Technical Cooperation Document

I. BASIC INFORMATION

Country/Region:	Brazil / CSC
TC Name:	Support for Diversification of São Paulo's Energy Matrix
TC Number:	BR-T1340
Team Leader/Members:	Arturo Alarcón (ENE/CBR), Team leader; Sylvia Larrea, Alternate Team Leader; Arnaldo Vieira de Carvalho; Misa Haratsu; Virginia Snyder; Juan Carlos Cardenas; Joel Hernandez; Marina Massini (INE/ENE); Cristina Celeste Marzo (LEG/SGO) under the supervision of Ariel Yépez (INE/ENE), Chief of the Energy Division.
Taxonomy:	Client support
Date of TC Abstract authorization:	July 2016
Beneficiary:	The State of São Paulo, by means of the Secretary of Energy and Mining
Executing Agency and contact name:	Inter-American Development Bank (IDB) through the Energy Division (INE/ENE)
Donors providing funding:	US$600,000 Japan Special Fund (JSF)
IDB Funding Requested:	US$0
Local counterpart funding, if any:	US$100,000 (in kind)
Disbursement period:	36 months includes execution period
Required start date:	January 2016
Types of consultants (firm or individual consultants):	Consulting firms and individual consultants
Prepared by Unit:	INE/ENE
Unit of Disbursement Responsibility:	CBR/CSC
TC Included in Country Strategy:	Yes
TC included in CPD:	Yes

II. OBJECTIVES AND JUSTIFICATION

2.1 The State of São Paulo (SSP) has almost 45 million inhabitants (21.7% of the total Brazilian population) in an area of just over 248,000km^2(2.9% of the territory). The SSP represents 28.7% of the Gross Domestic Product (GDP) of Brazil. As such, being an industrial center, with a high concentration of population, and 645 municipalities, the state has several opportunities for sustainable energy development and solid waste management.

2.2 Electricity consumption has increased about 36% in the last 10 years in the SSP, from to 99,931 Gigawatt-hour (GWh) in 2004 to 136,359 GWh in 2014, with a share in consumption as follows: industrial 38.5%; residential 29.3%; commercial 20.5%; public sector 8.5%; and rural and others 2.4%.

2.3 In the last three years (2014-2016), electricity tariffs have also increase considerably (40%). In this context, the Government of the SSP is interested in implementing and demonstrating energy efficiency (EE) measures and foster distributed generation with renewable energy (RE), particularly with photovoltaic (PV) generation, to encourage the local market, increase the use of RE and diversify the energy matrix. There are also opportunities for using solid waste to produce energy, considering the large amount of solid waste produced in the SSP (see paragraph 2.10).

2.4 **Power generation.** The expansion in electricity demand that took place in the last 10 years had an important impact on: (i) the use of available resources to produce conventional power (for instance, areas for the placement of large-scale hydropower plants); (ii) environmental impact, resulting from an increase of thermal power generation; and (iii) high investments for the construction of new power plants.

2.5 Distributed Generation (DG) of electricity, defined as small-scale electricity generation connected to the distribution grid, is becoming a viable complement to large centralized power plants, as it offers different benefits such as: (i) reduction of technical losses in transmission and distribution lines (electricity generation close to the demand); (ii) reduction of power outages (and increased reliability); (iii) allows the exploitation of non-conventional energy resources (solar, wind, biomass), with the alternative to interact with the grid through the purchase or sale of electricity and simultaneously reducing fossil fuel consumption; and (iv) by involving the final user in generating electricity, they can become more aware of their energy use, and as a result, implement EE measures.

