROCEL Info, 2014).

The law is however, limited in its effectiveness due to restricted resources for enforcement of such standards; relatively low ambition of standards in some product categories (somewhat limited by corporate interests); the fact that the standards are non-compulsory for buildings; and a general absence of governance due to there not being a single institution ahead of the theme.

TRANSPORT SECTOR PLANS AND REGULATION

National Plan for Logistics and Transport (PNLT)

PNLT is the federal government's central transport efficiency plan, instituted by law 11,518 in 2007 and led by the Ministries of Transport and of Defense. The plan is meant to institute better planning to government decisions in the transport sector, allowing the sector to contribute to broad economic and environmental targets. Its stated goals to support the shift of current transport modes (largely based on road) to more efficient and diverse modalities by 2031 (Ministério dos Transportes, 2012) serve as a backbone for policies to come and establishes targets to reach 2031 with the following percentage of goods transported per modality: Road (38%); rail (43%); hydro (6%); pipelines (4%); and intra-country cabotage (9%). As a result, the plan hopes to mitigate 42 Mt CO2eq by then, through vehicle emission offsets. The plan's budget and results are not tracked and published and the extent to which it has driven Brazil's efficiency market is unclear, although it likely has an indirect impact in the purchase of more efficient transport technologies, from local or overseas suppliers

National Urban Mobility Plan (PNMU)

Also led by the Ministry of Transport, the PNMU is a joint effort with the Ministry of Cities and serves as a basis upon which to build urban-mobility related incentives in federal, state and municipal regulations. Enacted by law 12,587 in 2012 it institutes principles which somewhat favour efficient transport modes, such as that cities must mitigate environmental externalities of urban transport, favour low-carbon transport and provide universal accessibility to its citizens. The plan does not set specific targets and does not have a budget allocation (Camara dos Deputados, 2012), and can therefore not be directly linked to any result. The extent to which the PNMU has driven Brazil's efficiency market is unclear, as goods and services purchased from measures linked to the Plan are most likely efficient mobility technologies (e.g. subways or trams) coming from international suppliers.

Automotives Polution Control Programme (PROCONVE)

Brazil's National Environment Council's (CONAMA) resolution 18 of 1986 established PROCONVE to reduce atmospheric polution from automotive vehicle, setting deadlines and maximum emission limits for national and imported vehicles. The programme does not include a budget of its own, but entitles regulatory branches of the

Ministry of Environment to update emission standards periodically and enforce these through sample tests (MMA, 1986). There are no published results attributed to PROCONVE, but it certainly has had considerable impact in shaping Brazil's automotive industry.

Inovar Auto

Within BNDES and FINEP's Inova Programme, the automotive branch 'Inova Auto' offers grants and limited loans for the automotive industry to enhance vehicle efficiency. As a target, the funders aim to shift automotive-efficiency from 14 km/litre of gasoline and 9.7 km/litre of ethanol to 17.26 km/litre and 11.96 km/litre respectively although no timeline is mentioned. Grant and loan disbursement data for Inovar Auto are not publicly available, and neither are its results, but it can serve as a driver for Brazil's energy efficiency market for products and services, given it may fund private players who may in turn purchase efficient goods.

INDUSTRIAL SECTOR PLANS AND REGULATIONS

Petrobras' OPERATIONAL energy efficiency programme

Within Brazil's industrial sector, Petrobras' internal programmes have considerable impact, given the company's size and potential for efficiency gains, and are thus worth highlighting. Petrobras has thirty-eight internal energy conservation commissions working to develop and implement measures to enhance the efficiency of its fossil extraction, refining, distribution, petrochemicals and biofuels - leading to significant power and fuel savings. Petrobras' efficiency division highlights Advanced Process Control projects and efficiency improvement of existing units, as key pillars in their efficiency strategy which cost the company R$ 480 million between 2008 and 2012, resulting in savings of 4,280 boe/day (Ferreira, 2012). Whilst Petrobras' programme is largely managed and executed in-house, it creates significant opportunities for external players to provide energy saving technologies and services, although there is no knowledge of ESCOs capturing shares of such opportunity.

BUILDINGS SECTOR PLANS AND REGULATIONS

Building labelling for commercial, public and residential buildings

Building on the Energy Efficiency Law, a working group for building energy efficiency has been established within the National Committee of Energy Efficiency Indicators to define voluntary standards for buildings and a specific building label under the PBE, coordinated by the PROCEL Edifica sub-programme. The label considers a series of aspects in a building's energy and resource consumption to achieve a final grade from A to E, but is non-compulsory. It therefore can be said to have some impact in driving the demand for efficient products and services related to the building sector, although the lack of published data makes it difficult to state exactly what has been the label's impact to date.

Caixa Azul Label

Yet another label for the building sector exists in Brazil, but focused on medium to low-income houses, rather than on edifices. Led by one of Brazil's two quasi-public banks, Caixa Econômica Federal, the Caixa Azul label attests to the resource efficiency of houses, considering energy and water usage. Different to the label above, the Caixa Azul doesn't provide a grading system, but rather a binary decision on labelled or not labelled houses. There are no published results accounting for this label's impact.

