

**BRAZIL**

**REHABILITATION PROGRAM FOR THE “FURNAS” AND  
“LUIZ CARLOS BARRETO DE CARVALHO” HYDROELECTRIC  
POWER PLANTS**

**(BR-L1278)**

**LOAN PROPOSAL**

This document was prepared by the project team consisting of: Sylvia Larrea (INE/ENE) and Alejandro Melandri (INE/ENE), Project Team Co-leaders; Alejandro Fros (ENE/CAR); Jorge Ordóñez (INE/ENE); José Félix Filho (VPS/ESG); Teresa Maurea Faria (LEG/SGO); Mónica Merlo (CSC/CBR); Marcos Texeira (CSC/CBR); Carlos Lago (VPC/PDP); Tulio Correa (VPC/PDP); Wesley Bazilio (CSC/CBR) under the supervision of Leandro Alves, Energy Division Chief (INE/ENE) and Fernando Carrillo-Florez (CSC/CBR).

## CONTENTS

### PROJECT SUMMARY

I.	DESCRIPTION AND RESULTS MONITORING .....	1
A.	Background, problem addressed, and rationale .....	1
B.	Objective, components, and cost .....	5
1.	Component I. Investments .....	5
2.	Component II. Engineering, administration, and audit .....	6
C.	Results Matrix with indicators .....	6
D.	Cost and financing.....	6
II.	FINANCING STRUCTURE AND MAIN RISKS .....	7
A.	Financing structure .....	7
B.	Main risks and mitigation measures.....	8
1.	Institutional and fiduciary risk.....	8
2.	Environmental and social risks.....	9
3.	Construction risk .....	10
4.	Operation and maintenance risk (O&M) .....	11
C.	Economic, financial, and technical viability .....	11
III.	IMPLEMENTATION PLAN AND MONITORING MECHANISMS.....	13
A.	Execution .....	13
B.	Administration.....	14

ANNEXES	
Annex I	Development Effectiveness Matrix (DEM) – Summary
Annex II	Results Matrix
Annex III	Procurement Plan – Summary

ELECTRONIC LINKS	
1.	Environmental and Social Management Report <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165108">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165108</a>
2.	Annual work plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165116">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165116</a>
3.	Complete procurement plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=36267051">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=36267051</a>
4.	Results monitoring and evaluation arrangements <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165118">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165118</a>

ADDITIONAL REFERENCES	
1.	Financial feasibility analysis, final report. May 2010 <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165601">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165601</a>
2.	Economic evaluation, final report <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165593">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165593</a>
3.	Technical viability analysis <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35173284">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35173284</a>
4.	Procurement analysis <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=36267051">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=36267051</a>
5.	Fiduciary agreements and requirements - financial management <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35172900">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35172900</a>
6.	Scope of work at the Luiz Carlos Barreto de Carvalho hydroelectric power plant (LCBC) <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35181537">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35181537</a>
7.	Scope of work at the Furnas hydroelectric power plant <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35181542">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35181542</a>
8.	Monitoring report on LCBC works <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35187813">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35187813</a>
9.	Monitoring report on Furnas hydroelectric power plan works <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188166">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188166</a>
10.	Execution events at LCBC <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188214">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188214</a>
11.	Execution events at Furnas hydroelectric power plan <a href="http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188212">http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35188212</a>

## ABBREVIATIONS

ANEEL	Agência Nacional de Energia Elétrica [National Electric Power Agency]
CGU	Controladoria Geral da União [Comptroller General of the Union]
EIRR	Economic internal rate of return
ENPV	Economic net present value
EPE	Empresa de Pesquisa Energética
ESMR	Environmental and Social Management Report
Furnas	Furnas - Centrais Elétricas S.A.
HPP	hydroelectric power plant
LCBC	Luiz Carlos Barreto de Carvalho
MW	Megawatts
O&M	Operation and maintenance
ONS	Operador Nacional do Sistema Elétrico
PAC	Programa para Aceleração do Crecimento [Growth Acceleration Program]
SAP	Systems, Applications and Products

## PROJECT SUMMARY

### BRAZIL REHABILITATION PROGRAM FOR THE “FURNAS” AND “LUIZ CARLOS BARRETO DE CARVALHO” HYDROELECTRIC POWER PLANTS (BR-L1278)

Financial Terms and Conditions				
Borrower: Furnas - Centrais Elétricas S.A. (Furnas) Guarantor: Federative Republic of Brazil Executing agency: Furnas			Amortization period:	20 years
			Grace period:	3.5 years
			Disbursement period:	3.5 years
<b>Source</b>	<b>Amount</b>	<b>%</b>	Interest rate:	LIBOR
IDB (Ordinary Capital)	US\$128,660,000	84	Inspection and supervision fee:	*
Local	US\$24,500,000	16	Credit fee:	*
Total	US\$153,160,000	100	Currency:	US dollars
Project at a glance				
<p><b>Project objective/description:</b></p> <p>The program's objective is to help restore and conserve the capacity to generate electric power from renewable sources, with a significant impact on energy efficiency and greenhouse gas emissions as it avoids using fossil fuels to generate electricity while optimizing the use of previously-committed water resources.</p> <p>The program's specific objectives are to finance the rehabilitation and modernization of the Furnas hydroelectric power plant (1,216 MW) and the Luiz Carlos Barreto Carvalho hydroelectric power plant (1,050 MW), both located in Rio Grande, State of Minas Gerais, to: (i) restore power generation capacity; (ii) increase maintenance efficiency and reliability, while reducing downtime and costs; (iii) increase the service life of the plants; and (iv) upgrade the technology.</p> <p><b>Special contractual clauses:</b></p> <p><u>Special conditions precedent to the first disbursement:</u> (a) Furnas will submit evidence to the Bank's satisfaction that the program's financial and accounting external audit services have been contracted (see paragraph 3.9); (b) Furnas will run the first simulation of the Chart of Accounts adapted to the program as part of the business Systems, Applications and Products (SAP) software used by Furnas (see paragraph 3.9); and (c) Furnas will submit an annual work plan (AWP) for the first year (see paragraph 3.3).</p> <p><u>Special execution conditions:</u> (a) Environmental and social. Furnas will comply with the environmental and social obligations specified in the Environmental and Social Management Report (ESMR), and implement the actions as programmed in the Action Plan. The IDB will verify compliance with the environmental and social obligations specified in the ESMR annually until the end of execution of the works. Upon completion of the works, the IDB and Furnas will agree jointly on the frequency for such verifications (see paragraph 3.7); (b) Fiduciary management. Furnas will prepare an abridged manual of program- related operations (see paragraph 3.7); and (c) Financial statements. Furnas will present the company's audited financial statements in order to allow its financial position to be evaluated and monitored.</p> <p><b>Exceptions to Bank policies:</b> None.</p>				
<p><b>Project consistent with country strategy:</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p><b>Project qualifies as:</b> SEQ <input type="checkbox"/> PTI <input type="checkbox"/> Geographic <input type="checkbox"/> Headcount <input type="checkbox"/></p>				