2.6 The SSP offers very favorable conditions for the use of RE, particularly solar energy, due to the existence and availability of transmission and distribution infrastructure close to demand centers as well as its atmospheric conditions, including cloudiness, temperature, and solar radiation. Given the high levels of electricity consumption in the SSP, there is a huge solar potential to be exploited, particularly as DG. A study[1] conducted by the Ministry of Mines and Energy (MME), shows that within the considered ranges of annual solar radiation (5.61 and 5.7kWh/m^2 per day), there is a potential of 9.100 (Megawatt) MW that is technically and economically viable to be installed, resulting in a potential generation of 12 (Terawatt-hour) TWh a year[2] (~2% of the total demand in Brazil, or enough energy for 4 million people) This potential could be exploited both through the installation of PV systems on roofs, and larger solar plants throughout the SSP.

2.7 At the federal level, the Government is encouraging the use of DG, particularly solar generation. In 2012, the Agencia Nacional de Energia Elétrica (ANEEL) (the electricity sector regulator) enacted Resolution No.48[3] which determines the rules for DG connections, and creates a compensation mechanism for users who install DG, including microgeneration, up to 100kW, and mini-generation between 100kW

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1 Department of Energy, database generated by the Brazilian Solar Atlas (2006) Energy, developed by the National Institute for Space Research.

2 Governo Do Estado de São Paulo, Subsecretaria de Energia Renovaveis, Seria Informacoes Energeticas, 005. January 2016.

3 The law in Brazil defines (Art. 14) DG as follows: production of electricity from agents (dealers) enterprises, permit holders or authorized agents, including those treated by art. 8 of Law No. 9,074, of 1995 connected directly to the electrical grid except for: (i) hydro plants with an installed capacity that exceeds 30MW; and (ii) thermoelectric plants, including cogeneration, with EE lower than 75%, according to ANEEL regulation.

to 1MW. With this rule, DG owners who export energy to the grid will receive an "energy credit" in compensation, which they can use for 60 months. In 2015 this Resolution was updated (resolution 687/2015), to: (i) include the possibility of dispersed DG installations to be considered as a single DG unit; (ii) simplify connection procedures, and (iii) increase the limits of what is considered DG (up to 5MW for mini generation based in solar technologies). These new rules had a considerable effect, increasing DG connections from 1,200 to 5,000 (2015-2016), with a total 47MW of installed capacity.

2.8 Similarly, in December 2015, the MME launched the Distributed Generation Development Program (ProGD), to stimulate the electricity generation by consumers, based on RE sources (particularly PV). MME expects that the program can generate R$100 billion (US$28.9 billion) of investments by 2030. In 2016, the MME installed a 60-kW system on the roof of the ministry building, which is expected to serve as a demonstration project.

2.9 Nonetheless, considering the size of the country and its solar radiation potential, these numbers are far from reaching the expected potential (ANEEL estimates 1.2 million connections by 2024, reaching several GW of installed power). Some barriers for the wide-spread connection of DG are the lack of: (i) financing mechanisms, particularly for single private consumers; (ii) confidence in the technology, due to few installations in the country; (iii) information on connection mechanisms, and installation procedures; and (iv) local capacity of technicians and equipment for the installation of large amount of systems. In order to reduce these barriers, the public sector can be a key enabler for the technological change.

2.10 **Solid waste.** Brazil produces around 195,000 tons of urban solid waste (USW) per day, of which 26,300 tons/day are collected only from the residential sector in the SSP[4]. The SSP currently has an installed capacity of 70MW from landfill biogas, however not all solid waste is used for landfill biogas power generation. In this regard, it is estimated that the potential for power generation of all USW of Brazil could supply 30% of the residential sector consumption of the country[5]. An integrated management of USW could be a source for electricity generation showing benefits as: avoiding methane emissions[6] from the landfills and extending the useful life of landfills. Moreover, electricity generation from waste brings cost reduction due to the proximity of generation to demand centers in some cases.

