

## TECHNICAL COOPERATION (TC) DOCUMENT

### I. BASIC INFORMATION FOR TC

▪ Country/Region:	BRAZIL
▪ TC Name:	Support for Innovation in the Energy Sector - Rio Grande do Sul, Paraná and Santa Catarina
▪ TC Number:	BR-T1422
▪ Team Leader/Members:	Arturo Alarcón (INE/ENE) Team Leader; Virginia Snyder (INE/ENE) Alternate Team Leader; Roberto Aiello, Cecilia Correa, Edwin Malagón, Fidel Márquez, Cecilia Seminario, Stephanie Suber (INE/ENE); Daniel Pérez (INE/TSP); María Eugenia Sanin (INE/INE); Cristina Celeste (LEG/SGO)
▪ Taxonomy:	Client Support
▪ Date of TC Abstract authorization:	02 Apr 2019.
▪ Beneficiary:	Companhia Estadual de Energia Elétrica-CEEE (Rio Grande do Sul); Centrais Elétricas de Santa Catarina-CELESC (Santa Catarina); Companhia Paranaense de Energia-COPEL (Paraná)
▪ Executing Agency and contact name:	Inter-American Development Bank (IDB)
▪ Donors providing funding:	OC Strategic Development Program for Infrastructure(INF)
▪ IDB Funding Requested:	US\$250,000.00
▪ Local counterpart funding, if any:	US\$75,000.00 (In-Kind)
▪ Disbursement period (which includes Execution period):	24 months
▪ Required start date:	July 1 <sup>st</sup> , 2019
▪ Types of consultants:	Individuals; Firms
▪ Prepared by Unit:	INE/ENE-Energy
▪ Unit of Disbursement Responsibility:	CSC/CBR-Country Office Brazil
▪ TC included in Country Strategy (y/n):	Yes
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation

### II. OBJECTIVES AND JUSTIFICATION OF THE TC

- 2.1 **Objective.** The objective of this Technical Cooperation (TC) is to support innovation in the electricity sector of the Brazilian states of Rio Grande do Sul, Paraná and Santa Catarina. The specific objectives are to: (i) support the development and implementation of innovative solutions to improve the quality of power supply and Energy Efficiency (EE) with the three state public utilities, Companhia Estadual de Energia Elétrica-CEEE, Companhia Paranaense de Energia-COPEL, and Centrais Elétricas de Santa Catarina-CELESC; (ii) support the assessment and design of an electric vehicle (EV) corridor between the three states and neighboring countries; and (iii) support the exchange of experiences among the three state public electric utilities, and with other utilities and innovation experts.
- 2.2 **Justification.** The southern region of Brazil includes the states of Paraná, Santa Catarina and Rio Grande do Sul. With an area of 576,000 square kilometers and

a population of nearly 30 million people, it is the smallest geographical region of the country. Nonetheless, this region is also an economic center with diverse activities, including industry, tourism, agriculture, agroindustry and services. According to the Industry Portal,<sup>1</sup> these three states account for 28% of the industries of the country, and rank third (Rio Grande do Sul), fourth (Santa Catarina) and fifth (Paraná) among the 27 states, in number of industrial establishments. Only behind São Paulo and Minas Gerais, 17% of the Gross Domestic Product (GDP) and 25% of the country's industrial exports come from these three states.

- 2.3 Electricity is an essential input for the industrial, commercial, and services sectors; the base of the economy of these states. For example, data from the Santa Catarina Federation of Industries (FIESC) show a close relationship between electricity consumption and industrial production; a 1% increase in the industrial production index results in a 0.38% increase in the demand for electricity. According to a survey by the *Confederação Nacional da Indústria*,<sup>2</sup> 80% of companies in the Brazilian South use electricity as the main input for their production process; 95% of these are impacted by power outages, with 10% experiencing them frequently; and 64% believe such outages are responsible for moderate to heavy damage. The electric utilities in these states are aware of the need of maintaining and improving power quality, and they have investment plans that show considerable increases of quality in recent years. Nonetheless, recent innovations in the power sector, such as distributed energy resources, and digitalization can provide new cost-efficient tools for the improvement of power quality and increase of EE. These new tools could help reduce technical losses on the grid and explore new digital solutions to reduce non-technical losses.
- 2.4 **Companhia Estadual de Energia Elétrica (CEEE).** The CEEE is the electricity company in the state of Rio Grande do Sul. It is engaged in the generation, transmission and distribution of electricity to rural and urban state population. CEEE-GT owns, through its subsidiary, 15 hydroelectric plants in Rio Grande do Sul and is responsible for the power transmission and distribution to 72 municipalities, including Porto Alegre, the state capital. The company has an installed power capacity of more than 900 Megawatts (MW) and produces nearly 19% of the hydroelectric energy generated in the state. Its other subsidiary, CEEE-D, supplies power to more than 1.5 million clients through a network of 72,138 Kilometers (km). The Bank has two loans with CEEE, one to support their transmission expansion and hydropower rehabilitation program (2813/OC-BR, US\$88 million), and the other to support the distribution expansion and smart metering program (2700-OC-BR, US\$133 million). Both loans are fully disbursed and finished execution in 2019.
- 2.5 **Centrais Elétricas de Santa Catarina (CELESC).** Is a power holding company with generation, transmission and distribution assets in Santa Catarina, serving industrial, residential, commercial and rural markets. It supplies energy to more than 2.7 million consuming units located in 264 municipalities and operates 12 plants with a total installed capacity to produce 106 MW. CELESC has a loan with the Bank, approved in 2017 and starting execution, to support the expansion

