



**Brasil** Innovation Lab  
for Climate Finance

# Distributed Energy Generation for Cooperatives

*Instrument Analysis*  
*September 2017*

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**The Brasil Innovation Lab for Climate Finance** identifies, develops, and supports implementation of transformative climate finance instruments that can drive funds for Brazil’s national climate priorities.

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# Distributed Energy Generation for Cooperatives (DGC)

## DESCRIPTION —

An instrument that provides long-term affordable pay-per-use to distributed renewable energy generation projects in cooperatives, overcoming funding barriers such as local content and guarantee requirements, short tenures, and funding caps

## GOAL —

To provide affordable pay-per-use for the implementation of distributed renewable energy generation systems in cooperatives and other rural producers

## SECTOR —

Distributed Renewable Energy

## PRIVATE FINANCE TARGET —

Insurance companies, pension funds, family offices, high net worth individuals, endowments and seed/angel investors

## GEOGRAPHY —

For pilot phase: Rio do Grande do Sul state in Brazil

In the future: the entire Brazilian territory

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## 1. CONTEXT

Brazil aims to increase its share of renewable energy (not including hydropower) to 23% of its energy mix by 2030, as part of its commitment under the Paris Agreement. The renewables sector has been progressing steadily towards this target. Currently, there are over 10 GW of wind and 3.5 GW of solar PV in the process of development and construction, and an additional 3-4 GW in both solar and wind are expected to be contracted annually through auctions. Distributed generation (DG) systems – small, on-site, grid-connected systems – should be a key part of this development, as they provide opportunities for cost savings for end-clients, while allowing developers and banks to gain experience at a smaller scale and with a more limited risk profile.

However, the development of distributed generation systems is still heavily constrained in Brazil due to very high upfront costs and limited funding availability. There are a number of financing facilities that cater to large scale renewable projects, but very few that target small scale systems and virtually none that match the specific cash flow characteristics of these systems.

The main barriers for the implementation of DG systems in Brazil are (i) the scarcity and caps of existing credit lines (that fund, on average, less than half of each project); (ii) the fact that subsidized credit lines from development banks require a certain amount of local content in the systems installed; (iii) a still underdeveloped local manufacturing capacity (especially in solar panels), which pushes developers to source from foreign manufacturers, thus failing to meet the local content requirements mentioned in item (ii) and; (iv) a complex regulation that forbids the sale of energy to the grid, allowing only a for compensation of energy bills.

Cooperatives are generally good candidates for distributed generation as they fit within the “shared generation” regulatory framework in Brazil (ANEEL/RN 482); Brazilian regulation allows for systems with up to 5 MW to be shared by numerous entities, thus lowering operational costs and implementation risks.

## CONCEPT

## 2. INSTRUMENT MECHANICS

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*Distributed Energy Generation for Cooperatives (DGC) is an instrument that combines a pay-per-use contract and a two-part performance structure. The result is contracts with terms that match the investment profile of DG systems, and more affordable DG systems for cooperatives.*

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Cooperatives currently source their energy mostly from large scale hydropower plants through a distribution and transmission system regulated by the National Agency of Electric Energy (ANEEL) and managed by the National Electric System Operator (ONS). Distributed Energy Generation for Cooperatives (DGC) aims to replace an important share of the energy sourced by cooperatives with on-grid distributed renewable sources such as solar PV and wind. It will do so by providing an affordable pay-per-use contract, effectively funding 100% of the DG projects with no local content or guarantee requirements and tenures that match the lifetime of the projects.

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## 2.1 FINANCING APPROACHES

DGC incorporates two innovative financing approaches:

- **Pay-per-use contract:** DGC will enable projects through a pay-per-use arrangement whose payments match the energy savings provided by the distributed generation systems (after discounts to clients). This will enable cooperatives to reap the benefits of DG systems without incurring any upfront costs or additional monthly expenses. In fact, it will provide 10-20% monthly savings on the cooperative's energy bills from the start.
- **Two-part performance structure:** In order to link generation performance to payments without overstepping regulatory restrictions, a two-part performance structure is implemented. DG contracts with cooperatives are split between a fixed portion based on the expected output of the DG system and a variable portion based on the performance of the system above that output. This means generation risk is virtually shifted away from cooperatives and absorbed by the Sponsor (Renobrax).