2.11 **Justification.** In this context, the SSP has expressed interest in developing, demonstrating, and boosting DG through RE, in particular using PV technology, as well as exploring different alternatives for the use of USW for electricity generation. These actions will allow for the diversification of the SPP's energy matrix; development of the local PV industry and technological capacity, and deepen the knowledge and education on RE topics while simultaneously having a positive impact on CO_2 emission reduction. The Government of the SSP aims to incorporate 1,000MW equivalent of solar energy into the energy matrix of this state in 2020 by promoting the installation of PV in sectors as: hotels, social household buildings,

4 http://www.energia.sp.gov.br/energias-renovaveis/residuos-solidos/ .
5 http://www.energia.sp.gov.br/portal.php/residuos-solidos
6 Methane has a Global Warming potential 20 times more than that CO_2 emissions.

other public buildings, commercial, power generation plants, small and medium-size industries, among others.

2.12 **Objective.** The main objective of this Technical Cooperation (TC) is to support the SSP to develop, implement and demonstrate sustainable energy measures, in order to promote their implementation at a large-scale. This TC will support the following activities: (i) develop financial mechanisms to achieve solar DG implementation at a large-scale; (ii) support the development, implementation, monitoring and demonstration of DG pilot projects in public buildings using PV; (iii) support the development of a study for electricity generation projects from USW; and (iv) to disseminate the results obtained for a potential replication of these kind of projects.

2.13 It is expected that this TC will contribute to promote new public policies on DG and diversify the SSP's energy matrix. It also will contribute to reduce barriers for the large-scale implementation of DG, CO_2 emissions, energy dependence, and public expenditure. Given the relative size of São Paulo's economy and population in Brazil, this TC will have a considerable replication potential of the measures and projects developed, in other states and cities of Brazil. Moreover, Government officials are in a unique position to eliminate many barriers and open the way for the EE and RE. The SSP can take a multifaceted approach to the promotion of EE and RE by implementing EE measures in their own buildings, replacing lighting fixtures, installing solar PV, implementing regulations and local legislation, developing local programs that make the solar energy most accessible and affordable for the public sector and all the paulistas. By investing in solar energy, the public sector, while improving energy security of the state, they also develop the local market and improve the environment. Moreover, the activities complement the work carried out by the TC RG-X1258: "Regional Energy Savings Insurance and risk management program", which supports the development of EE mechanisms in the private sector.

2.14 **.** This TC is consistent with the IDB's Country Strategy for Brazil 2016-2018 (GN-2850), which aims to promote the dialogue between energy sector actors regarding energy costs in Brazil and their potential impact on productivity. One possible solution to this problem is the development of non-conventional RE (solar and waste) that could help reduce the business sector's costs. The TC is included in the country programming for 2017.

2.15 This TC is consistent with the Update to the Institutional Strategy 2010-2020 (AB-3008), and is strategically aligned with the development challenge of productivity and innovation by closing the investment gaps in energy infrastructure that play a substantial role in increasing growth and productivity. The TC is also aligned with the cross-cutting issues of: (i) climate change and environmental sustainability, by using EE and RE to foster energy management and green growth opportunities and (ii) Institutional capacity, by strengthening the capacity of public institutions to develop EE and RE projects. The TC is also consistent with the Energy Sector Framework Document (GN-2830-3), as it will support the development of alternative energy, and the strengthening of the sector institutions.

2.16 Finally, the TC is also consistent with the expansion of the Co-financing for Renewable Energy and Energy Efficiency mechanism signed between the Japan International Cooperation Agency and the IDB in April 2016, which aims to promote and to extend support towards RE and EE. Particularly, this TC will support

developing mechanisms to implement quality infrastructure, by: (i) “Ensuring alignment with socioeconomic development and development strategies of developing countries/regions as well as comprehensive response to the needs”; and (ii) “Economic efficiency” of infrastructure.

