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Public Policy Recommendations to Encourage the Development of a Distributed Solar Generation Market in Sao Paulo.

Prepared for:

CLEAN ENERGY SOLUTIONS CENTER

cioeste
consórcio intermunicipal da região oeste metropolitana de são paulo.

December 2018

Agenda

1. About ImplementaSur.
2. Introduction.
3. Market context of PV DG at CIOESTE.
4. Competitiveness of PV DG and financial challenges.
5. Case studies.
6. Recommendations and roadmap.

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Turning climate change into a value creation opportunity

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WHO ARE WE?

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OUR MISSION

Accelerate climate change mitigation and adaptation actions in Latin-America, through policy guidance, innovative business models and financial mechanisms

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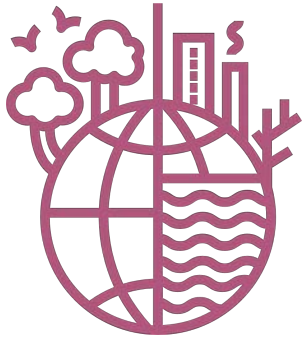

WHAT IS GOING ON ?

PHYSICAL RISKS

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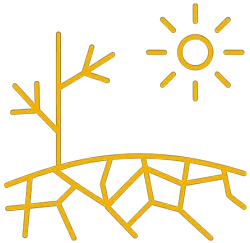

ACUTE EFFECTS

CHRONIC EFFECTS

TRANSITION RISKS

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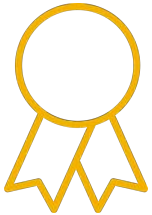
REGULATION

COMPETITION



REPUTATION

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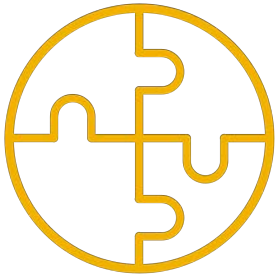

OUR APPROACH

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Risks

We measure the climate-related risks that influence investments and projects.

Opportunity

We formulate business models and deliver policy guidance, to accelerate climate change adaptation and mitigation

Finance

We enable the mobilization of financial resources to promote sustainable investment

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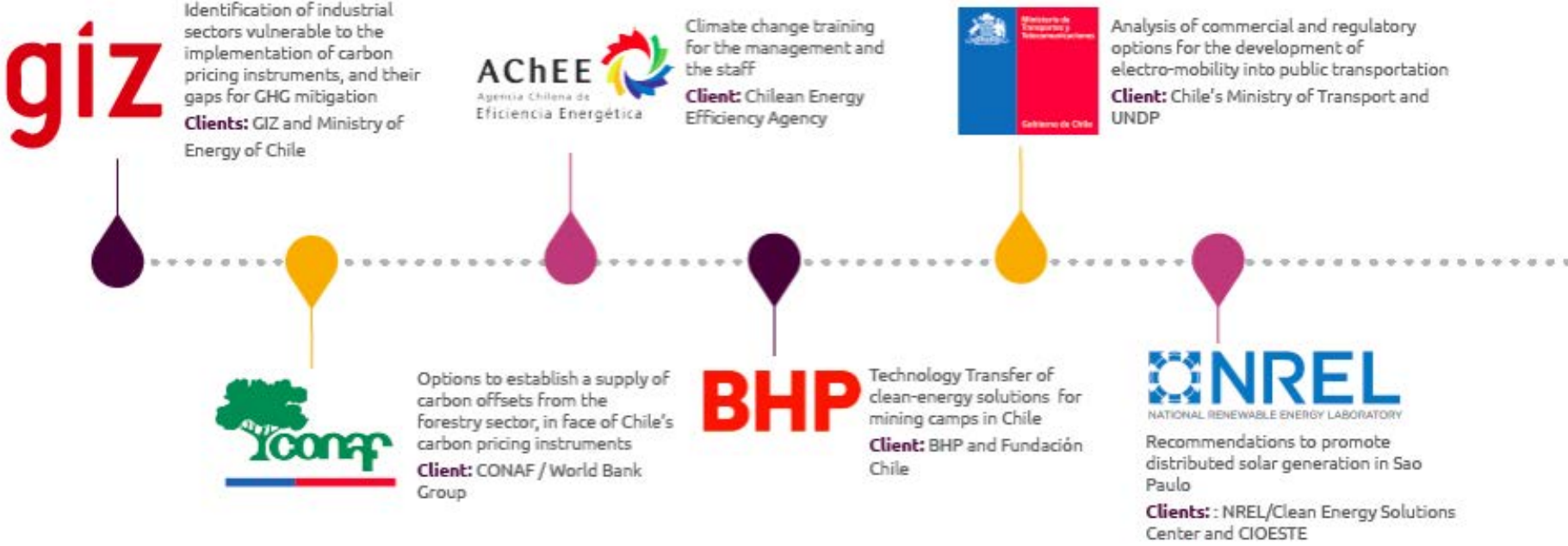
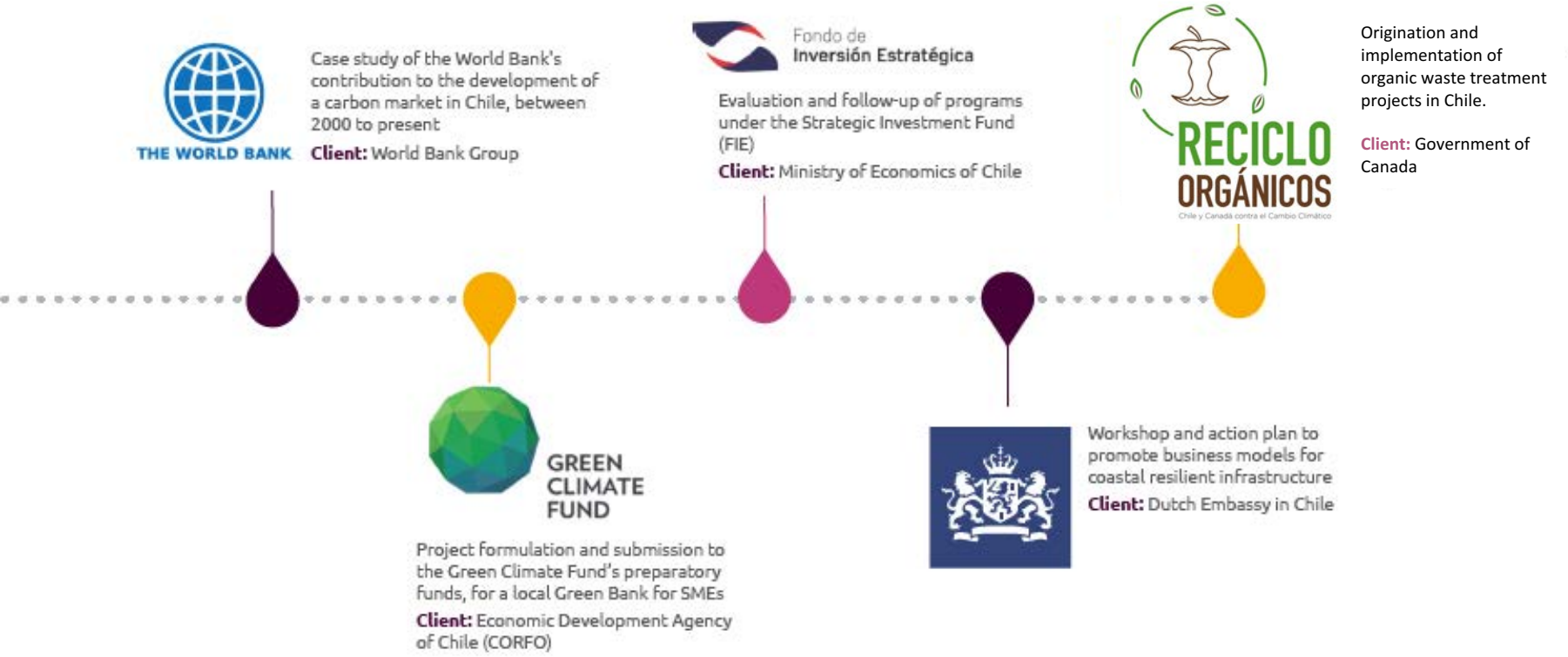
OUR EXPERIENCE