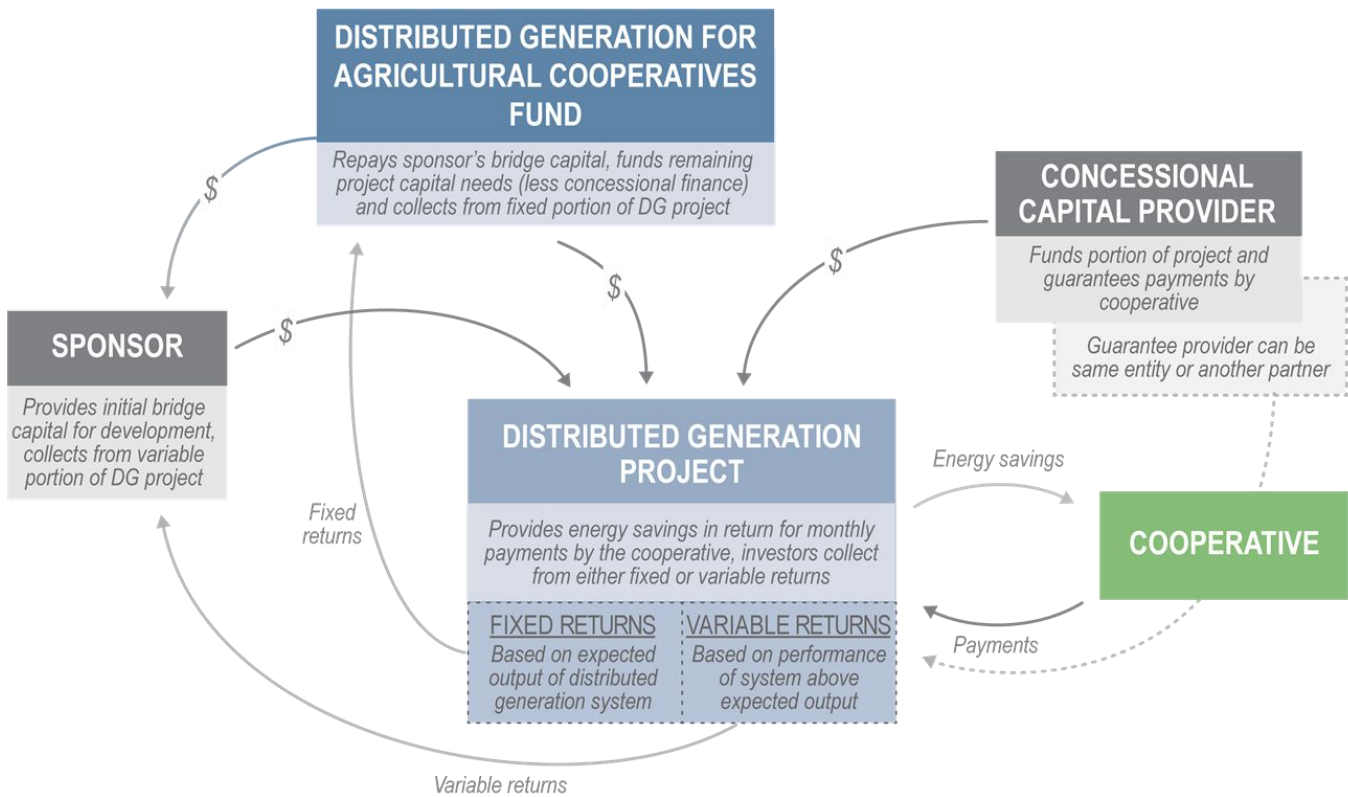
## 2.2 STRUCTURE

The DGC operational structure is illustrated in Figure 1. It will be structured as a single-tranche facility with guarantees provided by a regional development bank. It will be managed by a fund manager or a DFI with some regional presence. Origination would be carried out by one or more local banks that would act as agents and be responsible for interfacing with cooperatives, reviewing documentation, establishing eligibility and disbursing funds.