\* The credit fee and inspection and supervision fee will be established periodically by the Board of Executive Directors as part of its review of the Bank's lending charges, in accordance with the applicable provisions of the Bank's policy on lending rate methodology for Ordinary Capital loans. In no case will the credit fee exceed 0.75% or the inspection and supervision fee exceed, in a given six-month period, the amount that would result from applying 1% to the loan amount divided by the number of six-month periods included in the original disbursement period.

## I. DESCRIPTION AND RESULTS MONITORING

### A. Background, problem addressed, and rationale

- 1.1 **Background.** In recent years, power consumption in Brazil has grown 4.5% per year. In 2010, it grew 7.8% and in the 2011-2018 period demand for electric power is projected to increase 5.2% per year.<sup>1</sup>
- 1.2 This demand growth was met by an energy supply in which hydroelectric power plays a major role, consistent with the country's significant potential in this area, estimated at 260,000 megawatts (MW). Brazil has an installed capacity of 102,609 MW, of which 75.5% is hydroelectric power (77,508 MW). Furnas – Centrais Elétricas S.A. (Furnas) generates 11% (8,662 MW) of this hydroelectric power.
- 1.3 Furnas, a subsidiary of the Eletrobras<sup>2</sup> holding company, was established in 1957 by means of Federal Decree 41066 with the objective of building and operating the first large-scale hydroelectric power plant in Brazil, the Furnas hydroelectric power plant (HP) in Rio Grande, State of Minas Gerais, with a capacity of 1,216 MW. It aimed to address the energy crisis that was threatening the power supply for three major socioeconomic hubs: São Paulo, Rio de Janeiro, and Belo Horizonte.
- 1.4 The Furnas operations consist of electric power generation, transmission, and marketing. Its system carries more than 40% of the total power consumed in the country. Furnas operates in the Southeast and Center-West of Brazil, connecting the Federal District to eight states (São Paulo, Minas Gerais, Rio de Janeiro, Parana, Espírito Santo, Goiás, Mato Grosso, and Tocantins) where over half of the Brazilian population resides, and approximately 66% of the country's gross domestic product (GDP) is generated.
- 1.5 For power generation, Furnas owns and operates 10 hydroelectric power plants with total installed capacity of 8,662 MW, and two thermoelectric plants with total installed capacity of 796 MW, accounting for about 10% of the country's power generation. For power transmission, Furnas owns and operates 19,639 kilometers of transmission lines and 46 substations with transformation capacity of 101,651 MVA. In addition to its own generation infrastructure, Furnas is involved in several hydroelectric power projects in partnership with other companies: (i) Peixe Angical hydroelectric power plant (452 MW, with 40%); (ii) Foz do Chapecó hydroelectric power plant (855 MW, with 40%); (iii) Serra do Facão hydroelectric power plant (210 MW, with 49%); (iv) Retiro Baixo hydroelectric

---

<sup>1</sup> National Energy Plan 2030.

<sup>2</sup> Eletrobras is an open-stock, semipublic holding company in which the federal government holds 58% of the common stock traded on the New York, São Paulo, and Madrid stock exchanges. Eletrobras consists of six power generation and transmission companies and six power distribution companies. The generation and transmission companies are: (i) Chesf; (ii) Furnas; (iii) Eletronorte; (iv) Eletronuclear; (v) Eletrosul; and (vi) GTEE. The distribution companies are: (i) Amazonas Energia; (ii) Distribuição Acre; (iii) Distribuição Roraima; (iv) Distribuição Rondônia; (v) Distribuição Piauí; and (vi) Distribuição Alagoas. In addition, Eletrobras owns one half of the equity of Itaipu Binacional on behalf of the government.

power plant (82 MW, with 49%); (v) Santo Antonio hydroelectric power plant (3,140 MW); (vi) Baguari hydroelectric power plant (140 MW); and (vii) Teles Pires hydroelectric power plant (1,820 MW).

- 1.6 **Problem addressed.** A market where approximately 75% of power is generated by hydroelectric plants, and where demand for electricity is projected to grow 5.2% annually between 2011 and 2018,<sup>3</sup> concession holders and power producers are optimizing operations at their oldest hydroelectric power plants so as to reduce unscheduled downtime resulting in lost revenues and system outages.
- 1.7 Fifty-seven percent of the Furnas hydroelectric power generation infrastructure is over 30 years old (in terms of commercial operation), i.e., beyond its technical service life. The efficiency of the equipment is in progressive decline due to normal wear and tear, while downtime for preventive and corrective maintenance is increasingly frequent, lengthy, and costly. This causes a drop in the maximum power generated by the plants and a reduction in the amount of electricity produced annually. Moreover, less reliable service hurts Furnas financially with higher operating costs due to the drop in firm energy output from the generator and increased power purchases on the short-term market in order to meet its power sales obligations.
- 1.8 Specifically, the rehabilitation program for the Furnas and Luiz Carlos Barreto de Carvalho hydroelectric power plants (the program) consists of the rehabilitation and modernization of two hydroelectric power plants located in Rio Grande, State of Minas Gerais, that were built and entered into operation more than 40 years ago: (i) Furnas hydroelectric power plant (Furnas HPP), with installed capacity of 1,216 MW (eight generators of 152 MW each), entered into operation in 1963; and (ii) Luiz Carlos Barreto de Carvalho (LCBC) hydroelectric power plant, with installed capacity of 1,050 MW (six generators of 175 MW each), entered into commercial operation in 1969. In 2005, the availability indexes of the Furnas HPP and the LCBC HPP stood at 89.8% and 89.6%, respectively, with a downward trend and very close to the 89.4% threshold required by the National Electric Power Agency (ANEEL), the regulatory body. The equivalent forced outage rate for Furnas registers values of 0.04 when the system's benchmark index is 0.025. Thus the need for rehabilitation is significant in view of the direct impact on the revenue of the HPPs with the reduction in ensured power, which is a direct function of the availability index.<sup>4</sup>
- 1.9 **Rationale.** The program will help address the problems identified, aiming to: (i) restore the original power production by retrofitting and/or replacing equipment at two large-scale hydroelectric power plants in order to maintain quality and reliability standards in the delivery of service and extend their service life; and (ii) upgrade the power plants to the new environmental, safety, and system

---

<sup>3</sup> Data reviewed by Empresa de Pesquisa Energética.

