INTERNATIONAL EXPERIENCE WITH PRIVATE SECTOR PARTICIPATION IN POWER GRIDS

BRAZIL CASE STUDY
ESMAP Mission
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The International Bank for Reconstruction
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See synthesis report (No. 99009):

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CONTENTS

ACRONYMS ................................................................................................................................. II
BRAZIL CASE STUDY ...................................................................................................................... 1

1. RECENT HISTORY OF THE LEGAL AND INSTITUTIONAL DEVELOPMENT OF BRAZIL’S POWER SECTOR .......... 1
   1.1 Situation between 1985 and 1995 ....................................................................................... 1
   1.2 Initial Phase of the Reforms (1993-1995) ........................................................................... 2
   1.3 Restructuring Brazil’s Power Sector .................................................................................... 3
   1.5 Revitalization of Brazil’s Power Sector: 2001 - 2002......................................................... 5
   1.6 New Model for Brazil’s Power Sector ................................................................................. 5

2. OVERVIEW OF PHYSICAL DEVELOPMENT AND IMPLEMENTATION OF THE REFORMS ....... 7
   2.1 Operating Characteristics of Energy Optimization .............................................................. 7
   2.2 Electricity Consumer Market ............................................................................................. 8
   2.3 Generation ......................................................................................................................... 14
   2.4 Transmission .................................................................................................................... 18
   2.5 Distribution ....................................................................................................................... 20
   2.6 Free Trading ..................................................................................................................... 21

3. CURRENT INSTITUTIONAL ARRANGEMENTS ..................................................................... 25
   3.1 Policy Preparation ............................................................................................................. 25
   3.2 Sector Planning ................................................................................................................ 25
   3.3 Regulation and Oversight ................................................................................................. 27
   3.4 Operations ....................................................................................................................... 27
   3.5 Electricity Consumption Market ...................................................................................... 28
   3.6 Charges and Taxes .......................................................................................................... 30

4. FACTORS PROMPTING THE NEED FOR PRIVATE SECTOR PARTICIPATION ................ 33

5. BASIC CONDITIONS FOR IMPLEMENTING PRIVATE SECTOR PARTICIPATION .............. 36
   5.1 Laws and Legislation ....................................................................................................... 36
   5.2 Economic Aspects ........................................................................................................... 42
   5.3 Economic Regulation for Leveraging the Participation of Private Capital ....................... 44
   5.4 Aspects of Private Capital Participation in the Transmission and Distribution Segments.... 48

6. CONCESSION AWARD MECHANISMS .............................................................................. 49
   6.1 Transmission Segment .................................................................................................... 49
   6.2 Distribution Segment ..................................................................................................... 50

7. LESSONS LEARNED AND IMPROVEMENTS PURSUED ............................................... 53

8. FINAL REMARKS ............................................................................................................... 54
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Meaning in Portuguese</th>
<th>Meaning in English</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACL</td>
<td>Ambiente de Contratação Livre</td>
<td>Free Trading Environment</td>
</tr>
<tr>
<td>ACR</td>
<td>Ambiente de Contratação Regulada</td>
<td>Regulated Trading Environment</td>
</tr>
<tr>
<td>ANEEL</td>
<td>Agência Nacional de Energia Elétrica</td>
<td>National Agency of Electric Energy</td>
</tr>
<tr>
<td>ANP</td>
<td>Agência Nacional do Petróleo, Gás Natural e Derivados</td>
<td>Oil, Gas and Biofuels Industry Regulator</td>
</tr>
<tr>
<td>BEN</td>
<td>Balanço Energético Nacional</td>
<td>National Energy Balance</td>
</tr>
<tr>
<td>CAR</td>
<td>Curva de Aversão a Risco</td>
<td>Risk Aversion Curve</td>
</tr>
<tr>
<td>CCC</td>
<td>Conta Consumo de Combustíveis</td>
<td>Fuel Consumption Account</td>
</tr>
<tr>
<td>CCEAR</td>
<td>Contrato de Compra de Energia no Ambiente Regulado</td>
<td>Electricity Trading Agreements on the Regulated Floor</td>
</tr>
<tr>
<td>CCEE</td>
<td>Câmara de Comercialização de Energia Elétrica</td>
<td>Electricity Trading Chamber</td>
</tr>
<tr>
<td>CCI</td>
<td>Contrato de Compartilhamento de Instalações</td>
<td>Facility Sharing Agreement</td>
</tr>
<tr>
<td>CCT</td>
<td>Contrato de Conexão do Sistema de Transmissão</td>
<td>Transmission Connection Agreement</td>
</tr>
<tr>
<td>CDE</td>
<td>Conta de Desenvolvimento Energético</td>
<td>Energy Development Account</td>
</tr>
<tr>
<td>CFURH</td>
<td>Compensação Financeira por Uso de recursos Hídricos</td>
<td>Financial Compensation for the Use of Water Resources</td>
</tr>
<tr>
<td>CGH</td>
<td>Complexo de Geração Hidrelétrica</td>
<td>Hydro-power Generation</td>
</tr>
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<td>CGU</td>
<td>Central de Geração Undi-Elétrica</td>
<td>Wave Power Plant</td>
</tr>
<tr>
<td>CIP</td>
<td>Contribuição de Iluminação Pública</td>
<td>Street Lighting Levy</td>
</tr>
<tr>
<td>CMSE</td>
<td>Comitê de Monitoramento do Setor Elétrico</td>
<td>Power Sector Oversight Committee</td>
</tr>
<tr>
<td>CNPE</td>
<td>Conselho Nacional de Política Energética</td>
<td>National Energy Policy Council</td>
</tr>
<tr>
<td>COFINS</td>
<td>Contribuição para o Financiamento da Seguridade Social</td>
<td>Social Security Financing Levy</td>
</tr>
<tr>
<td>CPST</td>
<td>Contrato de Prestação de Serviços de Transmissão</td>
<td>Transmission Services Agreement</td>
</tr>
<tr>
<td>CRC</td>
<td>Conta de Resultados a Compensar</td>
<td>Account of Results to Compensate</td>
</tr>
<tr>
<td>CUST</td>
<td>Contrato de Uso dos Sistemas de Transmissão</td>
<td>Transmission System Usage Agreement</td>
</tr>
<tr>
<td>DNAEE</td>
<td>Departamento Nacional de Águas e Energia Elétrica</td>
<td>National Waters and Electricity Department</td>
</tr>
<tr>
<td>DNPM</td>
<td>Departamento Nacional de Produção Mineral</td>
<td>National Mineral Production Department</td>
</tr>
<tr>
<td>EER</td>
<td>Encargo de Energia de Reserva</td>
<td>Energy Reserve Charge</td>
</tr>
<tr>
<td>EOL</td>
<td>Usina de Geração Elétrica</td>
<td>Wind farm</td>
</tr>
<tr>
<td>EPE</td>
<td>Empresa de Pesquisa Energética</td>
<td>Energy Research Enterprise</td>
</tr>
<tr>
<td>ESS</td>
<td>Encargo de Serviços de Sistema</td>
<td>System Services Charge</td>
</tr>
<tr>
<td>GCOI</td>
<td>Grupo de Coordenação para Operação Interligada</td>
<td>Interconnected Operations Coordination Group</td>
</tr>
<tr>
<td>GDP</td>
<td>Produto Interno Bruto (PIB)</td>
<td>Gross Domestic Products</td>
</tr>
<tr>
<td>GWh</td>
<td>Gigawatt-hora – unidade de energia</td>
<td>Gigawatt-hour, energy unit</td>
</tr>
<tr>
<td>HV</td>
<td>Alta Tensão</td>
<td>High Voltage</td>
</tr>
<tr>
<td>IBGE</td>
<td>Instituto Brasileiro de Geografia e Estatística</td>
<td>Brazilian Institute for Geography and Statistics</td>
</tr>
<tr>
<td>ICMS</td>
<td>Imposto sobre Circulação de Mercadorias e Serviços</td>
<td>State Goods and Services Circulation Tax</td>
</tr>
<tr>
<td>kV</td>
<td>Kilo-volt, unidade de diferença de potencial elétrico</td>
<td>Kilo-volt, electric potential difference unit</td>
</tr>
<tr>
<td>kW</td>
<td>Kilo-Watt</td>
<td>Kilo-Watt, power unit</td>
</tr>
<tr>
<td>LV</td>
<td>Baixa Tensão</td>
<td>Low Voltage</td>
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<tr>
<td>MAE</td>
<td>Mercado Atacista de Energia</td>
<td>Wholesale Electricity Market</td>
</tr>
<tr>
<td>MCTI</td>
<td>Ministério da Ciência, Tecnologia e Inovação</td>
<td>Ministry of Science, Technology and Innovation</td>
</tr>
<tr>
<td>MME</td>
<td>Ministério de Minas e Energia</td>
<td>Ministry of Mines and Energy</td>
</tr>
<tr>
<td>MV</td>
<td>Média Tensão</td>
<td>Medium Voltage</td>
</tr>
<tr>
<td>MVA</td>
<td>Mega Volt-Ampère, unidade de potência</td>
<td>Mega Volt-Ampère, power unit</td>
</tr>
<tr>
<td>MW</td>
<td>Mega-vat, unidade de potência</td>
<td>Mega-watt, power unit</td>
</tr>
<tr>
<td>MWav</td>
<td>Mega-vat médio</td>
<td>Average Mega-watt, energy unit</td>
</tr>
<tr>
<td>NRV</td>
<td>New Replacement Value</td>
<td></td>
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<tr>
<td>ONG</td>
<td>Organização Não-Governamental</td>
<td>Non-Governmental Organization (NGO)</td>
</tr>
<tr>
<td>ONS</td>
<td>Operador Nacional do Sistema</td>
<td>National System Operator</td>
</tr>
<tr>
<td>P&amp;D</td>
<td>Pesquisa e Desenvolvimento</td>
<td>Research and Development</td>
</tr>
<tr>
<td>PAR</td>
<td>Plano de Ampliações e Reforços</td>
<td>Expansion and Strengthening Plan</td>
</tr>
<tr>
<td>PCH</td>
<td>Pequena Central Hidrelétrica</td>
<td>Small Hydro-power Plants</td>
</tr>
<tr>
<td>PDE</td>
<td>Plano Decenal de Energia</td>
<td>Ten-Year Energy Plan</td>
</tr>
<tr>
<td>PET</td>
<td>Programa de Expansão da Transmissão</td>
<td>Transmission Expansion Program</td>
</tr>
<tr>
<td>PIE</td>
<td>Produtor Independente de Energia</td>
<td>Independent Power Producer (IPP)</td>
</tr>
<tr>
<td>PIS</td>
<td>Programa de Integração Social</td>
<td>Social Integration Program</td>
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<tr>
<td>Acronym</td>
<td>Meaning in Portuguese</td>
<td>Meaning in English</td>
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<tr>
<td>PLD</td>
<td>Preço de Liquidação de Diferenças</td>
<td>Differences Settlement Price</td>
</tr>
<tr>
<td>PNE</td>
<td>Plano Nacional de Energia</td>
<td>National Energy Plan</td>
</tr>
<tr>
<td>PROINFA</td>
<td>Programa de Incentivo a Fontes Alternativas</td>
<td>Alternative Electricity Sources Incentive Program</td>
</tr>
<tr>
<td>RAP</td>
<td>Receita Anual Permitida</td>
<td>Permitted Annual Revenue</td>
</tr>
<tr>
<td>RESEB</td>
<td>Projeto de Reestruturação do Setor Elétrico Brasileiro</td>
<td>Brazilian Power Sector Restructuring Project</td>
</tr>
<tr>
<td>RGR</td>
<td>Reserva Global de Reversão</td>
<td>Global Reversion Reserve</td>
</tr>
<tr>
<td>SOL</td>
<td>Usina de Geração Solar</td>
<td>Solar Power Plant</td>
</tr>
<tr>
<td>TFSEE</td>
<td>Tarifa de Fiscalização de Serviços de Energia Elétrica</td>
<td>Electricity Services Inspection Fee</td>
</tr>
<tr>
<td>TUSD</td>
<td>Tarifa de Uso do Sistema de Distribuição</td>
<td>Distribution System Usage Tariff</td>
</tr>
<tr>
<td>TUST</td>
<td>Tarifa de Uso do Sistema de Transmissão</td>
<td>Transmission System Usage Tariff</td>
</tr>
<tr>
<td>TWh</td>
<td>Terawatt-hora, unidade de energia</td>
<td>Terawatt-hora, energy unit</td>
</tr>
<tr>
<td>UBP</td>
<td>Uso do Bem Público</td>
<td>Use of a Public Asset</td>
</tr>
<tr>
<td>UFV</td>
<td>Usina de Geração Fotovoltaica</td>
<td>Photovoltaic Power Plant</td>
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<tr>
<td>UHE</td>
<td>Usina Hidrelétrica</td>
<td>Hydro-power Plant</td>
</tr>
<tr>
<td>UTE</td>
<td>Usina Termelétrica</td>
<td>Thermo-Power Plant</td>
</tr>
<tr>
<td>UTN</td>
<td>Usina Nuclear</td>
<td>Nuclear Power Plant</td>
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BRAZIL CASE STUDY