The mechanics of the instrument are as follows:

1. The Sponsor advances bridge capital (20%) for the early development of the project
2. The DGC funds the remaining capital needed as an advancement of cooperatives' payments (minus the concessional capital provided)
3. The DG project provides energy savings in return for monthly payments by the cooperatives based on the performance of DG system
4. The DGC is paid by the fixed portion of contracts and the Sponsor is paid by the variable portion (two-part performance structure)
5. Concessional capital (20% of the total capital in the form of debt) and guarantee of payments are provided by a multilateral development organization

Figure 1. Operational Structure of DGC



### 2.3 PROJECT ELIGIBILITY

Small-scale renewable energy projects that generate electricity from solar PV or wind sources will be eligible for refinancing through DGC provided they meet the following criteria:

- Up to 5 MW of installed capacity – to ensure compliance with Brazilian regulations for distributed generation
- Exclusive beneficiary of the DG project must be a cooperative (agricultural, transport, credit etc) that is connected to the grid through the captive market
- The cooperative must have a commitment to a given level of energy consumption for the duration of the project
- Positive technical appraisal from a contracted engineer
- The project is in compliance with local environmental laws and regulations, and the ESG (environmental, social, and governance) criteria of DGC.

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## 2.4 COMPARISON TO CURRENT TERMS OF FINANCING

The instrument does not aim to provide capital at lower interest rates, but rather to do it at tenures that are proportionate to the lifetime of DG systems, while removing the need for local content and guarantees (by avoiding credit lines from Brazilian development banks) and reducing bureaucracy/ transaction costs. These attributes lead to payments that fit within the energy savings provided by the system, making the contracts affordable almost regardless of the financial situation of the cooperative. Table 1 below shows a summarized comparison between the current state of small-scale DG financing in Brazil and the terms offered by the DGC.

Table 1. Comparison of DGC terms with the current state of small scale DG financing in Brazil

	DGC	Current financing terms
Interest Rate	20%	20%
Term	15	5
Payment (% of savings)	80%	120%
Guarantees	Regional development bank as guarantor	Bank guarantee
% Project Financed	100%	50%
System performance risk	Developer	Cooperative

## 2.5 INVESTORS TARGETED AND STRATEGY TO PHASE OUT PUBLIC CAPITAL

The instrument has the potential of being funded by three types of investors:

- **Commercial investors** that target market-level risk-returns such as insurance companies, pension funds, family offices, high net worth individuals, and endowments
- **Concessional capital providers** that may be more flexible in their return, guarantee and/or term requirements such as development finance institutions, seed/angel investors, philanthropic donors, impact investment funds, and multilateral organizations
- **The Sponsor** itself will provide early development capital, taking part of the construction and legal risk.

As the instrument scales-up and is able to provide market-level returns with reasonable risk, most public support can be phased out. However, it is likely that some level of public support in the form of guarantees is still needed as cooperatives are generally not able to show the same credit worthiness of large private businesses.