<sup>4</sup> See the program economic and technical viability analyses in the optional electronic links.

- reliability operating requirements imposed by the National Power System Operator and ANEEL.
- 1.10 The rehabilitation of hydroelectric power plants is one of the best investments to maintain the power supply because it carries low investment costs—about 25% of the cost of building a new plant—and causes no environmental and social impacts. The timely rehabilitation of these plants benefits the population in general through the economical availability of clean, renewable energy.
- 1.11 **Brazil's power sector.** In 2001, the power sector experienced a severe energy crisis that culminated in a power rationing plan and changes to sector management. Amendments to the sector regulations were proposed in 2003 in order to: (i) guarantee the country's power supply; (ii) promote efficient pricing for consumers; and (iii) establish a stable regulatory framework. The new framework was approved in March 2004 with the enactment of Laws 10847 and 10848.
- 1.12 With respect to energy trading, two markets were created for the purchase and sale of electricity: (i) the Ambiente de Contratação Regulada (ACR) or regulated market environment, between generators and distributors or regulated consumers,<sup>5</sup> where prices are set by public auction with standardized agreements for the lowest bid; and (ii) the Ambiente de Contratação Livre (ACL) or free market environment, between power generators, traders, importers, exporters, and free or unregulated consumers,<sup>6</sup> where the consumer and the supplier can negotiate their own contract. Total power demand must be covered by agreements in order to guarantee the power supply for the country's interconnected system at all times; this obligation applies equally to distributors or regulated consumers and to free or unregulated consumers.
- 1.13 In institutional terms, the new framework created three new institutions: (i) Empresa de Pesquisa Energética (EPE), Brazil's energy research corporation responsible for long-term planning in the power sector; (ii) Comitê de Monitoramento do Setor Elétrico (CMSE), the Electric Sector Monitoring Committee responsible for overseeing the security of the power supply in Brazil; and (iii) Câmara de Comercialização de Energia Elétrica (CCEE), a body to oversee trading of power in the interconnected system. The institutional structure and operation of the power sector in Brazil are consistent with the objectives of Bank's Public Utilities Policy (OP-708) as they encourage quality, accessibility, and sustainability of the power service, in addition to its economic efficiency.
- 1.14 **The country strategy.** The new sector model implemented in 2004 has proven to be more stable and predictable, helping to attract investment and support sector

---

<sup>5</sup> Regulated consumers may purchase power only from the distribution company corresponding to their district. The power rates applicable to these consumers are regulated annually by ANEEL in accordance with the rate readjustment and revision rules for power purchases in their respective area of influence.

<sup>6</sup> Free or unregulated consumers are those with loads over 3MW connected via 69 kilovolts transmission lines. Free consumers may select their power supplier: a distribution company, a generator, or a broker.

- expansion. Despite continuous investment in the sector, there are significant investment requirements to keep pace with Brazil's expected strong economic growth.
- 1.15 Energy demand in Brazil grew 7.8% in 2010, to 419.01 terawatt-hours, as a result of the economic recovery.<sup>7</sup> Moreover, the ten-year energy plan estimates that power demand will grow at an average 5.2% per year between 2011 and 2018.<sup>8</sup> A concentrated increase in demand for energy is also expected due to the construction and use of facilities for the FIFA World Cup in 2014 and the Rio de Janeiro Olympic Games in 2016. These demand projections lay the groundwork for the projected expansion in generation and transmission systems, taking into account socioenvironmental factors and energy efficiency measures to save approximately 3% in power consumption over the period.
  - 1.16 Therefore, Brazil's Programa para Aceleração do Crecimento [Growth Acceleration Program] (PAC) identified the following strategic investments in the near term: (i) generation, including rehabilitation and modernization of the Furnas and LCBC hydroelectric power plants; (ii) power transmission (expansion, interconnections, and reinforcement); and (iii) energy efficiency programs.<sup>9</sup>
  - 1.17 **The Bank's country strategy with Brazil.** The program is consistent with the priorities established in the preparation of the IDB's strategy with Brazil for the 2011-2014 period, in which hydroelectric power plant rehabilitation and modernization is one of the strategic issues. The program is also aligned with the Sustainable Energy and Climate Change Initiative (SECCI) as it promotes renewable energy projects, energy efficiency, and avoids greenhouse gas emissions. The operation is envisaged in the 2011 Operational Program Report of the Bank with Brazil and contributes to aligning the Bank's program with the priority areas of GCI-9.<sup>10</sup> The 2011 Country Program document identifies the contribution of the program to the anticipated outcome of the strategy of "consolidating the power sector and electricity generation" and assumes the targets of the program to verify its contribution.<sup>11</sup>
  - 1.18 The Inter-American Development Bank has provided support to the region in the critical area of power infrastructure (generation, distribution, and transmission)

---

<sup>7</sup> Source: EPE.

<sup>8</sup> See <http://www.epe.gov.br>.

<sup>9</sup> See PAC at <http://www.Brazil.gov.br/pac>.

<sup>10</sup> GN-2570—Brazil. Indicator 1.3: "Lending to support climate change initiatives, sustainable energy (including renewable energy), and environmental sustainability."