1. RECENT HISTORY OF THE LEGAL AND INSTITUTIONAL DEVELOPMENT OF BRAZIL’S POWER SECTOR

1.1 Situation between 1985 and 1995

During the late 1980s and early 1990s, the Brazilian economy faced a series of disruptions, with spurs of hyperinflation (topping 1000% a year) that were addressed through a series of short-lived ‘heterodox economic plans’ of doubtful efficacy. The result was an across-the-board shortage of investments, followed by stagnation and shrinkage of the production capacity in several industrial sectors.

The power sector – which consisted almost exclusively of enterprises under Federal and State control – was severely affected by the repercussions of this negative phase for the Brazilian economy. The tariffs for sales between generators and distributors (wholesale trading) and from the latter to end-consumers (retail sales) were all established by the Brazilian Government. Frequently used as tools for curbing inflation, they fell well below the real costs of the services rendered. As demonstrated below, these tariff constraints had severe consequences for the power generation, transmission and distribution segments in Brazil.

On the supply side, new generation sources (mainly hydro-based) appeared during the late 1980s, with relative growth underpinned by massive construction projects undertaken during the previous decade, which started to come on-stream only around that time, including the Itaipu, Xingó and Tucuruí power generation complexes. However, investment shortfalls halted several other major power generation projects for more than a decade, such as Porto Primavera, Itá and Machadinho, where work began again only after 1995, with the beginning of the restructuring of the power sector and an inflow of private investments.

Sized to bridge vast distances between hydro-power generation sources and major consumption centers, Brazil’s high voltage interconnected transmission system was implemented and operated by power generation utilities, with the resulting costs embedded in power sold to distributors. Thus, interconnection projects for the transmission segment encountered resistance in terms of recovery through tariffs, when not directly associated with an expansion in power generation capacities. This meant that the generation utilities gave a lower priority to such investments, aimed largely for the optimization of the power transmission facilities in the system.

In terms of the enterprises rendering electricity distribution services to end-consumers, generally under State Government control, little effort was directed towards seeking greater efficiency, cost controls or higher earnings. The tariffs set by the Brazilian Government were aimed to even out the rates equally for every State in Brazil. This approach proved inadequate as it failed to attract investment needed to keep pace with the expansion of the customer base, leaving many families without electricity. Moreover, a drop in maintenance activities was noted in many cases, with adverse effects on service quality.

In order to deal with the generic problem of artificial tariffs set at inappropriately low levels in Brazil, the legal framework in place until 1993 established an Earnings Compensation Account (Conta de Resultados a Compensar – CRC). Covered by the National Treasury, this mechanism was intended to ensure a return
at between 10% and 12% on the investments guaranteed to each agent in the power sector, regardless of the tariffs actually in place. Thus, agents obtaining a return of over 12% would pay into this account, while those receiving less than 10% could draw down on its funds.

Unfortunately, the economic trigger used for this type of mechanism, together with the depressed tariff levels, resulted in incentives for agents to post negative earnings and discouraging more efficient business practices. The burden of supporting inefficiently operating companies was borne by the National Treasury and ultimately the Brazilian taxpayers.

A clear awareness of these problems is apparent in the preparation and promulgation of Brazil’s 1988 Constitution, which established that only the Federal Government would be in charge of services and activities linked to power services in Brazil, handled either directly, or through concessions. Tenders would be required to select the concessionaires, either public or private.

This was the situation of the Brazilian power sector during the 1990s, fraught with difficulties and with its intra-sector payment flows severely undermined by the financial situation of the concessionaires, almost all under State control. Quite naturally, many new power generation, transmission and distribution projects ground to a halt, or never even got off the ground, with collateral effects on the construction and equipment industries working with this sector.

1.2 Initial Phase of the Reforms (1993-1995)

The first legal initiative addressing the stagnation spreading through Brazil’s power sector, based on the country’s 1988 Constitution, was the 1993 Law Nº 8,631, which: (i) eliminated the guaranteed return of 10% to 12% and the Earnings Compensation Account (CRC); (ii) supported transferring more than US$ 26 billion from the National Treasury to electricity concessionaires that were CRC creditors; and (iii) required the signature of new supply agreements between generators and distributors, with firm guarantees in case of default.

Although this initial effort was relatively successful, at least three significant problems remained unresolved: (i) the distributors remained under State control, with guidelines that generally ran counter to the logic of business efficiency; (ii) under Federal Government control and with limited Federal budget allocations, the generators were still unable to keep pace with the demands to expand installed capacity; and (iii) transmission lines still offered no specific rates of return for the agents in charge of their construction and operation.

Two years later, another important legal milestone was established for the power sector: Law Nº 9,074/1995, which introduced sweeping changes to its structure and administration. With this law: (i) the Independent Power Producer (IPP) was introduced; (ii) open access was established for the transmission and distribution systems; (iii) consumers with installed capacity of 3 MW and upwards, called Free Consumers, were offered the possibility of selecting their own independent electricity supplier, from the point at which they were connected to the grid; (iv) all concession agreements had to be reviewed and renewed, imposing compliance with specific requirements, such as the completion of unfinished projects; and (v) specific incentives were offered for privatizing distribution and generation utilities, extending concession agreements by an extra period of ten to fifteen years, as set forth in Articles 27 to 30 of this law.
1.3 Restructuring Brazil’s Power Sector

In order to handle the implementation of major modifications established by law for Brazil’s power sector, the Federal Government, through the Ministry of Mines and Energy (MME) conducted a study called the Brazilian Power Sector Restructuring Project (RESEB). Under the aegis of this study, efforts were made not only to establish the new institutional resources required, but also to look even further ahead, recommending new modifications that would usher in conditions, through a set of legal and regulatory aspects that would:

- ensure ongoing supplies over the short term, during the transition process, and for the long term, by ensuring that investments in this sector are attractive, underwriting the expansion of the system and its extension into new areas;

- establish and upgrade the efficiency with which resources are deployed by the sector, while encouraging better use of electricity throughout the economy; and

- cut back on Government spending, attracting private capital in order to finance new investments and repay public debt through income brought in by divestment.1

Thus, between 1996 and 1998, several recommendations were presented through this Restructuring Project, drawn up by the joint efforts of international consultants and more than three hundred specialists familiar with this sector in Brazil, which were either implemented or submitted to the legislative process as they were introduced. In brief, the main institutions and characteristics recommended by this restructuring process of the Brazilian power sector were:

- Unbundling its basic activities into separate segments (generation, transmission, distribution, and trading/marketing);

- Generation should become a competitive activity at the risk of the entrepreneur, with prices set by the market;

- Independent transmission facilities that would ensure open access by generators to the market, with free consumers allowed to access sources of generation or free traders competing to render their services;

- Only power transportation activities in the transmission and distribution segments are natural monopolies, with prices established by the Grantor Authority2;

- The National System Operator (ONS) handles the generation and transmission systems independently, seeking optimal utilization of available energy resources and enabling the institution of open access to promote competition in the market;

- The Wholesale Electricity Market (MAE) is the setting where free competition underpins price formation, without adversely affecting optimization;

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1 Projeto RESEB, Estágio I – Relatório Sumário, November 1996, Coopers&Lybrand / Eletrobras
2 Grantor Authority: notion commonly used in the Brazilian legal framework. It is related to the Union, the States, the District of Columbia or the County responsible for the public service that is being conceded to third parties, preceded or not by assets’ construction.
• An Independent Regulator serves as a watchdog for this model, interpreter of specific legislation, and guarantor of stability of rules; and

• Finally, boosting supply as an investment opportunity can be left to the market agents.