OUR EXPERIENCE



OUR EXPERIENCE



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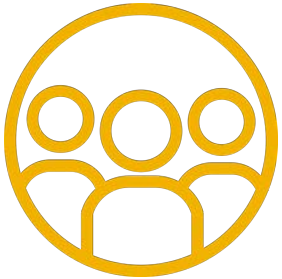


OUR TEAM

Turning climate change into a value creation opportunity

2. Introduction

Objective

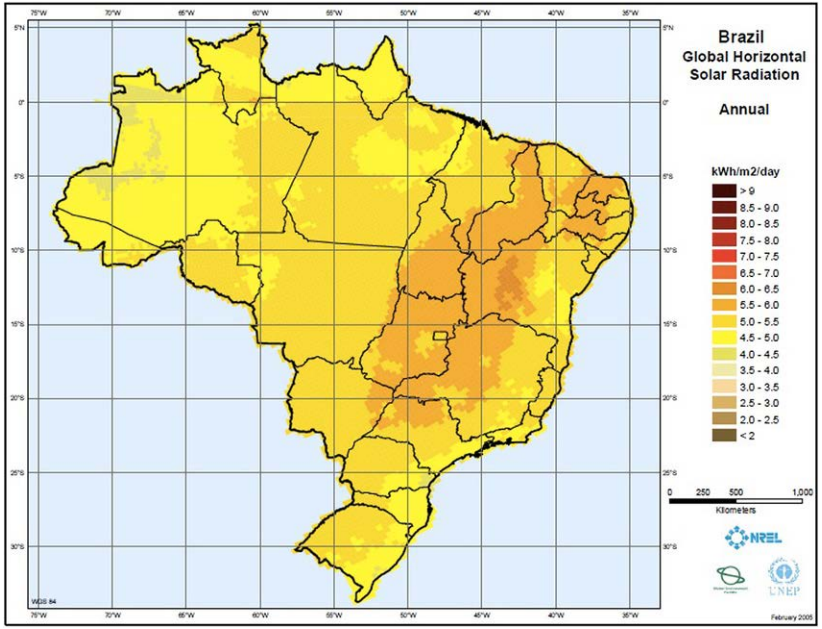
Public Policy Recommendations to Encourage the Development of a Distributed Solar Generation Market for Sao Paulo, with an emphasis on the commercial and industrial segment (C&I).