<sup>11</sup> Targets (2013): (1) equivalent forced outage rate: 2004-2005 average baseline 3.53% and incremental target at December 2013, 1.05%; (2) average megawatts: 2004-2005 baseline, 982.6 MW and incremental target at December 2013, 1,060.2 MW; (3) reduction in operation and maintenance costs: 2004-2005 average baseline: R\$2.19/MWh to R\$1.62/MWh.

through long-term financing and technical assistance for several initiatives.<sup>12</sup> Programs include the following hydroelectric power projects in Brazil: (i) Segredo; (ii) Dona Francisca; (iii) Cana Brava; and (iv) Campos Novos. The IDB is also financing several hydroelectric power plants, including: Porce III (Colombia); Misicuni (Bolivia); and rehabilitation at Péligre (Haiti); the HPPs of Centroamérica and Santa Bárbara (Nicaragua), and the Simón Bolívar - Guri HPP (Venezuela). The Bank has identified benefits for the region stemming from HPP rehabilitation<sup>13</sup> and contributes to this program with its experience at the regional level for the benefit of executing agencies and the projects in particular.

## **B. Objective, components, and cost**

- 1.19 **Objective.** The program's objective is to help restore and conserve the capacity to generate electric power from renewable sources, with a significant impact on energy efficiency and greenhouse gas emissions as it avoids using fossil fuels to generate electricity while optimizing the use of previously-committed water resources.
- 1.20 The program's specific objectives are to finance the rehabilitation and modernization of the Furnas hydroelectric power plant and the Luiz Carlos Barreto Carvalho hydroelectric power plant in order to: (i) restore power generation capacity; (ii) increase maintenance efficiency and reliability, while reducing downtime and costs; (iii) increase the service life of the plants; and (iv) upgrade the technology.
- 1.21 **Components.** The proposed program includes the following components:
- ### **1. Component I. Investments**
- 1.22 This component includes the rehabilitation of electromechanical and energy transformation components, including: (i) restoration of turbines, generators, hydromechanical equipment and associated systems; (ii) modernization of the control, supervision, and protection systems, including upgrading and/or implementing new control, command, supervision, and protection systems; and (iii) associated civil works.
- 1.23 To this end, the program will finance the repair of the turbine generators and auxiliary equipment, including the spiral chamber, draft tube, vanes, regulation and oil pressure system; stator casing, new stator coil, and restoration or replacement of the regulation and remote control systems with updated technologies. It will also retrofit many other units in the plants, including the spillway operation controls, bridge cranes, auxiliary power systems, transformers, and control systems.

---

<sup>12</sup> The IDB has supported Brazil over the years through technical cooperation operations for studies relating to: (i) renewable energy: small hydroelectric power plants (SHPs), biofuels, biomass, and solar energy; (ii) energy efficiency in the states of Minas Gerais and São Paulo.

<sup>13</sup> "Rehabilitación de Fuentes Renovables de Energía", Manoel Nogueira, IDB (2010).

Thorough descriptions of the scope of the interventions are provided in electronic links.<sup>14</sup>

## **2. Component II. Engineering, administration, and audit**

- 1.24 This component includes monitoring and technical and administrative support for sound execution of the program through supervision, including socioenvironmental supervision, as well as technical and logistical services to administer, audit, and evaluate the program.

### **C. Results Matrix with indicators**

- 1.25 The Results Matrix (see Annex II) provides results indicators associated with program components. These indicators were developed to help evaluate program impact. They were reviewed and agreed upon with Furnas, which will assist in their verification.

### **D. Cost and financing**

- 1.26 The total program cost is US\$153.16 million, as shown in Table 1.

---

<sup>14</sup> The detailed description of the scope of each intervention may be found under optional electronic links: “Scope of work at the Furnas hydroelectric power plant” and “Scope of work at the Luiz Carlos Barreto de Carvalho hydroelectric power plant.”

**Table 1. Cost and financing (US\$ million equivalent)**

Item		Approved financing		
Item	Description	IDB	Counterpart	Total
<b>1</b>	<b>Direct costs</b>	<b>108.91</b>	<b>-</b>	<b>108.91</b>
1.1	Furnas plant – works contract	56.00	-	56.00
1.2	LCBC plant – works contract	52.91	-	52.91
<b>2</b>	<b>Engineering, administration and audit</b>	<b>1.75</b>	<b>24.40</b>	<b>26.15</b>
2.1	Furnas plant – Engineering and supervision	-	14.80	14.80
2.2	LCBC plant – Engineering and supervision	-	9.60	9.60
2.2	Administration	1.45	-	1.45
2.3	External audit	0.20	-	0.20
2.4	Midterm and final evaluation	0.10	-	0.10
<b>3</b>	<b>Unallocated costs</b>	<b>13.90</b>	<b>-</b>	<b>13.90</b>
3.1	Contingencies	9.14	-	9.14
3.2	Escalation allowance	4.76	-	4.76
<b>4</b>	<b>Financial expense</b>	<b>4.10</b>	<b>0.10</b>	<b>4.20</b>
4.1	Interest	4.10	-	4.10
4.2	Commitment fee	-	0.10	0.10
4.3	Inspection and supervision fee	-	-	-
<b>PROGRAM TOTAL</b>		<b>128.66</b>	<b>24.50</b>	<b>153.16</b>
<b>Contribution percentage</b>		<b>84.0%</b>	<b>16.0%</b>	<b>100%</b>

## II. FINANCING STRUCTURE AND MAIN RISKS

### A. Financing structure

- 2.1 The program will be financed with an IDB investment loan of US\$128.66 million to Furnas, with a sovereign guarantee from the Government of Brazil covering the company's financial obligations. This financing will cover all estimated investment, administration, and audit costs in addition to contingencies and interest during construction to complete the program. Disbursements of IDB resources will be made directly to Furnas.
- 2.2 The program loan considers local counterpart resources for works supervision and engineering costs and financial expenses stemming from the credit fee. However, Furnas has invested US\$474 million since it began work to refurbish and modernize the Furnas and LCBC hydroelectric power plants (2005 to 2009). These expenses will not be recognized or charged against the counterpart contributions, pursuant to the applicable IDB policies (Operational Policy OP-504).
- 2.3 Resources from this program will specifically finance rehabilitation and modernization works performed in the 2010-2014 period and therefore require retroactive financing provided for work executed from January 2010 to June 2011

for approximately US\$29.8 million. The items recognized were performed in the past 18 months, the eligible period under the applicable policy (Operational Policy OP-504).