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<sup>1</sup> [Industry Portal](#).

<sup>2</sup> *O Consumo de energia elétrica na indústria e a produção industrial na economia catarinense, Observatório da Indústria Catarinense, Abril 2017.*

and modernization of their distribution system (4404/OC-BR, US\$276 million). The products and results from this TC will inform the investment plan of CELESC, some of the resulting activities (such as automation of the grid) could be eligible to be included in the loan financed by the Bank.

- 2.6 **Companhia Paranaense de Energia (COPEL).** serves 4.5 million customers across 395 cities in the state of Paraná. COPEL owns and operates 20 power plants (18 hydroelectric plants, one thermal plant and one wind plant), with a total installed capacity of 4,754 MW. It has: (i) a 2,574 km of transmission lines and 36 substations (all of them automated); (ii) a distribution system with 195,459 lines and network of up to 230 Kilowatts (kV), and 364 substations (100% automated); and (iii) an optical telecommunication system (Paraná's Infoway), which has 10,140 km of Optical Ground Wire (OPGW) installed between the main ring and urban radials (self-sustained cables), totaling 20,977 km, 399 cities of the state of Paraná and two cities of the state Santa Catarina.
- 2.7 **Research and Development (R&D) programs.** According to the electricity regulation in Brazil, all electricity companies should apply a minimum of 1% of their net operating income every year in the R&D Program for the Electric Power Sector. From these resources 40% is directly invested by the companies in R&D projects (the other 60% goes to the federal government for research). The regulatory entity, ANEEL, establishes guidelines and instructions that regulate the elaboration of R&D projects, which must be tendered periodically by the power utilities.
- 2.8 All three utilities have applied R&D resources, developing projects in EE, smart grids, Distributed Generation (DG), EV (mainly charging stations), and alternative energy generation. CEEE has conducted studies for the development of photovoltaics cells and the implementation of DG for quality improvement in distribution; CELESC is currently researching rapid-charge stations for EV, and also evaluating the use of distributed storage in distribution networks; COPEL has a very active research program focusing on storage (centralized and distributed), smart grids, smart healing and already developed an EV corridor between the coast of Paraná and the border with Argentina and Paraguay. While the resources used in these R&D programs have provided a way to support innovation in the sector, specific projects are often not coordinated among different utilities, there is a lack of coordination across R&D programs; losing an important opportunity to scale up innovation and results and exchange lessons learned at a regional level.
- 2.9 **EV.** The deployment of EV in Brazil is still incipient, with around 10,000 vehicles in circulation. Nonetheless, the potential for electric and hybrid cars cannot be underestimated, both in terms of production and in terms of demand. Official numbers show that Brazil has over 50 million vehicles, making it the largest market in Latin America, with more than two million cars added only in 2018. Likewise, several car producers are established in the country, particularly in the southern region, with a capacity of producing 4,6 million cars per year, for local market and exports. Considering the Brazilian electricity matrix is mostly renewable (85%), the deployment of electric and hybrid (electric and ethanol) vehicles appears as an opportunity to optimize the use of energy; decreasing cost overall. COPEL has already invested in an electric corridor, with 11 charging units. The corridor connects the city of *Foz do Iguaçu* (Paraná), in the border with Argentina and Paraguay, with the coast. Likewise, there is a corridor connecting Florianópolis (Santa Catarina) with Curitiba (Paraná) implemented by COPEL and CELESC. CELESC is also testing several charging facilities, in order to optimize charging

times. Given the geographical location of these three states, bordering Argentina, Paraguay and Uruguay, there is potential for the implementation of international corridors.<sup>3</sup>