Scope of the work

Diagnostic (for the CIOESTE context).	Lessons from recent international programs.	Recommendations and policy roadmap
• Competitiveness of distributed solar-PV (focus on C&I). • Identify current financial and market gaps with respect to Federal and State-level programs and policies, with focus on C&I (Outcomes from the ProGD - Brazil's support scheme for DG). • State of the local solar workforce (focus on standards & certifications from installers).	• Choose 4 international cases (mainly on the C&I segment), to analyze their balance between market mechanisms, financial incentives and business models (including options for municipalities to aggregate demand). • Assess the applicability of these cases to the CIOESTE context.	• Policy instruments and market mechanisms to boost the replicability of sustainable business models into market niches (with focus on C&I). • Institutional framework to implement policy roadmap (e.g. contracting capacity from municipalities). • **Webinar with results to CIOESTE's technical secretariat.**

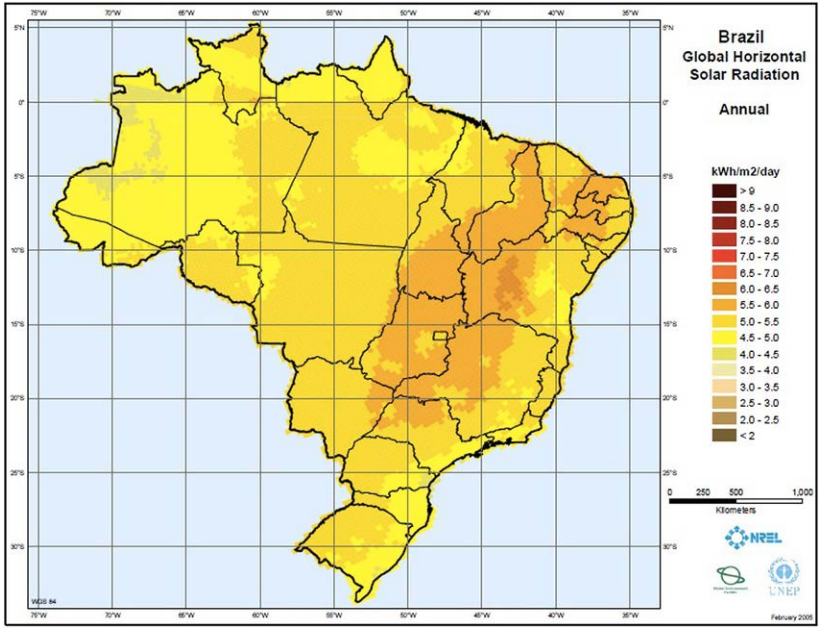
Evolution of the solar distributed generation market (PV DG).

- Brazil has an excellent solar horizontal irradiation (1,550 and 2,350 kWh/m2/year), which has a good fit with the country's load profile.
- Until recently PV DG in Brazil was limited only to applications that aimed to attend remote consumptions: PRODEEM and later the program LUZ PARA TODOS.



Evolution of the solar distributed generation market (PV DG).

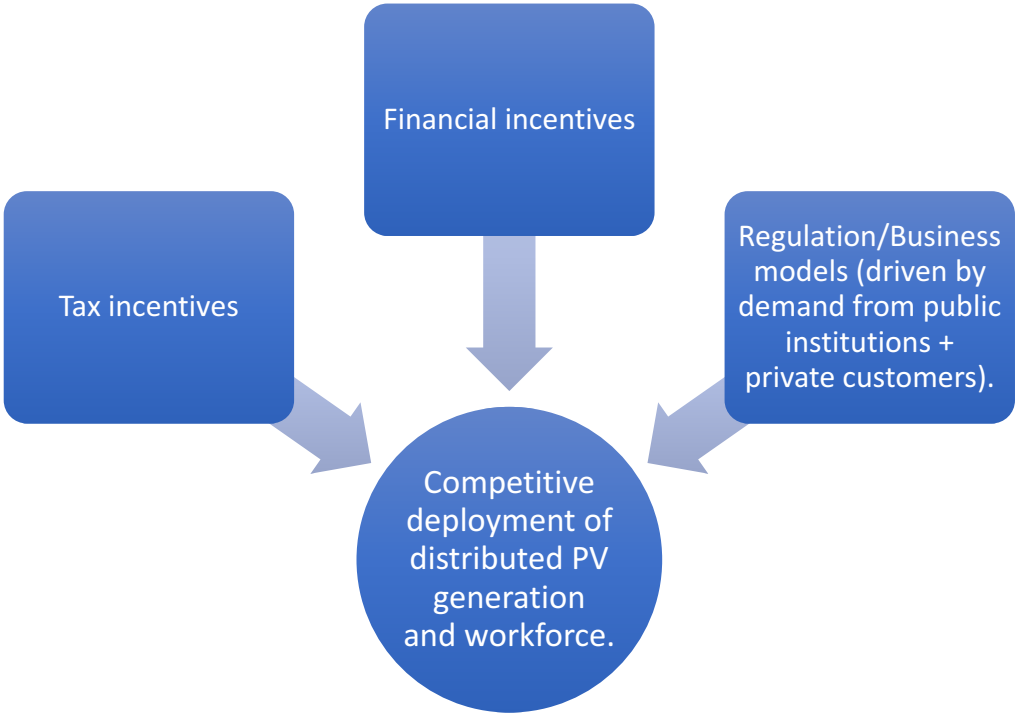
- PV DG started its growth on 2012 with Resolution 482 from ANEEL, and its review Resolution 687 from 2015. Both set the basic framework for net metering in the country
- Rapid deployment due to the fall in technology prices, but also driven by the need to reduce GHG emissions:
  - In 2014 EPE projected a total capacity of 1,319 MW by 2024, while in 2016 it had to re-adjust its projection closer to 2,500 MW for 2024.



Types of PV DG

- Micro-generation < = 75 kW connected to low-voltage (220V).
- Mini-generation > 75 kW y < = 5 MW connected to mid-voltage (13,8 kV).

Key elements for a successful deployment of distributed solar generation.