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### 3. INNOVATION AND FINANCIAL SUSTAINABILITY

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*DGC is the first instrument structured as a fund to address the financing needs of DG systems in Brazil, thus providing the flexibility and tenure lacking in financing options for most DG projects*

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#### 3.1 BARRIERS ADDRESSED

The DGC addresses the three main financing barriers described in the Context section of this report in the following ways:

- **Existing credit lines are scarce and fund, on average, less than half of each project:** the DGC will be a new financing alternative for DG systems in cooperatives and aims to fund 100% of each project
- **Subsidized development bank lines have tight local content and guarantee requirements:** no local content or collateral guarantees will be required of the cooperatives. Credit risk will be mitigated by financial guarantees offered by concessional capital providers
- **Regulation forbids the sale of energy to the grid, allowing only a compensation of energy bills:** a two-part performance structure, as describes in the Instrument Mechanics section above, will enable a performance-based structure without overstepping Brazil's regulations

#### 3.2 DGC IS WELL-ALIGNED WITH BRAZILIAN REGULATIONS AND THE INVESTMENT PROFILE OF DG PROJECTS

The DGC borrows from mainstream practices like project finance, invoice discounting, and leasing. However, an examination of comparable instruments did not identify other examples of instruments that combine these concepts and apply them in a similar fashion to overcome the barriers and risks that are unique to small-scale renewable energy projects in Brazil. Comparable instruments reviewed include subsidized loans provided by development banks, commercial loans and tailored-made financing facilities, mainly for solar installations, as shown in Table 2.

Table 2. Comparable instruments and their limitations

Instrument	Description	Limitations in Brazil
<b>BNDES, FNE Proinfra, BASA, CEF, PRONAF, BB Rural DG</b>	Government sponsored funds with subsidized interest rates for investments in green energy	'Local content' restriction (solar) and bureaucracy favor larger projects
<b>Santander Sustentabilidade, BB Proger Urbano</b>	Commercial lines offered at market interest rates	Loan period, rates and cap incompatible with mid-size projects
<b>Rooftop Solar, Private Sector, Financing Facility</b>	Credit lines for small-scale solar generation in India. PPAs and service agreements	PPAs not possible for DG in Brazil due to regulatory restrictions
<b>Solar City</b>	Successful in overcoming high up-front costs by owning power generation assets and selling energy directly to consumers	Sale of energy in any form outside of the regulated market is forbidden in Brazil



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### 3.3 CHALLENGES TO INSTRUMENT SUCCESS

The most relevant challenges to the DGC's success are as follow:

- **Eligibility of cooperatives may be limited by types of connection:** In order to qualify for the DGC, a cooperative must be, firstly, connected to the grid through the 'captive market'. This means that it cannot have a 'free market' connection, where it has no steady contractual relationship with energy suppliers. Secondly, it must have the bulk of its energy sourced through one of the costlier tariff types (typically B3 and A4). Cooperatives with industrial operations, for example, are strong energy consumers but are also more likely to be in the 'free market'. To overcome this barrier, the DGC can expand its presence to other states in Brazil and different types of cooperatives.
- **Reluctance of cooperatives to adopt projects linked to novelty tech:** There is a general lack of familiarity of the Brazilian cooperatives with distributed generation (especially wind energy). Many of them tend to think of energy as not within their focus of management. The DGC will overcome this by absorbing all of the management costs of the projects and having an on-the-ground relationship with the cooperatives.
- **Assets located in rural areas may be difficult to oversee:** Most of the assets will be located in rural areas, which makes the systems harder to maintain and oversee. As a first measure to mitigate this problem, the systems will be equipped with remote shutdown devices, which can be triggered in the case of defaults. Secondly, as far as the pilot goes, the Sponsor (Renobrax) has a strong foothold on the Rio Grande do Sul countryside. When the instrument reaches the point of being scaled-up to other regions of Brazil, this factor must be accounted for by the operational partner.
- **Cooperatives must commit to a given level of energy consumption for the duration of the lease contract (~15 years):** The DG systems will be designed to match the consumption levels of the cooperatives. If the cooperatives decide to scale-down their operations (e.g. work fewer shifts, sell fewer units etc) this energy consumption will likely fall and the DG systems will be left generating an excessive amount of energy. As per Brazilian regulation, this excess is credited to the cooperative and can be used in up to five years. So in the case of a permanent scale-down, this credit will likely be lost once the five years have passed, leaving the cooperative with an over-dimensioned (and over-priced) system. This issue can be addressed first by making the duration of the lease contract very clear to the cooperatives before they take any commitments to the projects. In a worst-case scenario, if a cooperative does scale-down its energy consumption or fails to meet payment, the energy generated will still be a liquid asset owned by the DGC. Moreover, the guarantee structure will keep DGC investors from losses even in the case of defaults.