- 2.10 This TC is consistent with the Bank's Country Strategy for Brazil 2016-2018 (GN-2850) which aims to promote the dialogue between the energy sector and actors regarding energy costs and their potential impact on productivity in Brazil. Particularly, the quality of electricity distribution has a strong impact on productivity and the costs associated with economic and commercial activities (¶2.3). This TC is aligned with the Innovation, Science and Technology Framework (GN-2791-8), 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 promoting the implementation of innovative technology that, amongst other benefits, will improve quality of electricity and therefore positively impact on industrial productivity. The TC is also aligned with the cross-cutting issues of climate change and environmental sustainability and with the Climate Change Sectoral Framework (GN-2835-8) by promoting the implementation of efficiency measures as well as supporting the deployment of EV that will displace the use of combustion engine cars, and hence, the reduction of greenhouse gas emissions. This TC is also consistent with the Energy Sector Framework Document (GN-2830), as it will support the development of alternative energies, and the strengthening of the sector's institutions. Additionally, this TC is aligned with the objectives and expected results of the Ordinary Capital Strategic Development program for Infrastructure (INF) as it supports the increase and exchange of knowledge to design and implement innovative development solutions. This TC will be aligned with the IDB Group Corporate Results Framework 2016-2019 (GN-2727-6) by contributing to the global innovation index and with the greenhouse gas emission index.
- 2.11 The Bank is already supporting the development of sustainable energy measures in Brazil, by means of TCs: (i) ATN/JF-16881-BR to support municipalities in Brazil for developing studies, tools and financing mechanisms to implement DG and EE projects (including public lighting); and (ii) ATN/JF-16079-BR, which the main objectives are: (i) support the development in the state of São Paulo; and (ii) implement and demonstrate sustainable energy measures (particularly DG with solar energy); and (iii) power generation with waste. The lessons learned in the development and implementation of both TCs, as well as the relevant products, will be considered for the execution of this TC, particularly regarding the hiring processes and market of firms that can provide consultancy services. The Bank has also loans with CEEE (2700/OC-BR and 2813/OC-BR) and CELESC (4404/OC-BR), as such, the communication channels between these entities and the Bank have already been established. Some of the products of this TC will be used as inputs for the operation with CELESC (4404/OC-BR), still in execution. The Bank is also supporting electromobility initiatives in Latin America and the Caribbean through the TC ATN/OC-17390-RG, recently approved. The proposed activities for Component 2 will be closely coordinated with the aforementioned TC team to avoid duplication of efforts and share lessons learned, the Terms of Reference for Component 2 will be reviewed by the team members of this TC.

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<sup>3</sup> Uruguay has a 300 km electric corridor that connects its capital, Montevideo, with Colonia and Punta del Este. The government is planning an expansion to connect Chuy, in the Brazilian border, by the end of next year.

### III. DESCRIPTION OF ACTIVITIES/COMPONENTS AND BUDGET

- 3.1 The TC contemplates three components:
- 3.2 **Component 1: Innovation to improve quality of power supply and EE (US\$100,000).** This component will finance studies to evaluate the feasibility for the implementation of innovative technologies in distribution networks to improve power quality (frequency and duration of interruptions) and increase EE (including reduction of power losses). The technologies to be analyzed include distributed energy resources (such as distributed storage and DG), smart metering, digitalization, smart grids, and demand side management. The studies will include an identification of state-of-the-art technologies and analysis of the technical and financial viability of such implementations in the regulatory framework of the beneficiaries. Studies conducted with this component will be closely coordinated with, and complement, the R&D programs of the companies. The products of this component will be studies for the application of innovative technologies for power distribution. As a result, this component will provide inputs for the companies to implement projects as part of their investment plans, and to inform the development of regulation at the federal level.
- 3.3 **Component 2: Southern EV corridor (US\$100,000).** This component will finance studies to evaluate the feasibility of an EV corridor (i.e. charging stations) from Paraná to Rio Grande do Sul (crossing Santa Catarina). The studies will include: (i) the projection of traffic demand for EV (including possible traffic with the neighboring countries of Argentina, Paraguay and Uruguay); (ii) the identification of EV markets and demands in these states as well as the economic benefits associated to the development of this new activity; (iii) the identification of electricity infrastructure reinforcement needs, due to the electric vehicle demand and its costs; and (iv) the preliminary design of the charging stations (location, type, etc.), including a cybersecurity assessment and considerations. This component will be coordinated with the activities that each power utility already performs regarding EV. Moreover, the component will also be closely coordinated with the ATN/OC-17390-RG team. Results from this component will support the decision-making process for the development of electric vehicle corridors in Brazil, in a coordinated manner between the three states (Paraná, Santa Catarina and Rio Grande do Sul) and the neighboring countries.
- 3.4 **Component 3: Dissemination of Knowledge (US\$50,000).** This component will support the implementation of at least three workshops (one in each state) to exchange experiences among the three public utilities, the Bank and industry experts regarding innovative solutions in the electricity sector. The result of this component is to create a more coordinate development of innovative solutions among the three utilities, as well as to exchange lessons learned by the Bank in other countries of the region.
- 3.5 The total amount of this TC is US\$325,000, from which US\$250,000 will be financed by Ordinary Capital Strategic Development program for Infrastructure (INF), and US\$75,000 with in kind counterpart finance from each of the three power companies (¶2.4; ¶2.5; ¶2.6) and in equal proportions (US\$25,000 each). The table below summarizes the allocation of funding per component:

### Indicative Budget in US\$

Components/Description	IDB/Strategic Development program for Infrastructure (INF)	Counterpart Funding (In kind)	Total Funding
Component 1. Innovation to improve quality of power supply and EE.	100,000	30,000	130,000
Component 2. Southern EV corridor.	100,000	30,000	130,000
Component 3. Dissemination of knowledge.	50,000	15,000	65,000
<b>Total</b>	<b>250,000</b>	<b>75,000</b>	<b>325,000</b>

#### IV. EXECUTING AGENCY AND EXECUTION STRUCTURE

- 4.1 At the request of the beneficiaries, and in line with the Operational Guidelines for Technical Cooperation Products (GN-2629-2), the Bank will act as the executing agency for this TC<sup>4</sup>. The Bank's role is essential for the coordination and articulation of the activities between the three-independent public utilities, and therefore for the harmonization of the activities at the states level. At present, there is few coordination among these three utilities regarding their R&D programs. Moreover, the Bank will contribute with the acceleration of the procurement process of consultancies that will allow the correct execution of this TC in time and manner. Given that innovation is the focus of this TC, the speed of start and execution of the funds should enable to follow new developments. The Bank will supervise and manage the consultancy services, and the beneficiaries will provide technical inputs to the consultants' reports. Each beneficiary company has designated a technical focal point that will coordinate with the Team Leader for the TC execution and provide the technical feedback.
- 4.2 The Bank will be responsible for the selection and contracting of consulting firms and individual consultants, which will be carried out in accordance with the policies for the selection of consultants (GN-2765-1), the operational guidelines (OP-1155-4) for the contracting of consulting firms, the human resources standards (AM-650) for the hiring of individual consultants and the IDB Corporate Procurement Policy (GN-2303-20) for logistics services and services other than consultancies. In addition, the Financial Management Guide OP-273-6 (GN-2811) will be applied. The initial procurement plan provides information on the contracts foreseen and their applicable monitoring and contracting methods. In accordance with the Operational Guidelines for Technical Cooperation Products, Revised Version (GN-2629-1), this TC is classified as a Client Support product.

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<sup>4</sup> The Secretary of Foreign Economic Affairs, at the Ministry of Economy, has communicated its non-objection for the IDB being the executing agency of the TC (document N° 22683/2019/CORES-SEAIN/MP). Prior to the execution of the project activities with any of the beneficiaries, the Bank shall obtain the corresponding request letter from the respective beneficiaries.

- 4.3 The local counterpart contribution will be in kind and will include the necessary technical and logistical support for the implementation of the operation. The beneficiaries will elaborate a spreadsheet that will specify the counterpart composition and will be used to report the compliance of the agreed reporting terms to the Bank.
- 4.4 The technical responsibility will be of the Energy Division (INE/ENE), which will receive support from the Bank's Country Office in Brazil (CBR). The focal point designated and responsible for executing this TC will be the Energy Specialist, Arturo Alarcón, with support from energy specialists based in Argentina, Paraguay and HQ.
- 4.5 Results of this TC are expected to be sustainable, as all the activities performed within the TC will be coordinated with the R&D programs and teams of each utility. Therefore, this TC will produce useful information for the utilities in terms of innovative projects that could be implemented as part of their investment plans.

## **V. MAJOR ISSUES**

- 5.1 The main risk of this TC is the coordination of all the stakeholders, and to maintain the interest of all parties during the TC execution. Nonetheless, two of the three beneficiary companies are already Bank clients and have a fluid communication with the Bank. A key mitigation action is to have the Bank as executing agency, to enable a balanced execution among the three utilities.

## **VI. EXCEPTIONS TO BANK POLICY**

- 6.1 No exceptions to Bank policy are requested.

## **VII. ENVIRONMENTAL AND SOCIAL STRATEGY**

- 7.1 This TC will finance consultancy products, studies and workshops, and does not require implementation of specific environmental or social safeguard policies; therefore, it has been classified as "C" (See [Safeguard Policy Filter Report](#) and [Safeguard Screening Form](#)).

### **Required Annexes:**

- Annex I. [Letters of Request](#)
- Annex II [Results Matrix](#)
- Annex III [Terms of Reference](#)
- Annex IV [Procurement Plan](#)