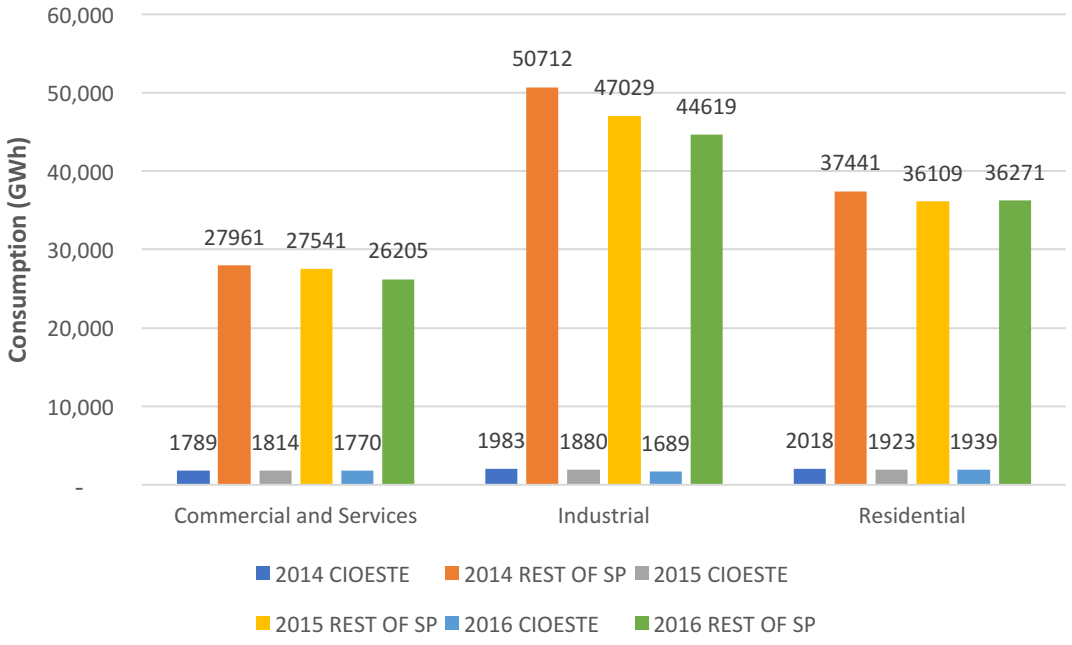


Demand-side factors, such as the population, income (represented by the GDP) and the electricity tariffs, prevail as determinants of the PV DG update (more than solar radiation).

3. Market context of PV DG at CIOESTE**.**

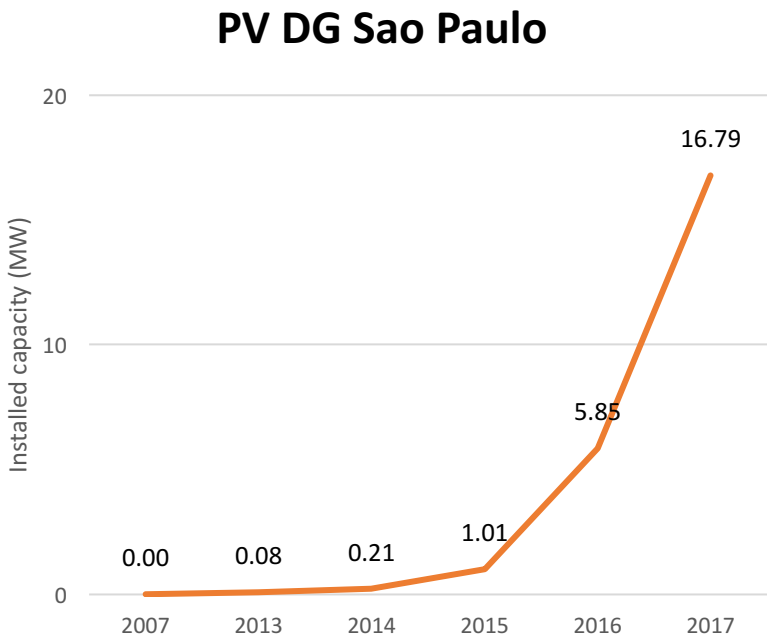
Perspective of the demand-side

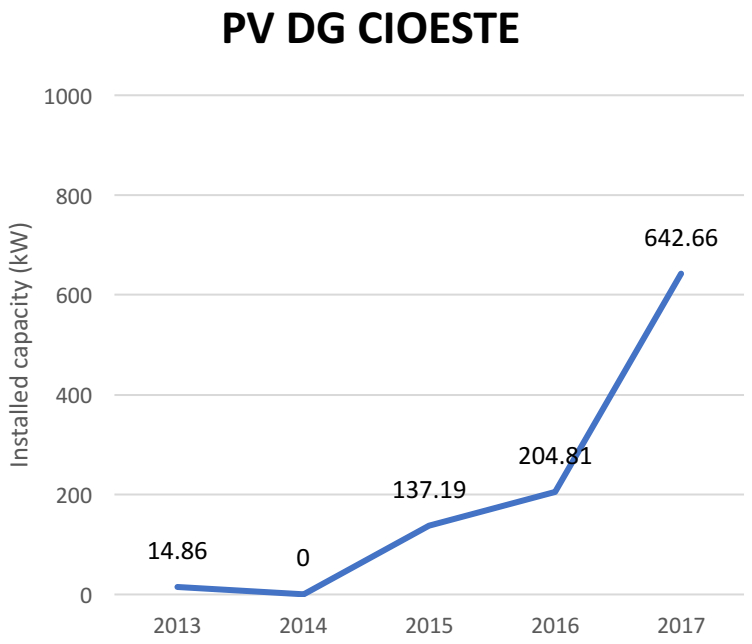
- Fall in C&I consumption between 2014-2016.
- CIOESTE's C&I demand represents only 4.7% of Sao Paulo's demand.