- 2.4 Consideration of this retroactive financing is justified because: (i) the objective of the operation is to finance the same program the IDB has been considering since 2007, which was postponed for reasons beyond the control of Furnas and the program; (ii) Furnas never ceased in its efforts with the IDB to agree on appropriate financing for the project; and (iii) Furnas intends to use the IDB support to complete financing for the program under terms and conditions consistent with the service life of this type of project, and its financial planning.
- 2.5 In June 2007, the program was declared eligible by the IDB and entered the pipeline. In January 2009, the IDB suspended program processing due to lending limits on non-sovereign guaranteed operations. Nevertheless, Furnas and the IDB continued discussions on the project, analyzing alternative forms of financing. In May 2009, given the importance of the program for Furnas and for the Government of Brazil, Furnas informed the IDB that it was interested in securing a government-guaranteed loan. Thus, in January 2010, the government formally committed to support the program with a sovereign guarantee, and the IDB placed the operation in the 2010 pipeline.
- 2.6 The retroactive financing is important to Furnas as it was forced to use its own resources to move forward with the program with the expectation that IDB resources would cover outlays, maintaining the cost of capital in line with the type of project (see paragraph 2.2). This meant that the company had to reallocate liquid assets among its various investments and obligations and obtain short-term financing with the Eletrobras holding company and State-owned banks.

## **B. Main risks and mitigation measures**

### **1. Institutional and fiduciary risk**

- 2.7 Furnas is a closed corporation in which Eletrobras holds 98.6% of its shares. As a subsidiary of Eletrobras, a company traded on the New York Stock Exchange, Furnas must comply with the financial reporting and internal control quality requirements established in the Sarbanes-Oxley Act enacted in 2002 in the United States. Accordingly, Furnas has audited financial statements available on its website.
- 2.8 The Institutional Capacity Assessment System<sup>15</sup> was used during project preparation to conduct an institutional and fiduciary analysis of the company's administration. The analysis found that Furnas complies with appropriate corporate governance criteria conducive to efficient decision-making.

---

<sup>15</sup> Prepared in accordance with the Financial Management Policy for IDB-financed Projects (document OP-273-1) and its Operational Guidelines (document OP-274-1).

- 2.9 Furnas has independent management units, adequate technical, accounting, and financial controls and processes, and skilled human resources. A review of the fiduciary systems found their performance satisfactory, posing low risk, and therefore not requiring preparation of a project risk management matrix.

## **2. Environmental and social risks**

- 2.10 The proposed program does not envisage installing new generators or making changes to the existing reservoirs. Works will be conducted far from conservation, indigenous, and urban areas, and the land set aside for the works is owned by the plants. Nonetheless, given the nature and magnitude of the rehabilitation and modernization activities, medium-sized construction jobsites will be needed, and may entail environmental and social impacts, particularly with regard to industrial safety and health. Accordingly, this operation was classified as Category “B” under the IDB Environment and Safeguards Compliance Policy (document GN-2208-20 and Operational Policy OP-703).
- 2.11 **Environmental and social impacts** During program design, Furnas prepared an environmental analysis report.<sup>16</sup> Subsequently, the IDB prepared the environmental and social management report (ESMR) to address the program environmental and social impacts. These impacts will essentially be positive as more clean energy will be generated. The main adverse impacts will be limited in scale and duration and are associated with: (i) removal of small patches of vegetation and associated impact (applicable only to the LCBC HPP rehabilitation); (ii) atmospheric and noise emissions; (iii) generation of solid waste, including used and obsolete equipment; and (iv) construction-related accidents.
- 2.12 **Impacts and risks associated with other activities at the Furnas and LCBC power plants and other Furnas projects.** When conducting the environmental and social evaluation, the project team also examined the potential impacts and relevant risks that could be deemed environmental liabilities or significant risks to reputation, relating to: (i) other activities and operations at the Furnas and LCBC plants; and (ii) other Furnas projects. The project team did not identify any prior environmental liability relating to either hydroelectric power plant not already resolved by Furnas.
- 2.13 With respect to other Furnas projects, the only one that raises an issue not fully resolved is the resettlement associated with the Serra da Mesa hydroelectric power plant in the state of Goiás, where negotiations are under way. Another situation posing a moderate risk to reputation is associated with the Santo Antônio hydroelectric power plant project on the Madeira River, in the State of Rondônia. Although licensed by the relevant environmental authorities, the project has certain socioenvironmental impacts. The IDB will monitor these situations during the supervision phase.

---

<sup>16</sup> This report was published in compliance with the IDB’s Disclosure of Information Policy (Operational Policy OP-102).

- 2.14 **Institutional capacity for environmental and social management.** During program preparation, the project team found that Furnas has effective control procedures and measures to mitigate environmental, social, health, and safety risks associated with a program of this kind, its new projects, and other activities in general. Furnas will be responsible for supervising the program's environmental management.
- 2.15 In general, the environmental and social analysis did not identify any risk factors for the environmental sustainability of the proposed program. However, the project team did identify areas with room for improvement in the capacity to manage environmental, social, health, and safety issues for the program and the company. These are set out in the Environmental, Health, and Security Plan of Action that takes into account the recommendations included in the ESMR and agreed upon with Furnas.

### **3. Construction risk**

- 2.16 The rehabilitation works that began in 2005 (Furnas) and 2007 (LCBC) are being performed by established construction, equipment, and installation contractors: (i) in the case of Furnas, the CEMF consortium is made up of Voith Siemens Hydro Power Generation Ltda., Alstom Brazil Ltda., Construtora Norberto Odebrecht S.A., and Engevix Engenharia S.A.; and (ii) in the case of LCBC, the CFLCB consortium is made up of Alstom Brazil Ltda., GE Hydro Inepar do Brasil S.A., Construções e Comércio Camargo Corrêa S.A., Construtora Norberto Odebrecht S.A., Camargo Corrêa Equipamentos e Sistemas S.A., CNEC Engenharia S.A., and Engevix Engenharia S.A.
- 2.17 The CEMF and CFLCB consortia have demonstrated technical competence for execution of the rehabilitation and modernization of the hydroelectric power plants under consideration. Contingencies during execution were resolved to the satisfaction of Furnas.
- 2.18 **Pace of execution and cost updates.** The delays and cost increases for the rehabilitation works were essentially due to the execution of services beyond the initial scope of work owing to uncertainties in the initial diagnostic assessment regarding the actual condition of some of the generators. Reprogramming a generator for refurbishment must be coordinated with the energy dispatch authority, which affects the work schedule since it depends on when the system can support the shutdown of a given unit.
- 2.19 In the case of the units to be refurbished under this program, the risk of delays and increased costs is mitigated by experience in the works performed since 2005. Therefore, the new works timeline and budget contain a readjusted forecast of the additional costs, services, and time needed to complete the program. Should any costs accrue beyond those envisaged by the program, they will be borne by Furnas, which has the financial strength to absorb such additional costs to complete the works, as necessary.