Virtually all of the recommendations above, if not already implemented in the 1995 act, were addressed by two subsequent laws:

• Law Nº 9,427/1996, which established Brazil’s Power Sector Regulator (ANEEL), as an Independent Entity; and

• Law Nº 9,648/1998, which established the National System Operator (ONS) and the Wholesale Electricity Market (MAE), and turned the construction and operation of transmission assets into an independent business, with its own source of revenue in the form of user payments.

In parallel to these legal measures, the Federal Government was also firmly committed to establishing an energy market that would be trustworthy enough to lower the perception of risk among private investors, attracting their capital to this sector. This has led to massive efforts to privatize the main sources of revenues brought in by power generation and transmission facilities that sold and delivered power at the wholesale level, rather than distributors whose focus is on end-use or retail-level consumers as their customers.

In fact, during the implementation of this restructuring process, due to the need and urgency of certain initiatives, some activities were undertaken even before the completion of the full legal and institutional framework as planned, or even the presentation of the studies examining these issues. This resulted in discrepancies between what actually took place and subsequent recommendations, particularly with regard to some policies during the initial stages. A typical example of this situation is the strong initial incentive for self-contracting, which opened up the possibility of the business group of a specific distribution utility purchasing power directly from a generation source owned directly thereby, with the economic constraint being a price cap established by the Regulator.

Despite some missteps and trip-ups during the implementation stage of this restructuring process, which is quite natural when so many agents, interests and segments of society are involved, it became very clear that the Brazilian power sector had reached a level of activity that was significantly higher than during the previous decade, with significant stakes held by private capital in the generation and transmission segments, as well as in distribution. However, this significant improvement in the management of the enterprises and the build-up of new assets for rendering power-related services was still not sufficient to keep pace with the surging demand triggered by the economic stability achieved by Brazil from 1995 onwards.

Consequently, between mid 2001 and early 2002, when the country was afflicted by a severe drought, the Government was forced to implement and administer a large-scale electricity consumption restriction program, with cuts of around 20% planned for the period. The consequences of this situation were severe, with a slowdown in economic activities nationwide. On the other hand, this was also a great opportunity for the people in charge of policy guidelines to reassess the approaches used in the restructuring of Brazil’s power sector that began in 1995.
1.5 Revitalization of Brazil’s Power Sector: 2001 - 2002

As a structural response to the power supply crisis that erupted at that time, the Brazilian Government accepted the responsibility of correcting dysfunctional aspects and proposing improvements to the institutional arrangements in place. This effort resulted in a new momentum in the development of: (i) institutions, stressing the planning and coordination role of the Ministry of Mines and Energy (MME) in striving to ensure expansion and security of supply, and transparency in the actions of institutional agents; (ii) interfaces between the market and regulated sectors, seeking out accurate economic signals for energy prices as well as transmission facility use; (iii) mechanisms to ensure fair competition by unbundling the G/T/D segments and buttressing the neutral stance of the ONS; and (iv) the tariff structure seeking to match actual cost of service in each consumer segment, with universal access to electricity and regulations establishing special tariffs for low income consumers.

These efforts led to measures that were proposed and adopted in laws ³ that eliminated self-contracting and bilateral negotiations of power purchases from distributors, establishing open and competitive procedures for all future acquisitions.

These measures coincided with a Presidential election, in a year when the party that had been in opposition during this entire preparation and implementation stage of the restructuring of Brazil’s power sector (1995-2002) was victorious in the polls. The immediate impact of this shift in power on the restructuring process that was still in its initial phase was a natural slowdown, as Brazil’s new Administration sought its own political guidelines for the Power Sector.

1.6 New Model for Brazil’s Power Sector

In order to correct the course and make up for the traumas experienced on the eve of its election, this new Administration established three key goals for the policies that were to be drawn up for the power sector: (i) all suggested solutions would have to guarantee national energy security, soothing fears of a new round of rationing, similar to the rationing that occurred between 2001 and 2002; (ii) on the other hand, consumers also required protection from overly high tariffs; and (iii) universal access to electricity services was established as a goal, bringing more than ten million citizens in from the dark.

The reforms implemented from 2003 onwards, called the New Model for Brazil’s Power Sector, may be described in the words of the person who actually conducted this process, today’s Brazilian President Dilma Rousseff, who at that time was the Minister of Mines and Energy. She said ⁴: “Many sweeping changes were introduced in the power sector. The distribution, generation and transmission activities were effectively separated, ensuring greater transparency for setting the tariffs charged to consumers. Genuine competition was established in the power generation segment, with separate tenders run for existing power plants, resulting in easier access to long term financing and credit for new enterprises. This ensured far greater confidence in completing the projects on schedule, lessening the perception of risk among investors.

Auctions expanding supplies allowed benchmark prices to form, lost since the late 1980s, but crucial for the functioning of any market. The format of these auctions and the auctions for energy generated by

³ Laws Nº 10,438, April 2002, and 10,604, December 2002, with the latter already in common agreement with the Administration taking office in January 2003.

⁴ Preface to the book entitled “Power Sector Reform in Brazil” by Maurício T. Tolmasquim
existing power plants helped ensure fair tariffs. Contractual guarantee mechanisms were introduced in order to minimize the risks of default, leaving the energy market more robust, while also contributing to fair tariffs.

The State was equipped with the tools for ensuring the effective functioning of the market, while respecting the characteristics of Brazil’s power sector. In order to re-establish these State prerogatives of planning long term strategic solutions, while encouraging the full functioning of the market and ensuring respect for the rights of citizens consuming or with the right to consume energy, the Power Sector Oversight Committee (CMSE) was set up, in order to monitor service conditions and decide on the steps needed to avoid further bouts of rationing, in addition to the Energy Research Enterprise (EPE), which handles planning and helps ensure the feasibility of competition. Supplementing them, the roles, limits and responsibilities of agents in this sector, especially the Ministry of Mines and Energy (MME), the Power Sector Regulator (ANEEL), the National System Operator (ONS) and the Electricity Trading Chamber (CCEE), were clearly defined.

These State actions, ultimately benefitting the consumers, are reflected in the guidelines for the auctions run to expand power supplies across the board, while also guaranteeing competition in auctioning off the Madeira and Belo Monte power plants. The actions of these entities must also be credited with the success of the reserve energy auctions through which massive quantities of renewable energy – particularly bio-electricity and wind farms – were contracted, with intense competition among investors and resulting benefits for consumers.

These were important changes. Correcting the course and clearly defining the regulatory framework paved the way for stability and conditions that fostered investments. Through these new institutional arrangements, the paralysis in project implementation was resolved, with significant investments in expanding supplies and less uncertainty in project execution.

Although creating new paradigms, these changes were also implemented in close compliance with the contracts in effect at that time, clearly indicating stability in the legal arrangements. Even when it would obviously have been more advantageous to migrate from the previous system to the New Model, investors were given the option to retain, if so desired, all the rights given to them in the current contract.”

Promulgated in March 2004, Laws N° 10,848 and 10,847 and all their accompanying regulations implemented the modifications described above. It is worth noting that this new model in fact reflected a forward-looking movement that advanced and improved the reforms that began a decade earlier, adding new purposes, such as universal access to electricity, while upholding the main guidelines underpinning open access to the transmission facilities, the engagement of private capital in the enterprises, the existence of a free electricity market between major consumers and independent power producers, and many other positive features that were already in place.
2. OVERVIEW OF PHYSICAL DEVELOPMENT AND IMPLEMENTATION OF THE REFORMS

2.1 Operating Characteristics of Energy Optimization

Brazil has a power system whose characteristics are unique, not found anywhere else in the world. With hydropower prevailing (85% of installed capacity and more than 90% of average energy produced), these generation plants are scattered all over the country.

Due to the climate diversity that is characteristic of a continent-size country such as Brazil, with different rainfall patterns, a hydro-based system complemented by thermal power was adopted, with centralized dispatch, in order to offset the heterogeneity of drier and rainier regions, ensuring more reliable supplies while optimizing the dispatch from the cost of generation perspective.

However, this type of dispatch requires massive electricity transfers between generation sources and load centers, which are not always near. This is why a transmission system that can handle huge loads safely and reliably is needed. According to data from the National System Operator (ONS), only 3.4% of Brazil’s electricity production capacity is located off the National Interconnected System, in so-called Stand-Alone Systems, located mainly in the Amazon.

The National Interconnected System encompasses the South, Southeast, Center-West, Northeast and part of Northern Brazil. In 2010, this comprised some 900 transmission lines, totaling 98,648 kilometers at voltages higher than 230 kV, known as the Basic Grid. Due to these characteristics, Brazil is an electrically well-integrated country, with the transmission system expansion costs being comparable to investments in generation facilities, resulting in strong links between planning and expansion decisions in these two segments.

The Stand-Alone Systems are supplied mainly by thermal power plants fueled by diesel oil and fuel oil, in addition to Small Hydro-power Plants (PCHs) and plants running on biomass. Although not exchanging electricity with other parts of the country, these stand-alone systems power four State Capitals in Northern Brazil, with some 1.3 million consumers.