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## PILOT AND BEYOND

### 4. IMPLEMENTATION PATHWAY AND REPLICATION

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*The pilot will be a 23 MW project in the state of Rio Grande do Sul, mobilizing BRL 200 million and involving the implementation of mostly wind generation systems in nine cooperatives.*

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#### 4.1 MAIN CHARACTERISTICS OF THE PILOT AND DEVELOPMENT TIMELINE

The pilot will be a 23 MW project in the state of Rio Grande do Sul mobilizing ~BRL 150 million and involving the implementation of mostly wind generation systems in nine cooperatives. This state was chosen for its familiarity with the Sponsor, Renobrax, whom is headquartered there, and a higher level of organization and professionalization of cooperatives. Most projects will be wind power projects, because the southern region of Brazil, where Rio Grande do Sul is located, has a more favorable wind potential than solar irradiance. The cooperatives that will host the projects are located within the Rio Grande Energia (RGE), Companhia Estadual de Energia Elétrica (CEEE), Hidroelétrica Panambi (Hidropan), and Rio Grande Energia - Sul (RGE-Sul) concessional areas. The timeline and key milestones to make the pilot actionable are presented in Table 3 below.

*Table 3. Timeline of development and implementation of the pilot*

	Q3 2017	Q4 2017	Q1 2018	Q2 2018
Secure projects pipeline, preferably with MoUs	■			
Negotiate with fund suppliers such as custody and management	■			
Determine optimal capital structure for pilot		■		
Secure funds with capital providers		■		
Finalize terms and conditions			■	
Terms and conditions signed and first project implemented				■

#### 4.2 MAIN CHALLENGES ASSOCIATED WITH THE IMPLEMENTATION OF THE PILOT

The main challenges associated with the implementation of the pilot are as follows:

- **Lack of access to cooperatives, which are needed for modeling and implementation of pipeline:** Cooperatives can be a closed circle with reluctance towards projects brought forth by outsiders. This is being countered with an indirect approach through two main players: Fecoagro/RS, the federation of cooperatives of Rio Grande do Sul and BRDE, the regional development bank of the south of Brazil. These entities are working as channels to the cooperatives, providing credibility to the DGC.

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- **Financial services suppliers might not be willing to accommodate the two-part performance structure:** The innovative aspect of this contract might become a barrier with service providers, most of which have deeply rooted processes. The Sponsor (Renobrax) is already in talks with a bank with strong presence in Brazil in order to avoid late surprises and make sure that it has the processes required.
  - **Investors might not agree with the proposed capital structure or terms:** So far, there are no investment funds available in Brazil that target small-scale DG projects. This means that investors might be hesitant to take part in the DGC. However, some of the potential investors of the DGC have already been identified and are aware of the general terms that have been developed so far.
  - **Projects might suffer bureaucratic or construction delays:** It is very common for DG projects in Brazil to be delayed for bureaucratic or construction reasons, since the regulatory and operational environment for DG is still underdeveloped. The fact that the Sponsor (Renobrax) has been involved with several renewable energy projects mitigates this risk, but the current model is also considering one year of implementation before any positive cash flows.

### 4.3 ENTITIES INVOLVED IN THE IMPLEMENTATION OF THE PILOT

The pilot will be developed and funded by Renobrax (who is also the instrument proponent for the Lab). Renobrax is a renewable energy company founded in 2006 with experience in the development, financial structuring, implementation and management of generation systems. Its current portfolio includes approximately 10 GW of wind and solar energy projects in various levels of maturity.