- 2.20 One external factor affecting the timeline for projects like this is for the authorization by the power dispatch authority to shut down the generator that needs to be refurbished. In this case, authorizations were often deferred because when the rehabilitation work first began, Brazil was just emerging from a period of power rationing. Currently, no supply problems are forecast, and therefore shutdown authorizations are expected to be granted in a timely manner.

#### **4. Operation and maintenance risk (O&M)**

- 2.21 Furnas has ample experience building, operating, and maintaining 10 hydroelectric power plants, and has operated the Furnas plant since 1963 and the LCBC plant since 1969, making Furnas the benchmark in the Brazilian power generation sector given its high availability indicators.
- 2.22 The first 8,000 hours, about one year of operation after the refurbishing, represent the greatest O&M risk, as electromechanical failures may occur, requiring the generator to be shut down for adjustments. Furnas will assume these risks as well as the cost overruns beyond contractor warranties.

#### **C. Economic, financial, and technical viability**

- 2.23 **Economic viability.** The economic viability of the program was evaluated using the cost-benefit methodology, in which the program's main direct benefit is the economic value of the electricity that would be lost if the program were not executed. This benefit was evaluated considering the marginal long-term cost of power on the Brazilian power market in the area of influence of the power plants to be refurbished.
- 2.24 Without refurbishment of the Furnas and LCBC hydroelectric power plants, there is a high probability of power shortages. Furnas would be exposed to higher energy trading costs since it would have to purchase power on the short-term market in order to meet its power sales obligations. Moreover, the annual operating and maintenance costs are estimated to increase by about 20%.
- 2.25 The environmental benefits associated with the restoration of hydroelectric power generation can be estimated by valuing a ton of CO<sub>2</sub> in international certificates traded to reduce emissions, using an average emission factor of 0.26 tons CO<sub>2</sub>/MWh, which is comparable to the estimated emission factor for operating power plants connected to the National Interconnected System (SIN).
- 2.26 Based on the foregoing, with a 30-year service life after program completion, and considering the investment made by Furnas from 2003 to 2009 as a sunken cost, the resulting economic internal rate of return (EIRR) is approximately 36%. Factoring

- in the investment, the EIRR would be 15.3% and 13.1% for the Furnas and LCBC plants, respectively,<sup>17</sup> demonstrating the program's sound economic viability.
- 2.27 **Financial viability.** The present value of the rehabilitation and modernization is US\$1.194 billion, which is evidence of financial viability.
- 2.28 In addition to the program's financial sustainability, the project team reviewed the financial position of Furnas. As of December 2010, Furnas reported net revenue of US\$3.9 billion and US\$363.1 million in profits for the year. Total assets were US\$13.6 billion with total liabilities of US\$4.4 billion, of which 93% is long term. Shareholder equity totaled US \$7.9 billion.
- 2.29 Considering the projections through 2018, Furnas is considered financially solid. The main financial indicators are shown under the electronic link, "Financial feasibility analysis, final report. May 2010."
- 2.30 Fitch Ratings gave Furnas an international BBB rating and a AAA (bra) local rating, with stable prospects in both cases.<sup>18</sup> The ratings reflect the link with the parent company, Eletrobras, the fact that Furnas is one of the largest companies in the Eletrobras group, and Furnas's strong cash generation capacity.
- 2.31 Furnas is exposed to the renewal risk for six hydroelectric power concessions ending in the period 2015-2017, including the concessions for the Furnas and LCBC plants considered in this program. These plants have a total installed capacity of 5,008 MW and representing 55% of Furnas's installed capacity. Given the importance of these concessions, Furnas and Eletrobras are negotiating the extension of these concessions with the Government of Brazil for an additional 20 years. The risk of nonrenewal of these concessions is deemed low given the strategic importance of these assets for the Eletrobras holding company. Moreover, this program will be fully executed during the term of the current concession, which contains mechanisms for compensation in the event of early termination of the concession.
- 2.32 **Technical viability.** The program's technical viability is based on the experience of the companies making up the consortia contracted to perform the works and supply equipment (see paragraph 2.17), sound management by Furnas, the technical preparation for the rehabilitation work, the experience gained with the rehabilitation of other power plants, and the involvement of an independent supervisory body to monitor the works (see paragraph 3.2).
- 2.33 Furnas has demonstrated its technical competence in the oversight of works, taking delivery of and bringing eight generators on line, rehabilitating and modernizing six

---

<sup>17</sup> The program's economic net present values (ENPV) are also high at US\$381.5 million and US\$296.8 million, respectively, for the Furnas and LCBC plants, without factoring in the sunken investment costs. If these investment costs are factored in, the ENPV would be US\$157.1 million and US\$46.8 million, respectively, for Furnas and LCBC.

<sup>18</sup> According to the Fitch Ratings report on the risk rating for Furnas – Centrais Elétricas S.A.

more, as well as rejecting equipment when it fails to meet operating requirements. Furthermore, Furnas successfully completed the rehabilitation of another large-scale hydroelectric plant, Mascarenhas de Moraes (476 MW), in 2009.