The National Interconnected System encompasses Federal and State enterprises as well as private companies generating power from a variety of sources, as well as electricity transmission, distribution, and trading companies – awarded rights as concessionaires, permit holders, or authorization holders under various legal mechanisms. Two types of end consumers then use the power produced by this system: free and regulated.

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5 "Transmission Structure in Brazil: Organization, Evaluation and Trends" - Luiz Augusto Barroso, Member, IEEE, José Marcos Bressane, Luiz M. Thomé, Max Junqueira, Ivan Camargo, Senior Member, IEEE, Gerson Oliveira, Silvio Binato, Mario Veiga Pereira, Member, IEEE – IEEE, 2004
For the Stand-Alone Systems, whose generation costs are higher than those of the National Interconnected System, power supplies to local populations are subsidized by a specific charge on this sector, imposed on purchases of the fuel oil used by thermal power plants in these regions, until they are connected up to the National Interconnected System.

The National Interconnected Power System of Brazil: 2010

![Map of the National Interconnected Power System of Brazil: 2010](http://www.ons.org.br/download/biblioteca_virtual/publicacoes/dados_relevantes_2010/0401_integracao_energetica.html)

2.2 Electricity Consumer Market

Brazil has some 190 million inhabitants, according to estimates by the Brazilian Institute for Geography and Statistics (IBGE). In 2010, some 98% of its population had access to electricity.

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According to the Energy Research Enterprise (EPE), Brazil has more than 67.9 million consumer units, divided between captive and free. The following tables show the evolution of the number of captive and free customers in Brazil between 2006 and 2010.

### TOTAL NUMBER OF CONSUMERS (CAPTIVE + FREE)

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>58,979,698</td>
<td>61,072,066</td>
<td>63,367,452</td>
<td>65,528,441</td>
<td>67,906,964</td>
</tr>
<tr>
<td>Residential</td>
<td>50,318,859</td>
<td>52,057,460</td>
<td>54,156,879</td>
<td>55,949,403</td>
<td>58,006,079</td>
</tr>
<tr>
<td>Industrial</td>
<td>515,618</td>
<td>525,504</td>
<td>528,953</td>
<td>536,545</td>
<td>553,589</td>
</tr>
<tr>
<td>Commercial</td>
<td>4,431,013</td>
<td>4,528,838</td>
<td>4,635,006</td>
<td>4,794,546</td>
<td>4,901,920</td>
</tr>
<tr>
<td>Rural</td>
<td>3,163,016</td>
<td>3,385,448</td>
<td>3,439,007</td>
<td>3,613,254</td>
<td>3,784,428</td>
</tr>
<tr>
<td>Government</td>
<td>435,944</td>
<td>451,633</td>
<td>471,086</td>
<td>490,520</td>
<td>507,455</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>52,048</td>
<td>57,337</td>
<td>65,130</td>
<td>69,858</td>
<td>73,947</td>
</tr>
<tr>
<td>Public Services</td>
<td>51,982</td>
<td>54,586</td>
<td>60,079</td>
<td>63,016</td>
<td>68,017</td>
</tr>
<tr>
<td>Self-Consumption</td>
<td>11,218</td>
<td>11,260</td>
<td>11,312</td>
<td>11,299</td>
<td>11,529</td>
</tr>
</tbody>
</table>

### CAPTIVE CONSUMERS

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>58,978,724</td>
<td>61,070,959</td>
<td>63,366,312</td>
<td>65,527,245</td>
<td>67,905,332</td>
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<tr>
<td>Residential</td>
<td>50,318,859</td>
<td>52,057,460</td>
<td>54,156,879</td>
<td>55,949,403</td>
<td>58,006,079</td>
</tr>
<tr>
<td>Industrial</td>
<td>514,787</td>
<td>524,589</td>
<td>528,037</td>
<td>535,647</td>
<td>552,357</td>
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<tr>
<td>Commercial</td>
<td>4,430,909</td>
<td>4,528,687</td>
<td>4,634,840</td>
<td>4,794,306</td>
<td>4,901,563</td>
</tr>
<tr>
<td>Rural</td>
<td>3,163,014</td>
<td>3,385,446</td>
<td>3,439,007</td>
<td>3,613,254</td>
<td>3,784,427</td>
</tr>
<tr>
<td>Government</td>
<td>435,943</td>
<td>451,630</td>
<td>471,083</td>
<td>490,517</td>
<td>507,452</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>52,048</td>
<td>57,337</td>
<td>65,130</td>
<td>69,858</td>
<td>73,947</td>
</tr>
<tr>
<td>Public Services</td>
<td>51,946</td>
<td>54,550</td>
<td>60,043</td>
<td>62,980</td>
<td>67,979</td>
</tr>
<tr>
<td>Self-Consumption</td>
<td>11,218</td>
<td>11,260</td>
<td>11,293</td>
<td>11,280</td>
<td>11,528</td>
</tr>
</tbody>
</table>

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7 Anuário Estatístico EPE 2011, Available at www.epe.gov.br.
The total number of consumers (captive + free) has been rising during the past few years at an annual rate of around 3.5%, resulting in a total of 67.9 million consumers in 2010.

It can also be observed that captive consumers represent almost all electricity consumers, with the residential class being the most representative among them (85%).

Free consumers are clustered largely in the industrial (75%) and commercial (22%) classes.

Brazil’s power consumption over the past two decades is presented in the following graphs. This information was taken from the National Energy Balance (BEN) drawn up by the Energy Research Enterprise (EPE) in 2011\(^8\), based on the historical figures posted by the power sector through 2010.

\(^8\) Available at www.epe.gov.br.
Consumption is clearly rising, reaching a total of 2,802,237 GWh in 2010.

The following Graph offers a detailed view of this consumption, with the share held by each energy source in total consumption.

As this graph shows, electricity has been the second largest source of energy consumed throughout this entire period, second only to oil products. For example, in 2010, electricity accounted for 16.3% of total consumption during the year. Furthermore, the share held by this energy source in total energy consumption has remained reasonably steady over time.

Consequently, as total consumption has been rising steadily, and with the share held by electricity remaining relatively stable, it is clear that power consumption has been rising by volume, as shown in the following graph.
More specifically, power consumption rose from 264,747 GWh in 1995 to 455,742 GWh in 2010, up by some 3.7% a year.

Energy consumption is one of the main indicators of economic development and the quality of life of a society. It reflects the pace of activity for the industrial, commercial and service sectors, as well as the ability of the population to acquire goods and services.

As shown by the following graph, the Brazilian economy went through a growth cycle between 1997 and 2010, reflected by the positive trend in its GDP. During this same period, energy consumption generally kept pace with economic growth. It is worth stressing that the curves showing variations in the GDP and electricity consumption moved apart during 2001, due to energy rationing in Brazil at that time.
Still within this context, another important dimension is the sector composition of the consumers of this electricity. The following tables present a breakdown of these amounts by consumption classes.⁹

**TOTAL CONSUMPTION (CAPTIVE + FREE) - GWh**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>356.129</td>
<td>377,030</td>
<td>388,472</td>
<td>384,306</td>
<td>415,277</td>
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<tr>
<td>Residential</td>
<td>85,784</td>
<td>89,885</td>
<td>94,746</td>
<td>100,776</td>
<td>107,215</td>
</tr>
<tr>
<td>Industrial</td>
<td>163,180</td>
<td>174,369</td>
<td>175,834</td>
<td>161,799</td>
<td>179,478</td>
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<tr>
<td>Commercial</td>
<td>55,369</td>
<td>58,647</td>
<td>61,813</td>
<td>65,255</td>
<td>69,170</td>
</tr>
<tr>
<td>Rural</td>
<td>16,022</td>
<td>17,269</td>
<td>17,941</td>
<td>17,304</td>
<td>18,500</td>
</tr>
<tr>
<td>Government</td>
<td>10,648</td>
<td>11,178</td>
<td>11,585</td>
<td>12,176</td>
<td>12,817</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>10,975</td>
<td>11,083</td>
<td>11,429</td>
<td>11,782</td>
<td>12,051</td>
</tr>
<tr>
<td>Public Services</td>
<td>12,164</td>
<td>12,441</td>
<td>12,853</td>
<td>12,898</td>
<td>13,589</td>
</tr>
<tr>
<td>Self-Consumption</td>
<td>1,987</td>
<td>2,158</td>
<td>2,270</td>
<td>2,319</td>
<td>2,456</td>
</tr>
</tbody>
</table>

**CAPTIVE CONSUMPTION - GWh**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>262,616</td>
<td>273,441</td>
<td>289,210</td>
<td>295,295</td>
<td>309,962</td>
</tr>
<tr>
<td>Residential</td>
<td>85,784</td>
<td>89,885</td>
<td>94,746</td>
<td>100,776</td>
<td>107,215</td>
</tr>
<tr>
<td>Industrial</td>
<td>72,771</td>
<td>74,391</td>
<td>80,439</td>
<td>76,836</td>
<td>78,790</td>
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<tr>
<td>Commercial</td>
<td>54,246</td>
<td>57,081</td>
<td>60,063</td>
<td>63,398</td>
<td>66,630</td>
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<tr>
<td>Rural</td>
<td>16,011</td>
<td>17,259</td>
<td>17,939</td>
<td>17,304</td>
<td>18,498</td>
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<tr>
<td>Government</td>
<td>10,590</td>
<td>11,117</td>
<td>11,523</td>
<td>12,114</td>
<td>12,755</td>
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<tr>
<td>Street Lighting</td>
<td>10,975</td>
<td>11,083</td>
<td>11,429</td>
<td>11,782</td>
<td>12,051</td>
</tr>
<tr>
<td>Public Services</td>
<td>10,251</td>
<td>10,467</td>
<td>10,830</td>
<td>10,904</td>
<td>11,570</td>
</tr>
<tr>
<td>Self-Consumption</td>
<td>1,987</td>
<td>2,158</td>
<td>2,240</td>
<td>2,182</td>
<td>2,453</td>
</tr>
</tbody>
</table>

---

FREE CONSUMPTION - GWh

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>93,513</td>
<td>103,589</td>
<td>99,262</td>
<td>89,012</td>
<td>105,315</td>
</tr>
<tr>
<td>Residential</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Industrial</td>
<td>90,409</td>
<td>99,978</td>
<td>95,395</td>
<td>84,963</td>
<td>100,688</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,123</td>
<td>1,566</td>
<td>1,750</td>
<td>1,857</td>
<td>2,540</td>
</tr>
<tr>
<td>Rural</td>
<td>11</td>
<td>11</td>
<td>3</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Government</td>
<td>57</td>
<td>60</td>
<td>62</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Public Services</td>
<td>1,913</td>
<td>1,974</td>
<td>2,023</td>
<td>1,994</td>
<td>2,019</td>
</tr>
<tr>
<td>Self-Consumption</td>
<td>-</td>
<td>-</td>
<td>31</td>
<td>137</td>
<td>3</td>
</tr>
</tbody>
</table>

The captive market accounts for 75% of electricity consumed in Brazil (309,962 GWh of the total 415,277 GWh), with the main classes being residential, industrial and commercial.