III. DESCRIPTION OF ACTIVITIES/COMPONENTS AND BUDGET

3.1 To achieve the proposed objectives, the TC will finance two components:

3.2 **Component I. Developing the Solar Distributed Generation in the SSP -** will finance activities focus on developing Solar DG in the SSP, including: (i) Evaluation of the potential of solar PV use with DG in public buildings; (ii) Study and demonstration of the technical and economic viability of DG pilot projects; (iii) Development of financing mechanisms for PV solar systems in DG; (iv) Support authorities within public entities to develop and/or review guidelines and manuals on how to install PV, codes and standards, permitting processes; and (v) Publicity campaign to promote solar power distributed generation.[7]

3.3 **Component II. Solid Waste Management -** will finance the analysis of the power generation potential in the SSP’s solid waste, and the development of a basic project design of power generation with the SSP’s solid waste (that can be implemented as a pilot project in the future).[8] Activities in this component will be coordinated with the Empresa Metropolitana de Águas e Energia S.A.

Indicative Results Matrix

Outcome Indicators	Unit	Base Line	Year 1st	Year 2nd	Year 3rd	Obj.	Verification Forms
Result: Develop, implement and demonstrate sustainable energy measures, in order to promote their implementation at a large-scale.							
DG projects implemented by the SSP in public buildings, after the completion of the TC (as a result of the information produced by this TC)	Projects	0	0	0	5	5	Project implement.
Design documents of a waste-to-energy project approved by the appropriate authorities for implementation at a municipal level	Technical design	0	0	0	1	1	Copy of design
Output Indicators	**Unit**	**Base Line**	**1st**	**2nd**	**3rd**	**Obj.**	**Verification Forms**
Component 1: Developing the Solar Distributed Generation in the SSP							
Technical study for evaluation of the potential of solar PV use with DG in public buildings and spaces of the SSP approved	Study	0	1	0	0	1	Acceptance memo of the consultancy report progress and final -
Technical study on the viability of DG pilot projects in public buildings approved	Study	0	0	1	0	1	
Technical study for the development of financing mechanisms for PV solar systems in DG approved	Study	0	1	0	0	1	
Technical consultancy to support authorities within public entities to establish guidelines and manuals on how to install PV in their facilities, next steps, financing mechanisms approved	Study	0	1	0	0	1	
Publicity campaign to promote solar power distributed generation in the public sector and workshop to present the results of the work done under the TC completed	Study	0	0	1	0	1	

[7] Detailed description of the activities to be developed in the TC.
[8] Ibid.

Component 2 Solid Waste Management							
Technical Study to analyze the power generation potential of waste to energy in the SSP approved	Study	0	0	0	1	1	Acceptance memo of the consultancy report progress and final
Request for Proposals documents for the design, construction and commissioning of a solid waste to energy power plant pilot project approved.	Study	0	0	0	1	1	

3.4 The total cost of the operation will be US$700,000. US$600,000 will be financed with the IDB resources from the Japan Quality Infrastructure Initiative. The eligible expenditures for financing will be limited to: (i) consultancies, including firms and individual consultants; (ii) travel cost and per-diem for consultants; and (iii) monitoring and supervision costs. The local contribution of US$100,000, will be in-kind based on men-hour and studies carried out by the Secretary of Energy and Mines that complement the objectives of this TC. The local Counterpart will be register in the Bank systems according to the values register in the annual monitoring reports.

Indicative Budget (in US$)

Activity/Component	Description	JQI/Fund Funding	Counterpart Funding	Total Funding
I: Development of Solar DS in the SSP	Development of Studies for solar DS	$365,000	$70,000	$435,000
II: Solid Waste	Analyze the solid waste potential in the SSP and develop project design for power generation	$135,000	$30,000	$165,000
III: Audit, Evaluation and Project Management	Monitoring and evaluation activities	$100,000	$0	$100,000
	TOTAL COST	**$600,000**	**$100,000**	**$700,000**

3.5 Project Monitoring will be carried through the following mechanisms: (i) technical meetings between the SSP, IDB and consultants; and (ii) joint review between the SSP, and IDB of technical reports to be presented by the consultants. While the studies are taking place; workshops will be organized with local technical staff for knowledge transfer aimed primarily to staff of the institutions involved. The technical support provide by the SSP will not limit the IDB execution role or its ability to manage the relation with the consultants.