### III. IMPLEMENTATION PLAN AND MONITORING MECHANISMS

#### A. Execution

- 3.1 **Executing agency.** Furnas will be responsible for execution of the program's technical, administrative, and financial aspects, and is experienced in executing similar projects as demonstrated with the recently completed rehabilitation of the Mascarenhas de Moraes hydroelectric plant. The Power Plant Works and Recovery Division (DRUH.C) of the Furnas Power Generation Construction Department, Corumbá (DGB.C) is responsible for managing the implementation, recovery, and modernization of all undertakings in the power generation sector.
- 3.2 To supervise and control the execution of works, in addition to its internal resources and capacity, Furnas contracted the following companies through bidding processes: (i) For the Furnas plant, Marte Engenharia Ltda.; and (ii) For the LCBC plant, SPEC – Planejamento, Engenharia e Consultoria Ltda. Both companies have ample experience in diverse fields of engineering, management, and supervision of large-scale works, with primary expertise in the energy sector.
- 3.3 **Monitoring and evaluation.** The monitoring system for program execution will use the following instruments to be prepared by the executing agency: (i) annual work plans (AWPs), which, in addition to describing the activities planned for the period reported, will include the agreed actions required to mitigate identified risks; (ii) semiannual reports on progress made with respect to the AWPs; (iii) the outcomes achieved through execution of the activities; and (iv) a plan of action for the following six-month period covering areas requiring corrective measures to improve program performance. **As a condition precedent to the first disbursement, Furnas will submit the AWP for the first year.**
- 3.4 The objective of the evaluation system will be to verify compliance with the targets specified in the Results Matrix (Annex II). To this end, the following instruments will be developed: (i) a performance monitoring report focusing on the achievement of outcomes, to be presented by the executing agency together with the semiannual monitoring reports; (ii) a midterm evaluation to verify compliance with general program execution and progress toward the targets in the Results Framework, to be conducted 18 months after the contract takes effect; and (iii) a final evaluation, six months after program completion, reporting on the outcomes of execution, attainment of the targets in the Results Matrix, and collecting and analyzing lessons learned in the program. The economic evaluation incorporating the program outcomes will be reviewed. Both the midterm and final evaluations will be financed with loan proceeds and will be done by an independent consultant.

- 3.5 **Environmental and social supervision.** Furnas will comply with the environmental and social obligations specified in the ESMR, and implement the actions included in the action plan, which will be reflected in the loan contract. The IDB will verify compliance with the environmental and social obligations specified in the ESMR annually until execution of the works is complete. Upon completion of the works, the IDB and Furnas will agree on the frequency of such verifications.
- 3.6 **Maintenance.** To facilitate proper monitoring of the condition of program works, Furnas will submit an annual maintenance plan to the IDB annually, for five years after completion of the first program works and in the first quarter of the year, including a report on the previous year's management and the planned actions for the following period.
- 3.7 **Special execution conditions.** The following special conditions will be implemented during program execution: (a) environmental and social. Furnas will comply with the environmental and social obligations specified in the ESMR, and implement the actions included in the action plan. The IDB will verify compliance with the environmental and social obligations specified in the ESMR annually until execution of the works is complete. Upon completion of the works, the IDB and Furnas will jointly agree to the frequency of such verifications (see paragraph 3.5); (b) fiduciary management. Furnas will prepare an abridged manual of program-related operations (see paragraph 3.9); and (c) financial statements. Furnas will present the company's audited financial statements in order to allow its financial position to be evaluated and monitored.
- B. Administration**
- 3.8 **Procurement of goods and services.** The works financed by the program are contracted and under execution. The bidding processes for the Furnas and LCBC plants were conducted in 2003 and 2005, respectively, in accordance with Brazilian Procurement Law 8666/93. Although this law does not fully replicate IDB procurement policies, it does comply with the basic principles. In both bidding processes, many international companies submitted bids—16 in the case of Furnas and 14 for LCBC—and each winning consortium includes two foreign companies. In addition, the lowest bidder was awarded the contract, as mandated by law.<sup>19</sup>
- 3.9 **Fiduciary considerations.** The most important fiduciary considerations to be reflected in the loan contract include: (i) disbursements and cash management: ex post semiannual review of disbursements; (ii) accounting and financial reporting: the first simulation of the chart of accounts adapted to the program as part of the SAP business software used by Furnas since January 2010; (iii) external control: Furnas will submit evidence to the IDB's satisfaction that the external financial and accounting audit services for the program and the company have been contracted (see paragraphs 3.12 and 3.13); and (iv) financial management system: prepare an abridged manual of program-related operations. **Special conditions precedent to**

---

<sup>19</sup> See optional electronic links: "Procurement analysis."

the first disbursement: (a) Furnas will submit evidence to the Bank's satisfaction that the external financial and accounting audit services for the program have been contracted or, alternatively, evidence of the commitment of the Comptroller General of the Union (CGU) to perform the audit of the program in accordance with terms of reference acceptable to the Bank; and (b) Furnas will run the first simulation of the chart of accounts adapted to the program as part of the SAP business software used by Furnas.

- 3.10 **Advance of funds.** Advances of funds will be requested by Furnas semiannually in accordance with a financial plan attached to each request. Program resources are expected to be disbursed in accordance with the following schedule:

**Table 2. Tentative disbursement schedule (US\$ millions)**

Source	Year 1	Year 2	Year 3	Year 4	Total	%
<b>IDB</b>	80.4	32.2	13.8	2.3	128.7	84%
<b>Local</b>	6.6	6.8	7.2	3.9	24.5	16%
<b>Total</b>	<b>87.0</b>	<b>39.0</b>	<b>21.0</b>	<b>6.2</b>	<b>153.2</b>	<b>100%</b>

- 3.11 **Timetable of investments and disbursements.** IDB financing will be disbursed over a period of three and a half years after approval of the operation, matching the execution period for the works.
- 3.12 **External audit.** The audit of the Furnas financial statements and the program audit during the term of the loan contract will be conducted annually by an independent external auditing firm, deemed eligible by the IDB to perform the program audit. Alternatively, the program audit may be performed by the CGU.
- 3.13 The program's financial statements for the first year of execution will be audited by the firm contracted by Furnas to conduct the audit, and delivered to the IDB within four months following the end of the fiscal year. Starting in the second year, if no significant problems are identified, the program audit will be incorporated into the Furnas audit report, providing the necessary clarifications in the notes to the financial statements. The program audits included in the Furnas financial statements will be delivered to the IDB annually during the program execution period.