In turn, free consumers account for 25% of total electricity consumption, due mainly to consumption by the industrial class.

The power sector has three main segments: generation, transmission, and distribution.

For the power generation and transmission segments, Brazil has a core system that consists of power plants, transmission lines and distribution assets: the National Interconnected System, which encompasses most of the Brazilian territory.

However, due to the geographical characteristics of Brazil, it is hard to lay construction lines over long distances that would allow all parts of the country to be connected into a single system.

Thus, in addition to the National Interconnected System, Brazil has several smaller systems that are not connected to its main system, clustered mainly in Northern Brazil, known as Stand-Alone Systems.

### 2.3 Generation

Energy production activities – particularly power generation – entered the XXI century seeking sustainable development, as a concept that blends rising supplies with conscious consumption, environmental protection and an enhanced quality of life. This type of development can meet the needs of the current generation, without adversely affecting the capacity to meet the needs of future generations. The challenge is to lessen environmental impacts while concomitantly underpinning economic growth, which – among other outcomes – fosters the social inclusion of large segments of the population, with rising incomes and more jobs.

Bringing electricity to more than 61 million consumers scattered over a continent-size country requires massive efforts. In 2007, Brazil reached a milestone, 100,000 megawatts (MW) in installed capacity (75% hydro and 25% thermal). However, much still remains to be done in order to expand its hydro-based facilities, as only 30% of this potential is currently in use.

Brazil has been moving steadily forward in its efforts to generate electricity from renewable sources. In 2008, it held its first biomass auction for energy generated by burning sugarcane bagasse, and has forged firmly ahead since then. Energy Auction Nº 002/2011 (A-3) organized by ANEEL, sold off 1,543.8 average
megawatts (MWav) from 51 power plants: one hydro (Jirau), 44 windfarms, two thermal power plants fueled by natural gas and four driven by biomass. Renewable sources accounted for 62% of the contracts, compared to 32% for fossil fuels.

As set forth in the National Energy Balance for 2011 (baseline year 2010), drawn up each year by the EPE, power generation in Brazil by public utilities (87.5%) and self-generators (12.5%) reached 509.2 TWh in 2010, 10.0% higher than in 2009. The main source is hydro-based, which rose by 3.7% in 2010.

Power generated from fossil fuels accounted for 9.8% of the total amount produced by public utilities, compared to 8.9% in 2009. Net imports of 35.9 TWh, together with internal generation, resulted in domestic power supplies of 545.1 TWh, 8.4% higher than in 2009. The final consumption level reached 455.7 TWh, up 7.8% compared to 2009. The following graph presents Brazil’s domestic power supply structure in 2010.

Brazil has a power generation mix that is predominantly renewable, with hydro-based generation accounting for more than 74% of supplies. Together with imports, which are essentially also renewable, it may be stated that some 86% of Brazil’s power comes from renewable sources.

A few years ago, hydropower plants accounted for some 90% of installed capacity in Brazil. By 2008, this had shrunk to around 74%, due largely to the construction of power plants fueled by other sources (such as thermal power plants burning natural gas and biomass), built at a faster pace than their hydropower counterparts.

Total power generation over the past few years is presented in the following Table, indicating that power generation in Brazil is sufficient to cover the demand of all of the nation’s consumers (captive and free):
## POWER GENERATION: 2006 - 2010

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>419,337</td>
<td>445,044</td>
<td>463,120</td>
<td>462,976</td>
<td>509,223</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Statistics Yearbook – Electricity 2011 – EPE

According to the Power Generation Database – available on the ANEEL website, accessed on May 18, 2012 – Brazil has 2,626 power generation enterprises in commercial operations, with a total of almost 118,000 MW of installed capacity.

<table>
<thead>
<tr>
<th>Enterprises in Operation</th>
<th>Type</th>
<th>Quantity</th>
<th>Granted Capacity (kW)</th>
<th>Inspected Capacity (kW)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CGH (Mini Hydro-power Plant)</td>
<td>380</td>
<td>226,706</td>
<td>224,886</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>EOL (Wind farm)</td>
<td>75</td>
<td>1,615,338</td>
<td>1,519,042</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>PCH (Small Hydro-power Plant)</td>
<td>429</td>
<td>4,085,191</td>
<td>3,991,785</td>
<td>3.38</td>
</tr>
<tr>
<td></td>
<td>UFV (Photovoltaic Power Plant)</td>
<td>8</td>
<td>5,494</td>
<td>1,494</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>UHE (Hydro-power Plant)</td>
<td>182</td>
<td>81,953,081</td>
<td>78,530,049</td>
<td>66.59</td>
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<tr>
<td></td>
<td>UTE (Thermal Power Plant)</td>
<td>1,550</td>
<td>33,018,133</td>
<td>31,656,798</td>
<td>26.84</td>
</tr>
<tr>
<td></td>
<td>UTN (Nuclear Power Plant)</td>
<td>2</td>
<td>1,990,000</td>
<td>2,007,000</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2,626</td>
<td>122,893,943</td>
<td>117,931,054</td>
<td>100</td>
</tr>
</tbody>
</table>

The percentage values refer to inspected capacity. Granted capacity is the same as the values used in the Concessions. The inspected capacity is equal to that taken into consideration as from the entry into commercial operation of the first power generation units.

A further 27,000 MW of installed capacity represents the number of enterprises under construction in Brazil.
### Enterprises under Construction

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
<th>Granted Capacity (kW)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini Hydro-power Plant</td>
<td>1</td>
<td>848</td>
<td>0</td>
</tr>
<tr>
<td>Wind farm</td>
<td>57</td>
<td>1,467,090</td>
<td>5.39</td>
</tr>
<tr>
<td>Small Hydro-power Plant</td>
<td>56</td>
<td>623,277</td>
<td>2.29</td>
</tr>
<tr>
<td>Hydro-power Plant</td>
<td>11</td>
<td>18,252,400</td>
<td>67.08</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>170</strong></td>
<td><strong>27,208,034</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

Finally, an amount of 20,000 MW was awarded between 1998 and 2012 to enterprises where construction had not yet begun. Most of them were tendered out against the highest payment for the Use of a Public Asset (UBP)\(^{10}\), have not yet obtained environmental licensing as required to start up construction.

### Enterprises Awarded Concessions, 1998 – 2012

(Construction Not Yet Begun)

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
<th>Awarded Capacity (Kw)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini Hydro-Power Plant</td>
<td>61</td>
<td>40,698</td>
<td>0.19</td>
</tr>
<tr>
<td>Wave Power Plant</td>
<td>1</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Wind Farm</td>
<td>200</td>
<td>5,698,190</td>
<td>27.23</td>
</tr>
<tr>
<td>Small Hydro-Power Plant</td>
<td>130</td>
<td>1,815,400</td>
<td>8.68</td>
</tr>
<tr>
<td>Hydro-Power Plant</td>
<td>11</td>
<td>2,179,042</td>
<td>10.41</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>551</strong></td>
<td><strong>20,922,731</strong></td>
<td>100</td>
</tr>
</tbody>
</table>

It is quite clear that Brazil is in a position to attain diversification while maintaining its clean energy matrix. The initiatives adopted by its Government include solutions designed to boost process efficiency while

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\(^{10}\) With the introduction of the New Model for Brazil’s Power Sector, there was an alteration in the concession system for new hydropower plants, shifting from the highest payment for the use of a public asset to the lowest sales tariff for the regulated market.
also cutting the costs of renewable sources, such as wind, solar, and biomass, among others, in order to make them commercially feasible.

As an example, in April 2012, ANEEL published a Normative Resolution that granted a discount of 80% on the Transmission and Distribution System Usage Fees (TUST/TUSD) for solar power plants, whose capacity injected into the transmission or distribution systems is less than or equal to 30 MW, falling due on the production and consumption of electricity sold by these plants.

The main stumbling blocks hampering the expansion of the hydro-based segment in Brazil are environmental and legal in nature. Most of the delays in projects that are behind schedule are due to difficulties in obtaining environmental licenses, caused by lawsuits, actions and injunctions.

Their opponents claim that these projects – principally in the Amazon region – will adversely affect the lives of local communities, as well as local plants and wildlife, by interfering in natural river flows and water volumes. However, new power plants with minimal social and environmental impacts must be built, in order to produce sufficient power to support economic growth and job creation.

Due to difficulties in acceptance among local communities and pressures from organized groups – particularly environmentalist non-governmental organizations (NGOs) – entrepreneurs have been allocating funds for project impact mitigation at the environmental and social levels. Implementing these projects in sustainable ways, pursuing profits while simultaneously offsetting the social and environmental impacts caused by these power plants – is a trend in the construction of hydro-power plants.

2.4 Transmission

Power transmission utilities are in charge of the deployment and operation of the network connecting generation plants to the facilities of the distribution companies located close to consumption centers. These enterprises are awarded concessions for rendering these services through public auctions run by ANEEL. The concessions for rendering public transmission utility services are valid for thirty years, and may be extended for similar lengths of time.