ANNEX II – ALIANÇA PROGRAMME SUMMARY

Seeking to tackle inherent cultural and semantic barriers that hinder energy efficiency investments, CNI and ABRACE have been supported by the Foreign Commonwealth Office under MME and ANEEL's supervision to deliver the Aliança Programme, an ambitious hands-on initiative that seeks to unlock investments in energy efficiency in in 100 large industrial sites within the next 4 years as part of PROCEL's public strategy.

CNI and ABRACE's engagements with large energy consumers' high leadership indicates that the term "energy efficiency", is misunderstood by Brazilian businesses, often perceived as a 'further improvement', rather than a real cost reduction alternative. Despite the use of global best practice in energy assessments, process optimization works, use of advanced manufacturing software, allied to proven concepts of culture creation, energy efficiency is not considered a significant value to Brazilian industries. Even though executives' speeches will often refer to energy efficiency as an important item, corporate actions do not include concrete movements to use energy more efficiently.

To tackle this, the Aliança program designed a support package to large industrial companies including innovative elements, such as its contractual structure with private companies in the form of of voluntary agreements for energy efficiency improvements. A company that enlists in the program signs an agreement with CNI with a set of commitments that will be valid for 2 years, including performance targets and coverage of 50% of the services cost of the program (estimated at ~€ 150,000 per company). CNI will in turn support the company with methodologies (technical developments and implementation of "culture by design"), best-in-class techniques, advanced software of optimization, computational resources, laboratories of universities and a team of highly qualified experts to create a formal energy efficiency program in the company aiming to identify 5% improvement in energy intensity for each company by working only on non-investment interventions, such as operational, process and behavioural measures. Other than Opex opportunities, an attractive list of capital projects also results from the assessment, usually representing about 30% potential energy savings with an average payback shorter than 1 year in 90% of the cases.

With the successful implementation of the Programme over 2015 and 2016, its methodology is being adopted as an element of Brazil's public policy, having been approved for further implementation using PROCEL's resources in 12 companies during a first cycle – August-2017 to July-2018 – and subsequently to another 13 that have already signed-up to the programme. MME and MDIC plan to explore the results from Aliança as a clear demonstration that energy efficiency is profitable and must be perceived a competitive advantage for the Brazilian companies, since part of the findings will bring immediate savings in terms of energy consumption and will also contribute to Brazilian GHG goals.

ANNEX III – OFF BALANCE SHEET INITIATIVE SUMMARY

A further initiative captained by CNI and ABRACE, counts on the World Bank's support and seeks to tackle the fact that large companies are often unwilling to take on debt to invest in energy efficiency projects, even where IRRs are significantly attractive.

Few industrial companies have created their own service company, such as Odebrecht Ambiental which was originally responsible for water treatment stations within the Odebrecht group and subsequently expanded to serve other clients. This solution has been useful in several companies, but it also presents difficulties in terms of CAPEX, since this service company is a controlled company whose debt will impact the ratings of holding company as well. The ESCO model in itself is a means to overcome this hurdle, in what end-users do not take up loans, and are serviced by ESCOs that do so on their own balance sheets.

Given major limitations of Brazil's ESCO market (outlined above), CNI and ABRACE have sought to develop an alternative funding model with support and sponsorship from World Bank. Based on the establishment of a special purpose vehicle (Sociedade de Eficiencia Energetica or SEE), whose core business is to provide energy equipment and services to multiple industrial clients, this model would benefit from economies of scale and reach special lines of credit and other financial instruments (such as green bonds) eligible to energy efficiency and climate issues.

In the first years of its operation, it is predicted that SEE would receive applications for energy efficiency projects from host companies, including detailed project design. SEE would procure materials and install the equipment in the host company conditions. SEE would be responsible for raising the capital to invest in those fixed assets. SEE would receive a fixed payment for the "capacity" made available to the host companies (a kind of service). This payment would cover service debt and operation expenses, resulting in a return on assets and profit margin for SEE to continue growing its operations.

In this model, in a first moment, SEE would be a joint venture controlled by several industrial companies and possibly financial institutions. Given the multiple ownership, no single company would have to consolidate SEE in its balance sheet, therefore protecting its financial ratings. It will be basically an off-balance kind of financial arrangement. SEE would be highly leveraged, borrowing in the market or even issuing green bonds to acquire equipment and make capacity available to energy users, which would make payments which be considered as operational expenditures (OPEX). SEE would not be an ESCO, but it would guarantee the availability of the capacity. SEE would not be a leasing company too.

Some analysis done by ABRACE and CNI indicate that the "capacity" model" would be suitable for most of the industrial energy projects. Those studies also indicate that there is a great demand for those kinds of services which will result in significant energy electricity and fuel savings, particularly in the combustion and heat recovery segments.

CNI and World Bank have been working in partnership for the last 2 years. Contract model between the clients and SEE have already been prepared, a long list of energy efficiency projects already identified and discussed with the industries. The current step focused on clarifying small details in accounting and investors structure issues.

Both initiatives of CNI are connected in the sense that Aliança will feed the off-balance company with attractive energy efficiency projects to be implemented by SEE. While Aliança focuses on improving energy intensity of companies with operational opportunities (Opex), but also generates high return list of capital projects (Capex), SEE will close the gap in terms of project finance. The hypothesis of CNI and the Governmental entities is that both initiatives may create success cases to influence the market of energy efficiency projects and the energy consumers as a whole, raising this topic to the level of other critical elements that may positively impact competitiveness and environmental issues.

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