Development Effectiveness Matrix			
Summary			
I. Strategic Alignment			
1. IDB Strategic Development Objectives	Aligned		
Lending Program	The intervention contributes to support climate chance initiatives, renewable energy and environmental sustainability.		
Regional Development Goals	The intervention contributes to protect the environment, responding to climate change, promoting renewable energy, and enhancing food security. Indicator: Stabilization of CO2 equivalent emissions (metric tons per habitant).		
Bank Output Contribution (as defined in Results Framework of IDB-9)	The intervention contributes to the Bank's outputs: Infrastructure for competitiveness and social welfare (Km of electricity transmission and distribution lines installed or upgraded), and protecting the environment, responding to climate change, promoting renewable energy, and enhancing food security (Percentage of power generation capacity from low-carbon sources over total generation capacity funded by IDB).		
2. Country Strategy Development Objectives	Aligned		
Country Strategy Results Matrix	In preparation	The project is consistent with the priorities established in the preparation of the Bank's Country Strategy with Brazil for the period 2011-2014, where a strategic issue is the rehabilitation and modernization of hydropower.	
Country Program Results Matrix	GN-2617	The intervention is included in the 2011 Country Program Document.	
Relevance of this project to country development challenges (If not aligned to country strategy or country program)			
II. Development Outcomes - Evaluability	Highly Evaluable	Weight	Maximum Score
	8.3		10
3. Evidence-based Assessment & Solution	9.9	25%	10
4. Ex ante Economic Analysis	10.0	25%	10
5. Monitoring and Evaluation	5.7	25%	10
6. Risks & Mitigation Monitoring Matrix	7.5	25%	10
Overall risks rate = magnitude of risks*likelihood	Low		
Environmental & social risk classification	B		
III. IDB's Role - Additionality			
The project relies on the use of country systems (VPC/PDP criteria)	yes	The project relies on the use of all financial management sub-systems.	
The project uses another country system different from the ones above for implementing the program			
The IDB's involvement promotes improvements of the intended beneficiaries and/or public sector entity in the following dimensions:			
Gender Equality			
Labor			
Environment	yes	The management capacity of environmental, social and health and teh safety of the Program and the Company, which are set out in the Environmental, Health adn Safety Action Plan (PAASS) which takes into account the recommendations made in the IGAS and agreed with Furnas.	
Additional (to project preparation) technical assistance was provided to the public sector entity prior to approval to increase the likelihood of success of the project			
The ex-post impact evaluation of the project will produce evidence to close knowledge gaps in the sector that were identified in the project document and/or in the evaluation plan.			

The problems to be attacked by the project are clearly stated, as the factors that contributed to them. The magnitudes of the deficiencies for each factor and the relationship between them are presented. The expected outcomes are specific and measurable but do not cover all the economic benefits presented in the cost/benefit analysis. The project has vertical logic and the indicators presented in the results matrix are SMART.

The project has a monitoring and evaluation plan but does not specify the budget required for monitoring. The cost-benefit analysis generates internal rates of return above 12%, and will be replicate at the end of the project as part of its evaluation. The risks are classified and presented mitigation measures, but there are not indicators, baselines and targets to monitor mitigation measures progress.

BRAZIL: Rehabilitation Program for the “Furnas” and “Luiz Carlos Barreto de Carvalho” Hydroelectric Power Plants (BR-L1278)					
Results Matrix					
<b>Program objective</b>	The objective of the hydroelectric power plant rehabilitation and modernization program is to help restore and conserve the capacity to generate electric power from renewable sources, with a significant impact on energy efficiency and greenhouse gas emissions. The program’s specific objectives are to finance the rehabilitation and modernization of the Furnas hydroelectric power plant (1,216 MW) and the Luiz Carlos Barreto de Carvalho hydroelectric power plant (1,050 MW) to: (i) restore power generation capacity; (ii) increase maintenance efficiency and reliability, while reducing downtime and costs; (iii) increase the service life of the plants; and (iv) upgrade the technology.				
<b>Output indicator</b>	<b>Baseline December 2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Furnas HPP. Refurbished generators (G)	3 (G-04, G-05, and G-06)	1 (G-03)	1 (G-02)	2 (G-01 and G-07)	1 (G-08)
LCBC HPP. Refurbished generators (G)	3 (G-01, G-02, and G-03)	1 (G-05)	1 (G-04)	1 (G-06)	
<b>Outcome indicator</b>	<b>Baseline (2004-2005 average)</b>	<b>Target level December 2013</b>	<b>Verification source</b>	<b>Frequency of verification</b>	
Reduction in the equivalent forced outage rate (%)	3.53	1.05	ONS publication	monthly	
Reduction in the equivalent scheduled outage rate (%)	6.57	1.95	ONS publication	monthly	
Increase in the availability index (%)	89.9	97.00	ONS publication	monthly	
Increase in average power (Furnas + LCBC) (average MW)	982.6	1,060.2	Furnas, Annual Report	annual	
Reduction in operating and maintenance costs (R\$/MWh)	2.19	1.62	Furnas, Annual Report	annual	

**PROCUREMENT PLAN**  
**REHABILITATION PROGRAM FOR THE “FURNAS” AND “LUIZ CARLOS BARRETO DE**  
**CARVALHO” HYDROELECTRIC POWER PLANTS**  
**(BR-L1278)**

This program has no procurement plan because all procurements have already been completed and are in execution. Two bidding processes were conducted in accordance with the Brazilian Procurement Law 8666/93 for the execution of works at the Furnas and the Luiz Carlos Barreto de Carvalho hydroelectric power plants. No additional procurements are anticipated. Information on procurement recognized by the program is summarized in the loan proposal and analyzed in detail in the program’s “procurement analysis”.<sup>1</sup>

---

<sup>1</sup> Program procurement analysis <http://idbdocs.iadb.org/wsdocs/getDocument.aspx?DOCNUM=35165610>

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

PROPOSED RESOLUTION DE-\_\_\_/11

Brazil. Loan \_\_\_/OC-BR to FURNAS - CENTRAIS ELÉTRICAS S.A.  
Rehabilitation Program for the “Furnas” and “Luiz Carlos  
Barreto de Carvalho” Hydroelectric Power Plants

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the FURNAS - CENTRAIS ELÉTRICAS S.A., as Borrower, and with Federative Republic of Brazil, as Guarantor, for the purpose of granting the former a financing to cooperate in the execution of the rehabilitation program for the “Furnas” and “Luiz Carlos Barreto de Carvalho” hydroelectric power plants. Such financing will be for an amount of up to US\$128,660,000 from the Single Currency Facility of the Ordinary Capital resources of the Bank, and will be subject to the Financial Terms and Conditions and the Special Contractual Conditions of the Project Summary of the Loan Proposal.