The revenue received by the transmission utilities for making the transmission system available to the National System Operator (ONS) and rendering transmission services to users is called the Permitted Annual Revenue (RAP).

For transmission utilities submitting winning bids, the value of this amount is obtained as the outcome of the transmission auction. This amount is paid to the transmission facilities as from the time that their facilities enter into commercial operation, subject to review every five years, as set forth in the concession agreements. Furthermore, the RAPs paid to the transmission utilities are adjusted annually for inflation.

The transmission segment in Brazil consists of more than 98,000 kilometers of transmission lines.

The following table shows the expansion of Brazil’s transmission network between 2006 and 2010, by voltage level.\textsuperscript{11}

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|c|}
\hline
Voltage & Year 1 & Year 2 & Year 3 & Year 4 \\
\hline
\text{System} & 2006 & 2007 & 2008 & 2009 \\
\hline
\text{MW} & 100 & 200 & 300 & 400 \\
\hline
\end{tabular}
\end{table}

\textsuperscript{11} Source: Anuário Estatístico de Energia Elétrica 2011, prepared by the Empresa de Pesquisa Energética – EPE, Available at www.epe.gov.br.
Brazil's transmission network has been expanding over the years, rising from 86,200 km in 2006 to 98,600 km in 2010 (up by 14%). Furthermore, most of this network consists of 230 kV and 500 kV power lines. This vast transmission network is due to the configuration of the generation segment, which consists mainly of hydropower plants located in places remote from consumption centers.

As already mentioned, the main characteristic of this segment is its division into two major sections: the National Interconnected System, which encompasses almost the whole of Brazil, and the Stand-Alone Systems, which are installed mainly in the North. However, it must be stressed that the trend is for the Stand-Alone Systems to be gradually integrated with the National Interconnected System, over time.

The following tables present the expansion in the transformation capacity, the number of transformers and the number of modules in Brazil’s transmission segment.  

| Brazil’s Transmission Network (km) |
|-------------------------------|----------------|----------------|----------------|----------------|----------------|
|                               | 2006  | 2007  | 2008  | 2009  | 2010  |
| 230 kV                        | 36,342| 37,155| 37,710| 41,503| 43,251|
| 345 kV                        | 9,579 | 9,772 | 9,772 | 9,784 | 10,060|
| 440 kV                        | 6,671 | 6,671 | 6,671 | 6,671 | 6,671 |
| 500 kV                        | 29,341| 29,392| 31,868| 33,212| 34,372|
| 600 kV                        | 1,612 | 1,612 | 1,612 | 1,612 | 1,612 |
| 750 kV                        | 2,683 | 2,683 | 2,683 | 2,683 | 2,683 |
| TOTAL                         | 86,229| 87,286| 90,316| 95,465| 98,648|

Source: Nota Técnica 396/2009 - SRE/ANEEL.
### Number of Transformers

<table>
<thead>
<tr>
<th>Companies</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEEE</td>
<td>165</td>
<td>169</td>
<td>169</td>
<td>169</td>
<td>171</td>
<td>172</td>
<td>178</td>
</tr>
<tr>
<td>CEMIG</td>
<td>123</td>
<td>126</td>
<td>126</td>
<td>126</td>
<td>126</td>
<td>126</td>
<td>126</td>
</tr>
<tr>
<td>CHESF</td>
<td>372</td>
<td>379</td>
<td>383</td>
<td>391</td>
<td>398</td>
<td>411</td>
<td></td>
</tr>
<tr>
<td>COPEL</td>
<td>287</td>
<td>295</td>
<td>299</td>
<td>302</td>
<td>305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTEEP</td>
<td>555</td>
<td>568</td>
<td>596</td>
<td>626</td>
<td>649</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ELETROPIORTE</td>
<td>154</td>
<td>161</td>
<td>161</td>
<td>161</td>
<td>172</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td>ELETROSUL</td>
<td>122</td>
<td>130</td>
<td>149</td>
<td>162</td>
<td>169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FURNAS</td>
<td>310</td>
<td>319</td>
<td>336</td>
<td>345</td>
<td>346</td>
<td>346</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,088</td>
<td>2,128</td>
<td>2,142</td>
<td>2,173</td>
<td>2,238</td>
<td>2,304</td>
<td>2,366</td>
</tr>
</tbody>
</table>

### Number of Modules

<table>
<thead>
<tr>
<th>Companies</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEEE</td>
<td>901</td>
<td>915</td>
<td>922</td>
<td>939</td>
<td>950</td>
<td>966</td>
<td></td>
</tr>
<tr>
<td>CEMIG</td>
<td>507</td>
<td>525</td>
<td>529</td>
<td>541</td>
<td>544</td>
<td>573</td>
<td></td>
</tr>
<tr>
<td>CHESF</td>
<td>1,605</td>
<td>1,678</td>
<td>1,702</td>
<td>1,746</td>
<td>1,773</td>
<td>1,813</td>
<td></td>
</tr>
<tr>
<td>COPEL</td>
<td>1,064</td>
<td>1,076</td>
<td>1,088</td>
<td>1,103</td>
<td>1,118</td>
<td>1,129</td>
<td></td>
</tr>
<tr>
<td>CTEEP</td>
<td>1,913</td>
<td>1,959</td>
<td>1,972</td>
<td>2,070</td>
<td>2,144</td>
<td>2,204</td>
<td></td>
</tr>
<tr>
<td>ELETROPIORTE</td>
<td>557</td>
<td>578</td>
<td>582</td>
<td>591</td>
<td>606</td>
<td>635</td>
<td></td>
</tr>
<tr>
<td>ELETROSUL</td>
<td>452</td>
<td>491</td>
<td>528</td>
<td>559</td>
<td>582</td>
<td>643</td>
<td></td>
</tr>
<tr>
<td>FURNAS</td>
<td>710</td>
<td>726</td>
<td>759</td>
<td>779</td>
<td>787</td>
<td>801</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,709</td>
<td>7,948</td>
<td>8,082</td>
<td>8,328</td>
<td>8,504</td>
<td>8,764</td>
<td></td>
</tr>
</tbody>
</table>

### 2.5 Distribution

The electricity distributors handle consumer services and connections. Brazil’s electricity distribution market consists of 63 private and State-owned utilities servicing more than 64 million consumer units all over the country.

The rights and obligations of these companies are established in the concession agreements signed with the Brazilian Government for the provision of public utility services in their concession areas – the geographical territory in which each of them holds a monopoly on electricity supplies.

The following table shows the expansion in the number of consumer units and the extent of the electricity distribution network in Brazil.  

---

13 Source: Banco de dados, 3º ciclo de revisões tarifárias periódicas das distribuidoras de energia elétrica, Available at www.aneel.gov.br.
Brazil's electricity distribution network soared from 2,164,217 km in 2003 to 2,968,451 km in 2009, reflecting average growth of around 5.4% per year.

In turn, consumer units rose from around 52.7 million in 2003 to 64.6 million in 2009 (average annual growth of 3.4%).

The following table presents the expansion of the electricity distribution segment market, divided into High Voltage – HV, Medium Voltage – MV, and Low Voltage – LV:14,15:

<table>
<thead>
<tr>
<th>Distribution Market (MWh)</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Voltage – HV</td>
<td>68,955,438</td>
<td>75,981,477</td>
<td>73,941,400</td>
<td>75,660,289</td>
<td>77,293,059</td>
<td>79,069,576</td>
<td></td>
</tr>
<tr>
<td>Medium Voltage – MV</td>
<td>85,563,189</td>
<td>90,988,992</td>
<td>95,303,466</td>
<td>98,164,882</td>
<td>104,223,997</td>
<td>108,398,582</td>
<td></td>
</tr>
<tr>
<td>Low Voltage – LV</td>
<td>129,845,721</td>
<td>132,822,086</td>
<td>139,563,727</td>
<td>144,509,775</td>
<td>152,669,800</td>
<td>160,358,573</td>
<td></td>
</tr>
<tr>
<td>Total Market</td>
<td>284,364,348</td>
<td>299,792,555</td>
<td>308,808,593</td>
<td>318,334,946</td>
<td>334,186,856</td>
<td>347,826,732</td>
<td></td>
</tr>
</tbody>
</table>

It is apparent that Brazil's electricity distribution segment has kept pace with the steady expansion of its market, reflected in growth of around 4.1% a year.

In addition to providing services to end consumers, distributors must also implement special programs, such as ensuring social inclusion for the poorest segments of the population through formal access to electricity networks. The monthly bills for electricity are then used also as proof of residence.

These programs include the Low Income Tariff (with special rates for consumers complying with certain consumption and income characteristics), the Light for All Program (ensuring universal access to electricity), as well as measures against clandestine connections (informal hook-ups allowing illegal access to electricity without paying the corresponding bills).

Additionally, the distributors are in charge of implementing energy efficiency projects and R&D activities.

### 2.6 Free Trading

The New Model for Brazil's Power Sector establishes that electricity is traded in two distinct market environments: the Regulated Trading Floor (ACR) and the Free Trading Floor (ACL).

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14 According to Distribution Procedures:
LV: ≤2 kV
MV: between 2 kV and 34.5 kV
HV: Superior to 34.5 kV

15 Source: Banco de dados, 3º ciclo de revisões tarifárias periódicas das distribuidoras de energia elétrica, Available at www.aneel.gov.br.
Deals on the Regulated Trading Floor are formally closed through regulated bilateral contracts, called Electricity Trading Agreements on the Regulated Floor (CCEAR), signed by seller agents (traders, generators, independent power producers or self-generators) and buyers (distributors) taking part in the electricity auctions.

On the Free Trading Floor, trading takes place freely among the generator agents, the traders, the free consumers and the electricity importers and exporters. In this setting, they are free to establish the delivery conditions as well as the purchase and sale volumes and the respective electricity prices, with the agreements being firmed up through bilateral contracts.