3.6 To report operation progress, the Bank will prepare an annual monitoring report, which shall contain at least: (i) the status of the physical and financial progress of the TC; (ii) the products and results achieved; (iii) report on the activities carried out; (iv) identification of the difficulties encountered and the steps taken to solve the problems; (v) lessons learned and best practices identified; and (vi) work schedule for the following year; and (vii) any other information necessary to meet the requirements agreed with the donor requirements. The TC will also apply the TC Monitoring module of Convergence. At the end of the executing period, the project team will prepare a final report considering the results achieved by the TC.

3.7 The Bank, in coordination with the SSP, will be responsible for taking appropriate measures to ensure proper compliance with visibility and disseminations agreed with the JQI.

IV. Executing Agency and Execution Structure

4.1 To the request of the SSP's SEM, this client support TC will be executed by the IDB, to: (i) facilitate coordination between the public entities (SSP and EMAE); and

(ii) avoid lengthy internal budgeting procedures that would delay the start of the TC execution and consultancy payments. The Energy Division (INE/ENE) will be responsible for its execution, in coordination with the IDB Country Office in Brazil,.

4.2 The Bank will contract individual consultants, consulting firms, and non-consulting services in accordance with the Bank's current procurement policies and procedures. The TC will follow IDB governing policies and procedures that are applicable for the procurement of goods, works and services as well as all IDB governing policies and procedures that are applicable for selecting and contracting consultants and consulting firm for technical assistance operations. Intellectual property of the products will belong to the Bank, which will give a Use License to the beneficiary.

4.3 In compliance with the Operational Guidelines for Technical Cooperation Products-Revised version (GN-2629-1), this TC is classified as Client Support. The technical responsibility is in charge of the INE/ENE.

4.4 The focal point designated and sector specialist responsible for executing this TC will be the Energy Specialist based in Brasilia, Brazil, with the support of the Bank Representation in Brazil (COF/CBR) and the INE/ENE Team.

V. RISK AND MAJOR ISSUES

5.1 One of the possible risks of this TC is the future coordination among the different public entities for the development of the pilot project. Lack of coordination among institutions can make the project difficult and delay its implementation. In order to mitigate this, (i) an interinstitutional agreement will be signed by the public entities (SSP and EMAE) and the IDB, to regulate the relationship and assign responsibilities between the parts, and (ii) a task force that involves staff from different entities, including the SSP, the selected office where the pilot will be installed, the utility company for that specific territory and the group, will have the support of the consultant hired to perform as a Project Manager for this TC.

VI. EXCEPTIONS TO BANK POLICY

6.1 No exceptions to Bank's policies are requested.

VII. ENVIRONMENTAL AND SOCIAL STRATEGY

7.1 According to the Environmental and Safeguards Compliance Policy (OP-703), this TC has been classified as Category "C". The latter ratifies a negative minimum or inexistent environmental, social and/or cultural impact; therefore no environmental assessment studies or consultations are required for Category "C" operations. (see Safeguard Policy Filter Report and Safeguard Screening Form Report).

Required Annexes:

- Letter of Request
- Terms of Reference
- Procurement Plan

SUPPORT FOR DIVERSIFICATION OF SAO PAULO'S ENERGY MATRIX

BR-T1340

CERTIFICATION

I hereby certify that this operation was approved for financing under **Japan Special Fund (JSF)** through a communication dated December 5, 2016 and signed by Michiko Tamashiro (ORP/GCM). Also, I certify that resources from said fund are available for up to **US$600,000** in order to finance the activities described and budgeted in this document. This certification reserves resource for the referenced project for a period of four (4) calendar months counted from the date of eligibility from the funding source. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, represent a risk that will not be absorbed by the Fund.

Original Signed — 03/10/2017

Sonia M. Rivera
Chief
Grants and Co-Financing Management Unit
ORP/GCM

Date

Approved: Original Signed — 03/13/2017

Rigoberto Ariel Yepez-Garcia
Division Chief
Energy Division
INE/ENE

Date