Commercial investors of the DGC will include Brazilian-based multi-family offices and private equity asset managers. The structuring of the fund as well as the terms and conditions of the project will be provided by a local bank with strong regional presence in the south of Brazil.

Public capital will be required for approximately 20% of the DGC's capital (including its pilot phase) and will be provided by a regional development bank. It will be phased out in two to three years as the DGC increases its scale and is able to dilute fixed costs as the proposed model is proven successful. Public capital should be replaced primarily by commercial capital, as the DGC aims for market-like risk-returns.

### 4.4 POTENTIAL FOR REPLICATION

The DGC has the potential of expanding to regions in Brazil with a high number of cooperatives, high solar irradiance levels and/or high potential for wind energy. Table 4 below summarizes these attributes for each region in Brazil. The Northeast shows the highest potential for both solar and wind energy and a high number of cooperatives, which makes it the best candidate for expansion. However, the Southeast, although showing scarcer natural resources, has the higher number of cooperatives and, perhaps more importantly, a higher level of organization and professionalization in the cooperative system.

Table 4: Selection criteria for the replication of the DGC

Region	Number of Cooperatives	Irradiance (kWh/m <sup>2</sup> )	Wind Potential (TWh/year)
Northeast	1.738	5,9	144,3
Center-East	660	5,7	5,4
Southeast	2.349	5,6	54,9
North	789	5,5	26,4
South	1.050	5,2	41,1
<b>Total/Avg in Brazil</b>	<b>6.586</b>	<b>5,6</b>	<b>54,4</b>

Source: Panorama do Cooperativismo Brasileiro, Atlas Brasileiro de Energia Solar and Atlas do Potencial Eólico Brasileiro

When mature, the instrument aims to provide private investors with a 10% real return rate, equivalent to ~150% of Brazil's baseline interest rate, with receivables backed by low-risk multilateral organizations.

The main barrier for the expansion of the DGC is the lack of familiarity of cooperatives with distributed generation. We estimate that only 15% of the 3500 cooperatives in agriculture, infrastructure and transport have the adequate level of institutionalization to accommodate this type of transaction. Considering that each cooperative demands 2.1 MW in energy on average, the instrument would have the potential to deploy 1.1 GW in energy projects, mobilizing BRL 5.5 billion in financial resources and compensating for 23 million tons of CO<sub>2</sub> emissions within its lifetime.

## 5. IMPACT

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*The pilot project will mobilize BRL 200 million in investments, reducing carbon emissions by 490 thousand ton CO<sub>2</sub> emissions and providing cost savings of nearly BRL 85 million to cooperatives.*

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### 5.1 QUANTITATIVE MODELLING

The quantitative modelling of the instrument consists of individual sheets for each project/cooperative under the proposed pilot discussed in Section 4, with an aggregate sheet for the instrument itself. The model for each project is designed with the current energy consumption and the energy bill of the cooperative as a starting point. The figures for power generation are then added, with attention to the amount of energy allocated to each type of tariff. The amount of energy consumed and the amount of energy generated run through a compensation mechanism, as described by the Brazilian regulation (RN 482). Energy produced in excess is credited to the cooperative and can be used within five years.

The model produces a 'compensated energy bill,' which is the basis for the assessment of the monthly savings provided by the DG system. These savings are then compared to a 15-year lease contract at a ~20% fixed interest rate per year. If these figures provide a 10-20% benefit to cooperatives, the contract is approved, meaning that the project is able to provide adequate returns for the DGC, as well as savings for the cooperative at the same time.

The DGC is structured as a direct cash-flow model, starting with the required investments categorized both by type and investor. A monthly cash flow model is then applied, accounting for investments, payments, O&M expenses, administrative and management costs, guarantee fee and the financial interest on the cash retained. The DGC should be structured as one of the three securitization tools available in Brazil: a FDIC (*Fundo de Direitos Creditórios*), a CRI (*Certificado de Recebíveis Imobiliários*) or a CRA (*Certificado de Recebíveis do Agronegócio*) in order to maximize flexibility and minimize risks and tax payments.