At the moment, the conditions for an electricity consumer to become free are:16

<table>
<thead>
<tr>
<th>Consumer Connection Date</th>
<th>Supply Voltage</th>
<th>Minimum Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>After July 8, 1995</td>
<td>Any voltage</td>
<td>3 MW</td>
</tr>
<tr>
<td>Before July 8, 1995</td>
<td>69 kV</td>
<td>3 MW</td>
</tr>
</tbody>
</table>

In turn, the generation agents (public power generation utilities, independent power producers, or self-generators), as well as the traders, may sell electricity in both segments. However, all contracts, whether closed on the Regulated or Free Trading Floors, must be registered with the Electricity Trading Chamber (CCEE).

The following graph presents the rise in electricity volumes sold through contracts in this Chamber.17 It must be stressed that the amounts for 2000 cover only the period between September and December, after the start-up of the Wholesale Energy Market.

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16 Since 1998, as regulated by Law No. 9,427/1996, consumers with minimum demands of 500 kW serviced at any supply voltage, also have the right to purchase electricity from any supplier, provided that the supplied electricity is generated by small hydropower plants or alternative sources (wind, biomass or solar).

The total amount of energy traded through contracts reached 76,756 MWav in 2011, up 7.5% over sales in 2010, of 71,402 MWav. The amount covered by bilateral contracts (dark blue), rose 9.3%, from 36,994 MWav in 2010 to 40,451 MWav in 2011.

Furthermore, the bilateral contracts account for 52.7% of the total amounts contracted in 2011, as shown in the following chart:

The following graph presents the consumption associated with the Free (ACL) and Regulated (ACR) Trading Floors in 2011, as well as the percentage share of consumption on the Free Trading Floor of the total consumption of the National Interconnected System. The values presented do not include in-house consumption by power plants.
The consumption value for the Free Trading Floor corresponded to 26.3% of total consumption in 2011.

The consumption of agents on the Free Trading Floor is set forth in detail by class, in the following graph (MWav):

Consequently, the free consumer is the main consumption agent on the Free Trading Floor, accounting for 61.4% of total consumption (109,420 MWav of the total amount of 178,067 MWav). Second comes the self-producer, accounting for 22.9% of total consumption (40,822 MWav out of 178,067 MWav).
3. CURRENT INSTITUTIONAL ARRANGEMENTS

The Brazilian power sector encompasses a large cluster of institutional agents, all with duties, responsibilities, skills and competences defined in ways that underpin the feasibility of the correct functioning of this sector, constantly pursuing fair tariffs, secure supplies and universal access to electricity.

3.1 Policy Preparation

In the institutional arrangements in place for Brazil’s power sector, there is a sharing of duties and responsibilities, in terms of the preparation and implementation of energy policies, between the National Energy Policy Council (CNPE) and the Ministry of Mines and Energy (MME), with the Government activities performed by these entities playing a key role in these arrangements.

This Council was established by Federal Law Nº 9,478/1997 as an interministerial advisory entity linked to the President’s office, whose main duty is to draft national policies and suggest specific steps intended to ensure the rational use of Brazil’s energy resources, in order to respond fully to nationwide demands. It is backed by the technical support of the regulatory entities in this sector, with a plenary consisting of representatives of a wide variety of Ministries, in addition to representatives of civil society, academia, the States and the Federal District among others.

The entity in charge of conducting energy policies in Brazil is the Ministry of Mines and Energy (MME). Its responsibilities include the preparation and implementation of energy sector policies, based on the assumptions proposed by the CNPE. This Ministry was established in 1960 by Federal Law Nº 3,782/1960, and re-established by Law Nº 8,422/1992 after its duties and responsibilities had been transferred to the now-defunct Ministry of Infrastructure in 1990. Its duties and responsibilities are, specifically:

- Develop plans for Brazil’s energy sector, supported by the Energy Research Enterprise (EPE), which will be addressed below;
- Monitor the security of supplies by the Brazilian power sector; and
- Define preventive actions for restoring supply security, evening out imbalances between energy supply and demand.

Furthermore, Eletrobras and Petrobras are both linked to this Ministry, both being mixed ownership enterprises, in addition to the Energy Research Enterprise (EPE), the Power Sector Regulator (ANEEL), the Oil, Gas and Biofuels Industry Regulator (ANP) and the National Mineral Production Department (DNPM). In turn, Eletrobras controls several enterprises in the Brazilian power sector, particularly in the Generation and Distribution segments.

3.2 Sector Planning

The responsibility for planning of Brazil’s power sector belongs to the Ministry of Mines and Energy (MME), supported by data and other required information supplied by other related entities. Through this approach, the activities involved in sector planning are based on information provided by:

3.2.1 EPE – Energy Research Enterprise

Established by Federal Law Nº 10,847/2004 and set up through Decree Nº 5,184/2004, this Enterprise is a public company linked to the Ministry of Mines and Energy (MME) which renders services in the research area involving energy matters in Brazil, such as electricity, natural gas, oil and oil products, in addition to coal, renewable energy sources and energy efficiency, among others, in order to provide input for sector planning through long term studies focused on national energy resources.
Among its duties and responsibilities are those required to take part in the New Energy Auctions, which are essential for the current model for the Brazilian power sector: 18

- Identifying and quantifying energy resource potential;
- Conducting studies in order to determine the best possible use of hydro-power potential and possible sites;
- Obtaining prior environmental licenses and declarations of hydro-availability required to tender out hydro-based generation enterprises;
- Handle the technical qualification of enterprises taking part in the energy auctions conducted by ANEEL.

The documents resulting from its activities are listed below: 19

- Ten-Year Energy Plan (PDE): drawn up for a period of ten years, adjusted annually for the subsequent ten-year period, with macro planning for the exploitation and development of Brazil’s energy resources, planning the expansion of the infrastructure needed to meet the nationwide energy demand, and evaluating the growth of demand for fuel and electricity in the country.
- National Energy Plan (PNE): using the data gathered together in the Ten-Year Energy Plans, the objective of this plan is to assist the formulation of the supply expansion strategy for cost-effective, sustainable energy from a long term standpoint, involving issues related to electricity and other energy sources, namely oil, natural gas and biomass.
- National Energy Balance (BEN): this is the most traditional of Brazil’s energy sector documents, presenting all the accounting data for energy supply and consumption in Brazil. The document is prepared and published annually.
- Transmission Expansion Program (PET): prepared on the basis of studies conducted by the Energy Research Enterprise (EPE), together with the utilities, through the Regional Transmission Studies Groups. The transmission facilities required for the expansion of the Basic Grid are intended to ensure the conditions needed to service markets and underpin power exchanges among regions, with these transmission facilities included in the plan. Drawn up on a four-year basis, it is updated annually for the subsequent four years.

3.2.2 National System Operator (ONS) 20

Established specifically to operate the generation and transmission facilities of the Brazilian Power System, as optimally and economically as possible, as will be detailed in section 3.4, ONS is also responsible for pinpointing the short-term expansions and reinforcements required to ensure the security and adequate performance of the Basic Grid.

For every two-year period and updated annually, ONS presents the Plan of Expansions and Reinforcements (PAR), prepared with input from agents throughout the sector, taking into account proposed new development projects and applications for access among other information, aiming to ensure open access to the National Interconnected System for any interested agent.

Based on this information, the Grantor Authority can carry out the planning for Brazil’s power sector, in terms of transmission and generation activities, by dovetailing the needs indicated in the studies presented by the EPE and the ONS.

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18 Power Sector Reform in Brazil – Mauricio Tolmasquim
19 www.epe.gov.br
20 www.ons.org.br
3.3 Regulation and Oversight

Brazil’s power sector regulator (ANEEL) was established by Federal Law Nº 9,427 promulgated on December 26, 1996, linked23 to the Ministry of Mines and Energy. Its main duties and responsibilities are:

- Regulating and overseeing power generation, transmission, distribution and trading activities, responding to claims and complaints from agents and consumers while maintaining an even balance among the parties, to the benefit of society;
- Mediating conflicts of interest among power sector agents, and between them and consumers;
- Granting of concessions, permits, and authorizations for electricity-related facilities and services;
- Ensuring fair tariffs;
- Striving to ensure good quality services;
- Requiring investments;
- Encouraging competition among operators; and
- Ensuring universal access to services.

In order to perform these functions, this Regulator is granted management autonomy, and its decisions are independent, with no administrative recourse given to the Ministry of Mines and Energy22. Its five supervisory board members are chosen by the President and approved by the Brazilian Senate for a fixed non-coincident four year term, allowing for one reconduction23.

It was set up to replace the National Waters and Electricity Department (DNAEE), as part of the reorganization implemented through the Brazilian Power Sector Restructuring Project in 1997.

3.4 Operations

The model resulting from this Restructuring Project included a proposal to set up an Independent System Operator, as an entity whose role would be similar to that of the Interconnected Operations Coordination Group (GCOI).24 With the main purpose of fostering the decentralization of ownership of generation and transmission assets, this entity would be structured as an independent, non-profit organization, operating under the supervision of ANEEL with governance that would encompass all five classes of agents in the power sector: generation, transmission and distribution utilities, free consumers and the public sector.

As a result, the National System Operator (ONS) was set up through Federal Law Nº 9,648/1998, as a corporate entity established under private law that is in charge of the coordination and control of generation and transmission operations within the National Interconnected System. Its duties and responsibilities include:

- Programming and scheduling the operations and centralized dispatch of generation facilities, in order to optimize the operation of the interconnected power systems;
- Supervision and coordination of power system operating centers;
- Supervision and control of the operation of Brazil’s interconnected power system, as well as international connections;

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21 Aneel is part of the MME organizational structure, although there is no subordination to MME in terms of technical or administrative decision. The role of MME is to establish the political guidelines for the regulator
22 Power Sector Reform in Brazil – Maurício Tolmasquim
23 Aneel has five members in its board, needing the vote of at least three of them to make a decision regarding regulatory and administrative issues. Each member of the board has a four years term, which are non-coincident because they are appointed in different years. Besides, the possibility of reconduction means that the Regulators can be chosen two times in a row, at most.
24 Power Sector Reform in Brazil – Maurício Tolmasquim
• Contracting and management of transmission services and the respective access conditions, in addition to ancillary services (in charge of ensuring security and quality for transmission services, such as frequency regulation and offsetting losses, among others);
• Proposing expansions of the Basic Grid facilities to the Grantor Authority as well as strengthening the current systems, to be taken into consideration when planning the expansion of the transmission system; and
• Proposing operating rules for the transmission facilities in the Basic Grid of the National Interconnected System, to be approved by ANEEL.