Source: Aneel

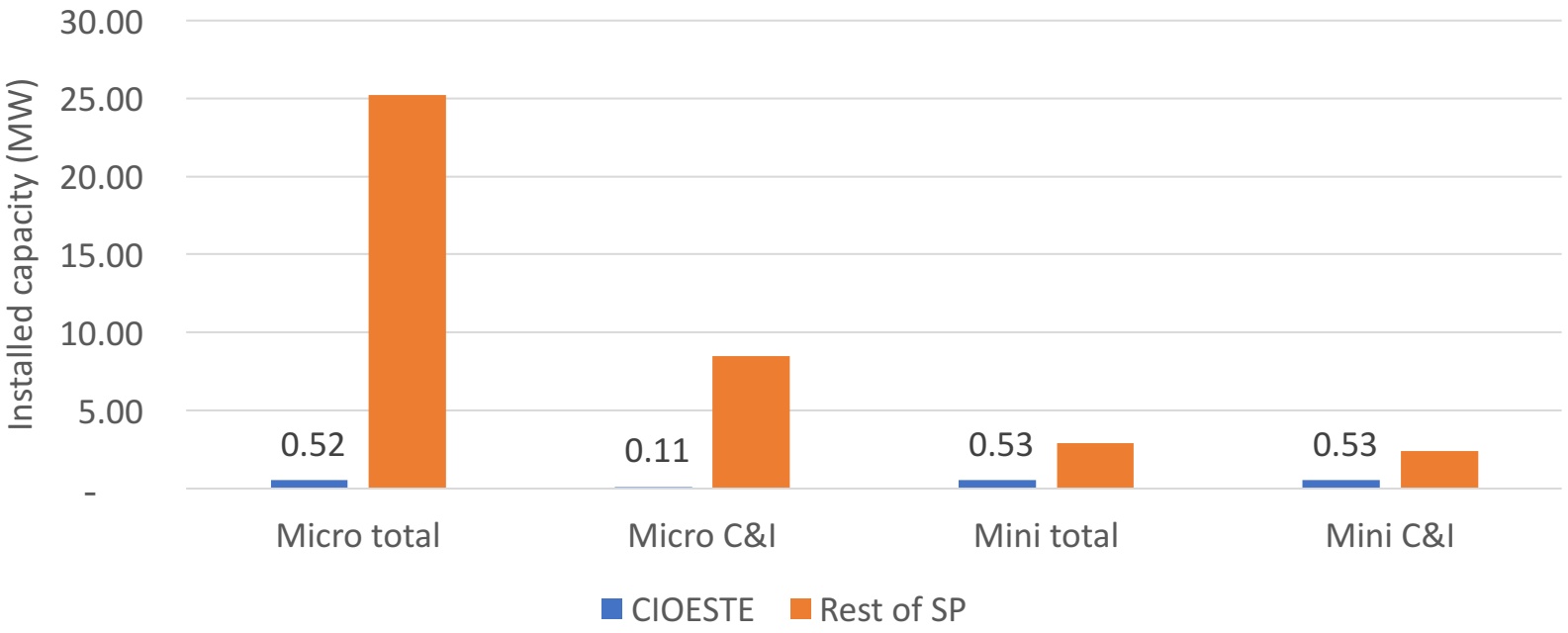
Annual growth rate for CIOESTE was 5 times lower than Sao Paulo's between 2015-2017.





Source: Aneel

CIOESTE has a large space for growth in micro-generation PV DG.



Incentives to promote the competitiveness of PV DG on C&I customers.

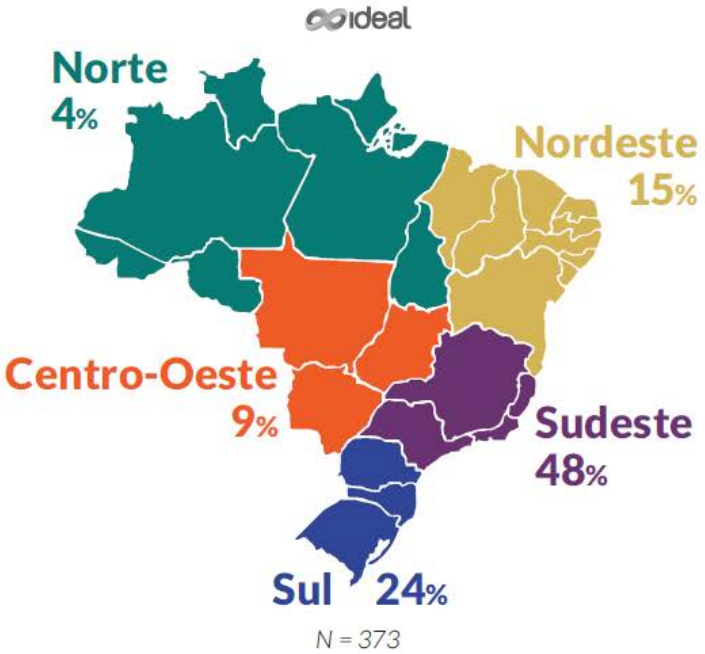
- Programa de Desenvolvimento da Geração Distribuída de Energia Elétrica (ProGD): General framework of support.
- Tax incentives:
  - Convênio ICMS 6/2013 y 16/2015 (17 – 18%).
  - Discount of PIS/COFINS.
  - Discount of IPI.
- Law PLS 252/2014 for sustainable building (including PV DG).
- Financial incentives from: BNDES, Caixa, Agência de Desenvolvimento Paulista – Desenvolve SP, Empresa Brasileira de Inovação e Pesquisa.

Framework for net-metering (Resolution 687/2015)

- Changes made to improve the attractiveness of PV DG, beyond self-supply.
- Option to use surplus energy for up to 60 months.
- Threshold of up to 5,000 KW, allowing significant economies of scale in OPEX.
- New mechanisms:
  - Consumers to use the credits from their generated energy to pay the electricity bills of other properties that they own.
  - The energy generated among all consumer units is distributed between the owners (multiple consumer units).
- CCEE, is studying alternatives to sell all the energy injected in the grid (net after consumption) into the wholesale market.