Table 5: Fundamental inputs and results of the quantitative modelling of the pilot

	DGC Pilot
Type of Tariff	A4 Green/ B3
Consumption	7,560 MWh/month
% of Energy Consumed on Peak	7%
Current Active Demand	21 MW
Type of DG System	Wind
DG System Size	23 MW
Energy Savings to Cooperatives	10-20% of energy bill
IRR to DGC Equity Shareholders	12% + inflation
Capital Commitment – Commercial Investors	BRL 80 million
Capital Commitment – Sponsor	BRL 32 million
Capital Commitment – Concessional	BRL 32 million

## 5.2 ENVIRONMENTAL AND SOCIAL IMPACT

- **Environmental impact:** Considering that the pilot instrument will enable 23 MW in energy capacity, and a factor of ~21 tons of CO<sub>2</sub> emissions for the lifetime of each kW enabled, it has the potential of compensating for ~490 thousand tons of CO<sub>2</sub> emissions.
- **Social impact:** The instrument will have a direct impact on the cost structure of cooperatives. Considering a 23 MW pilot, the instrument will save cooperatives a total of BRL 85 million along the 15-year contract, which should be deployed in improving their infrastructure and increasing their business and social reach.

## 6. KEY TAKEAWAYS

Small, distributed generation renewable energy projects are ideally suited to market conditions in developing countries and provide an entry point for project sponsors and local financial institutions to develop technical capacity with less risk. However, financing is often not well matched to the needs of small projects. The DGC aims to catalyze investment in small-scale renewable energy by systemically improving financing conditions through a pay-per-use contract and a two-part performance structure. The DGC meets the Lab criteria for endorsement in the following ways:

**Innovative:** The DGC combines a pay-per-use contract and a two-part performance structure under a single financial instrument. The results are contracts with terms that match the investment profile of DG systems. This will allow cooperatives to reap the environmental and financial benefits of DG generation, without incurring any upfront costs or generation risks. Other

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instruments that would be able to provide such benefits (such as distributed energy sale contracts) do not fit within Brazilian DG regulations.

**Catalytic:** The DGC can change the dynamics of financing and investment of DG systems in target markets at a cost that is comparatively low for donors and has significant scale up potential. A pilot of the DGC will require BRL 32 million in concessional capital, BRL 32 million from the Sponsor and a BRL 80 million in DFI/commercial investor contributions at standards terms. This BRL 150 million facility has the potential to deploy 23 MW of clean energy, providing cooperatives with almost BRL 83 million in cost savings and avoiding the emission of 490 thousand tons of CO<sub>2</sub> emissions along its lifetime.

**Financially sustainable:** The DGC will be structured as one of the established financial instrument categories mentioned above (FDIC, CRI or CRA), providing familiarity to Brazilian investors. Cooperative receivables will be guaranteed by a regional development bank, virtually eliminating default risks. Commercial investors are expected to realize a 12% real yearly gain, which is close to 1.8x the Brazilian basic interest rate. Public finance will be phased out once commercial investors are comfortable with the risk-return balance provided by the DGC, which should happen in 2-3 years.

**Actionable:** The DGC is based on well-proven concepts used in other fields. The instrument could be launched in a four-month time frame if funds are raised in a timely manner. Project development will be handled by Renobrax (the instrument proponent), guarantees will be provided by a regional development bank and promising fund managers and implementation partners have been identified.

#### Next steps:

- **October, 2017** – Secure projects pipeline, preferably with MoUs
- **October, 2017** – Negotiate with suppliers such as custody providers and asset managers
- **January, 2018** – Determine optimal capital structure for pilot
- **January, 2018** – Secure funds with capital providers
- **April, 2018** – Finalize terms and conditions
- **April, 2018** – Terms and conditions signed and first project implemented

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