Status of the market of suppliers

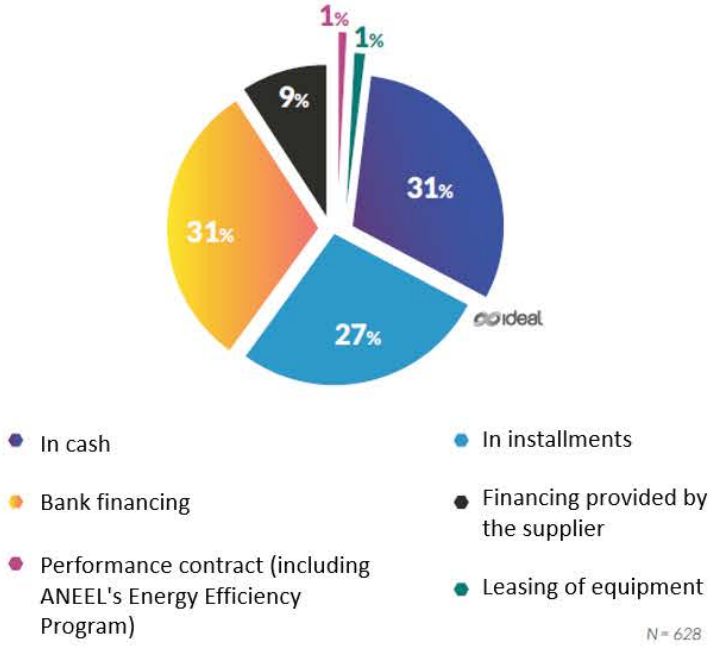
Concentration of suppliers in the Southeast of Brazil.



Location of PV DG companies, by region (Fuente: Instituto IDEAL 2017).

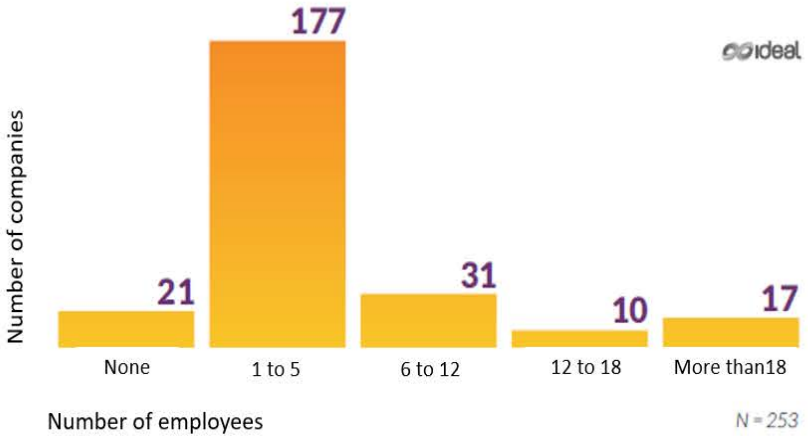
Status of the market of suppliers

Marketing options dominated by turnkey contracts. Few based on PPA, leasing or ESCO model.



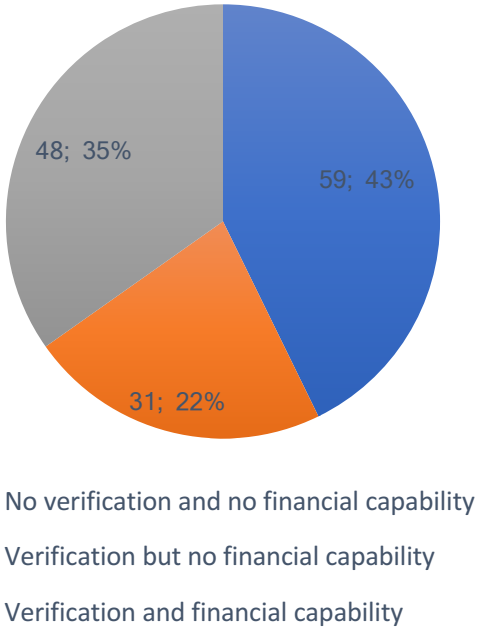
Status of the market of suppliers

Teams of small suppliers, with few projects and lack of sufficient working capital (SMEs).



Status of the market of installers/suppliers

- Financial barriers that prevent bringing business models less intensive in capital (based on leasing or ESCO).
- A large part of the suppliers still do not have enough projects according to their experience (43% – 59 suppliers).

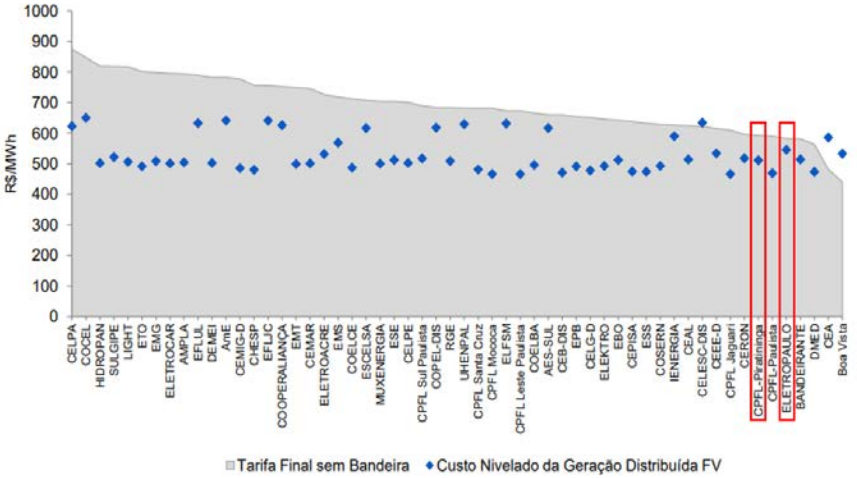


Source: based on data from Portal Solar for Sao Paulo

4. Competitiveness of PV DG and financial challenges.

Parity with the grid for 53 distribution companies (96% of the low voltage market).

- Effect of incentives and increase in rates (associated with the drought and expansion of the system).
- Factors that restrict the development:
  - Law No. 12.783 of 2013 forced distribution companies to reduce tariffs by 18%.
  - Some C&I customers may be tempted to migrate from a regulated tariff structure to the wholesale market (or "Mercado Livre").
- EPE states that only consumers with high purchasing power and an average consumption of 400 to 1,000 kWh/month, will have the financial conditions to become early adopters of PV DG.



Fuente: *Syrkis, 2017*.

Financial challenges

- High transactional costs (e.g. high due diligence costs)
- Limited acceptability of the collaterals and guarantees that MSMEs can provide
- The average financial institution has little specialized knowledge and will hardly consider the expected revenues as a valid collateral
- Cutting down 20% of financing cost could have a positive impact on increasing the number of PV projects by 6% to 10%

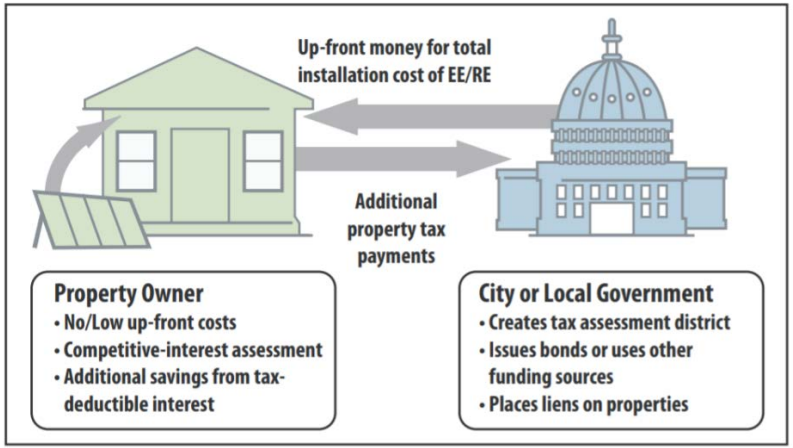
Role of investment aggregators

- Can translate the initial capital into a tariff or lease and aggregate atomized assets:
  - The final customer pays a monthly fee to the company.
  - It allows significant economies of scale in investment and financial costs.
- Nevertheless, the market for aggregated clean energy investments is still incipient:
  - Developers have to go through a capital and resource intensive origination process.
  - Aggregate standardized assets to fulfill the minimum requirements from financial institutions.
  - Some of these developers are MSMEs that bear with the difficulties to access finance.

5. Case studies.

Financial program: **PACE (Property Assessed Clean Energy)**.

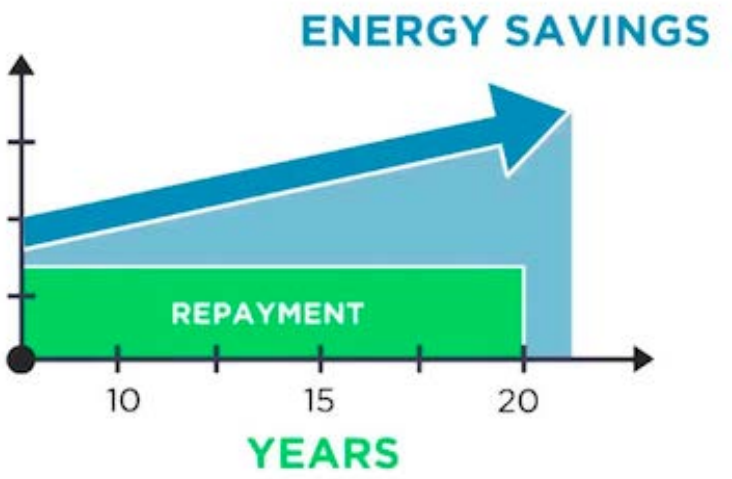
- Long-term loan applicable to all different types of energy efficiency and renewable energy facilities, and to different types of beneficiaries.



Financial program: **PACE (Property Assessed Clean Energy)**.

- The energy savings can represent an amount greater than the amortization, which is transferred through a surcharge on real estate taxes.

- Alternatively it can operate through a mortgage loan.



Benefits from **PACE**.

Covered 33 States – 80% of the total population of the United States.

	Residential installations	Commercial installations
Total investment (MM US$)	5,128	588
Number of installations	216,000	1445
Jobs created	40,300	8,826

Source: PACE Nation

- It allows the bank to use the asset (embedded in the property) as a valid collateral for the loan, just like with a standard mortgage loan.
- It generally does not require a credit check, just the ownership of the property.
- It can leverage the existing collection system associated with property taxes.
- Increases the value of the real estate properties.

Case studies

Sonoma County Energy Independence Program (2009)

- Issuance of result-based green bonds, which can be purchased by Sonoma County's Treasury and Water Agency, and private actors.
- Marketplace to access contractors, incentives and financing options.
- 11.3 MW of installed capacity equivalent to US $ 53,732,943 and more than 1,480 jobs created.

Boulder County ClimateSmart Loan Program (2009)

- First PACE program (addressing energy efficiency and renewable energy needs) and the first to financed through the public auction of bonds.
- Loans with a range between US$ 3,000 and the minimum value between US$ 50,000 and the 20% of the property value.
- Interest rates in the range of 6.75% - 8.75%.
- US $ 9 MM of investments (229 projects), from which US $ 3.6 MM are PV projects, equivalent to 520 jobs-year

Case studies

Connecticut's Commercial Property Assessed Clean Energy (C-PACE)

- Cooperation with the Conneticut Green Bank to issue green bonds.
- C-PACE focused on non-residential real estate assets.
- As of early 2018, C-PACE had reached 200 projects, with more than US $ 114 million invested, 25 MW of installed capacity and more than 1,300 jobs-year, representing approximately US $ 204.5 million in savings.

India's Solar Municipal Bonds (SMB) Model

- Target of 40 GW of solar rooftop projects by 2022.
- Municipalities operate as aggregators of PV DG (or RESCO), and as issuers of green bonds in the capital markets.
- Municipalities can leverage their proximity to clients, their healthier credit profiles, stronger balance-sheets and better access to public guarantees, to facilitate the access to finance.
- Municipal bonds are backed-up by the assets, and can be issued through the SPVs of the municipalities.
- The SMB model could reduce the cost of PV DG by 12%.

6. Recommendations and policy roadmap.

Suggested CANVAS model for PV DG

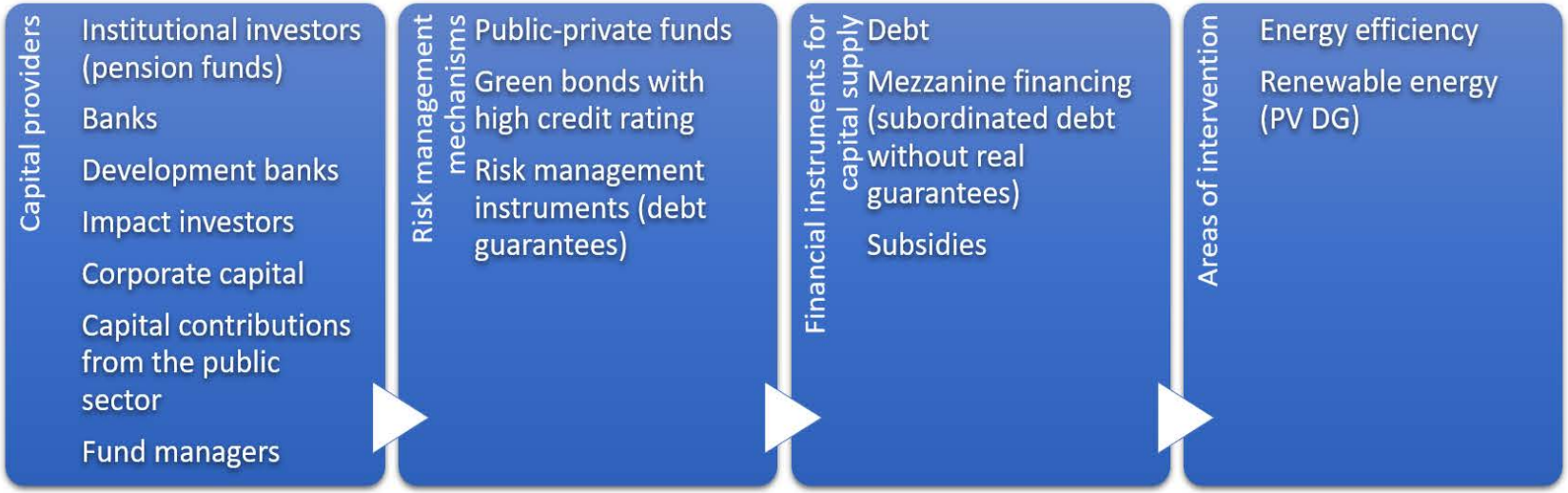
Market segment:	C&I customers with high daily load for electricity consumption and creditworthiness.
Value proposition	Generation of savings, protection to the environment, increase in the value of the property.
Demand parameters	Income level, credit rating, electricity consumption profiles, GHG mitigation potential and internal price on carbon (companies with exports to European markets).
Distribution channels	Municipalities, organizations that allow aggregation of demand in order to take advantage of economies of scale, match-making platforms.
Revenue structure	Feasibility studies, payment for assets, payment for services (ESCO model).
Cost structure	Financial costs for initial capital, HR, dissemination, materials.
Key actors	Municipalities, C&I customers, Ministry of Mines and Energy (MME), banks, providers, electricity distributors, universities.

Steps to design a financial instrument

Source: "Financial Incentives to Enable Clean Energy Deployment" (NREL 2016).

1. Frame the design of the financial instrument
   - Establish the instrument's risk policy
   - Define the instrument's exit policy
2. Involve the private sector and the financial community, so as to identify sources of private leverage.
3. Establish the expected life of the instrument, until the business model is adopted by the market.
4. Establish the degree of political feasibility of the proposed instrument.
5. Identify the articulation, complementarity or concatenation of the proposed instrument with other existing instruments.
6. Consider resources for the marketing of the financial instrument, for the creation of a portfolio of projects and the building of capabilities.
7. Track the performance of the instrument and assess its impact

Deployment of clean energy investment through the development of financial instruments



Source: own elaboration, 2018, based on Sikken, Maltay, Sikken, Maltay, & Mahlerplein, 2015.

Roadmap for a PV DG program (1/2)

Political, legislative, institutional and financial coordination.

Technical standards of suppliers and facilities that ensure the quality and solvency of investments.

Confirm municipalities don’t have an obstacle to act as financial entities and promote the generation of energy.

Financial sustainability and flexibility of the governance structure to receive private and public resources.

Roadmap for a PV DG program (1/2)

Financing terms and conditions, including MRV system, and framework of environmental and social safeguards.

↓

Capitalization of the PV DG program: Strategy to attract donors and taxpayers (securitization?).

↓

Pipeline origination: Foster energy audits and the identification of initial capital requirements of installers and aggregators.

↓

Implementation of PV DG program: Technical evaluation of projects; financing; collection of payments.

Thanks!

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