It must be stressed that the operating decisions are taken by the ONS, together with other agents in this sector, at regular meetings where all agents are guaranteed representation.

Furthermore, in order to ensure the continuity and security of electricity supply nationwide, the operations of the National Interconnected System are overseen and assessed by the Power Sector Monitoring Committee (CMSE) which is an entity set up under the auspices of the Ministry of Mines and Energy through Federal Law Nº 10,848/2004, under its direct coordination. Its duties and responsibilities include:

• Identifying difficulties and stumbling blocks adversely affecting the regularity and security of power supply and keeping pace with the expansion of demand for electricity, natural gas and related products;
• Draw up proposals for adjustments, solutions and recommendations for preventive or remedial actions when situations are noted;
• Conduct regular integrated analyses of supply security and services for the electricity, natural gas, oil and oil products markets; and
• Establish the merit order of dispatch for the power plants in the National Interconnected System.

As a result, decisions taken by this Committee may alter the operations planning followed by the ONS, in order to make the best possible use of the energy sources in the National Interconnected System, particularly with regard to Brazil’s hydropower segments, which is strongly characterized by government activities.

3.5 Electricity Consumption Market

3.5.1 Electricity Trading Chamber (CCEE)

During the first wave of reforms that restructured Brazil’s power sector, which took place in the mid-1990s, the Wholesale Electricity Market (MAE) was set up. With no legal status, this entity handled power purchase and sale transactions. However, the intended self-regulating model did not succeed, as this market was unable to handle the settlement of trades on the spot market.

Due to several difficulties, the New Model for this sector that was introduced in 2004 established a new entity in charge of ensuring the feasibility of electricity trading for the National Interconnected System in both of the two newly-created contracting environments: the Regulated Trading Floor (ACR) and the Free Trading Floor (ACL). This entity is the Electricity Trading Chamber (CCEE) established through Federal Law Nº 10,848/2004 as a non-profit corporate entity under private law, regulated and inspected by ANEEL.

Its obligations include:25

25 www.ccee.org.br
Keeping records of all contracts closed on the Regulated Trading Floor and the Free Trading Floor;
Promoting the metering and recording of the generation and consumption data for all CCEE Agents;
Calculating the Differences Settlement Price (PLD) for the Spot Market, by submarket;
Handling the Accounting system for the amounts of electricity traded on the Spot Market and through Financial Settlements;
Investigating non-compliance with electricity trading limits and other offenses, and, when applicable, as delegated by ANEEL, impose the respective penalties, in compliance with the Trading Agreement;
Calculating the amounts and take the steps needed for the deposit, custody and execution of Financial Guarantees put up to cover Financial Settlements on the Spot Market, as set forth in the Sales Agreement;
Organizing power purchase and sale auctions, as delegated by ANEEL;
Undertaking the monitoring of the actions performed by the Agents under the auspices of the Electricity Trading Chamber (CCEE), in order to ascertain their compliance with the Trading Rules and Procedures, as well as other regulatory provisions, as defined by ANEEL;
Performing other activities as specifically ordered by ANEEL, the Shareholders’ General Meeting or legal requirements, as set forth in Article 3 of the Electricity Trading Chamber (CCEE) By-Laws.

3.5.2 Electricity Trading Floors in Brazil

The reforms implemented in the Brazilian power sector established different contracting systems, according to the level of competition desired among the agents.

Regulated Trading Floor (ACR)

In order to service regulated consumers that do not meet the requirements for free consumers 26 or do not exercise their migration rights, distribution utilities must purchase electricity at the generation auctions, offering “New Energy” (from enterprises that have not yet started up operations) or “Old Energy” (from generation enterprises already in operation). At these auctions, the generators compete to offer energy at the lowest tariffs to the distributors, firmed up through long-term agreements. This environment is known as the Regulated Trading Floor, with Brazilian law requiring that the distributors contract 100% of their five years forecasted requirements, in addition to having regulated tariffs.

In this context, as the outcome of the new or old Energy Auctions, Regulated Power Purchase Agreements (CCEARs) are signed by the generation and distribution utilities, with compliance closely monitored by ANEEL.

Free Trading Floor (ACL)

Established by Federal Law Nº 9,074/1995, the categories of the Free Consumer and Special Consumer represent consumers that, complying with specific criteria and opting for the free contracting regimen, may choose their energy supplier from among the available generators and traders. This type of transaction takes place on the Free Trading Floor, with bilateral contracts signed between consumers and electricity suppliers and with financial settlement through the CCEE.

Similar to its Regulated counterpart, consumers purchasing on the Free Trading Floor also have a legal obligation to keep 100% of their load provided through supply contracts, under threat of penalties.

26 Established in Articles 15 and 16 of Federal Law Nº 9,074/1995
imposed for failing to service their entire load, although at non-regulated prices, encouraging competition in the generation and trading segments.

The reference price for trading on these floors, particularly deals closed to make up for differences arising from the contracts (known as the “Spot Market”), is the Differences Settlement Price (PLD). Calculated each week on the basis of the Marginal Operating Cost, which is the cost of adding one MWh of generation to the National Interconnected System, this is determined by the CCEE, underpinned by technical data supplied through computer projections and historical databases maintained by the ONS.

### Institutional Structure – Brazil’s Power Sector

#### Policies
- National Congress
- CNPE/MME

#### Regulation and Oversight
- ANEEL

#### Market
- CCEE
- G
- T
- D
- T
- ONS

#### Institutional Agents
- EPE
- Eletrobras
- Utilities

### 3.6 Charges and Taxes

The sector charges are costs added over the value of the electricity tariff to subsidize the development and financing of programs related to the power sector, defined by the Federal Government.

Their annual values are established through Resolutions and Orders issued by ANEEL. In turn, the concessionaires must pay in the amounts collected from consumers through the electricity tariffs.

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The tariff established by ANEEL for the distribution concessionaires encompasses the following sector charges:

a. **Global Reversion Reserve (RGR):** Charge introduced by Decree Nº 41,019/1957, with its duration extended through 2035 by Law Nº 12,431/2011. This is an annual amount established by ANEEL, paid monthly at a twelfth of its overall value by the concessionaires, in order to provide funds for the reversion and / or nationalization of public power services, in addition to financing the expansion and improvement of these services. Its annual value is equivalent to 2.5% of the investments allocated by the concessionaire to assets related to rendering electricity services, and limited to 3.0% of its annual revenues. Its administration is assigned to Eletrobras.

b. **Fuel Consumption Account (CCC):** Established by Law Nº 5,899/1973, this Account is intended to apportion out the costs incurred for fuel burned to generate thermal power in the Stand-Alone Systems. The CCC values are established each year by ANEEL for each distribution utility, based on its market, and may vary according to the need to make use of the thermal power plants. This charge is paid monthly by all agents selling electricity to final consumers.

c. **Electricity Services Inspection Fee (TFSEE):** Introduced by Law Nº 9,427/1996 and regulated by Decree Nº 2,410/1997, this fee is established each year by ANEEL, in order to fund the operation of this Regulator. It is equivalent to 0.5% of the annual economic profit posted by the concessionaire, permit holder or authorizee of public utility services. The fee is paid monthly at one twelfth of its annual value, with its administration assigned to ANEEL.

d. **Alternative Electricity Sources Incentive Program (PROINFA):** Introduced by Law Nº 10,438/2002 and regulated by Decree Nº 5,025/2004, its purpose is to step up the participation of alternative energy sources (wind, biomass and small hydropower plants) for power generation in Brazil. Each year, ANEEL publishes the annual energy fees and defrayal amounts to be paid in twelve monthly installments, by all the agents in the National Interconnected System that sell electricity to end consumers or that pay for the use of the distribution networks. These fees are calculated on the basis of the generation forecasts of the power plants included in this Program and the associated costs presented in the Specific Annual Plan drawn up by Eletrobras, which also handles its administration.

e. **Energy Development Account (CDE):** Introduced by Law Nº 10,438/2002, in order to provide funds for: (i) the energy development of the States; (ii) ensuring a keen competitive edge for energy generated from alternative sources such as wind, small hydro-power plants, biomass, natural gas, and coal in the areas served by the interconnected electricity systems; (iii) foster universal access to electricity services nationwide; and (iv) ensure raising sufficient funds to finance the subsidies that may be required for fair electricity tariffs charged to end consumers in the Low Income Residential Sub-Class. These funds come from: (i) annual fees for the Use of Public Assets (UBP); (ii) fines imposed by ANEEL; and (iii) annual fees paid in by all agents selling electricity to end consumers. The management of CDE is a responsibility of MMA and Eletrobras.

f. **Financial Compensation for the Use of Hydro Resources (CFURH):** Introduced by Law Nº 7,990/1989, this fee is intended to compensate the Federal Government, the States and the Municipalities affected by water use and the loss of productive land caused by flooding areas required to form the reservoirs needed by hydro-power plants. Of the amounts paid in each month as financial compensation, 45% is allocated to the States, 45% to the Municipalities, 3% to the Ministry of the Environment (MMA), 3% to the Ministry of Mines and Energy (MME),
and 4% to the Ministry of Science, Technology and Innovation (MCTI). The collection of these amounts is handled by ANEEL.

g. **Research and Development (R&D) and Energy Efficiency:** Introduced by Law Nº 9,991/2000, this initiative is intended to encourage scientific and technological research related to the power sector. Concessionaires and permit holders engaged in public electricity distribution services must allocate a percentage of their net operating revenues each year to research and development of power sector and energy efficiency programs for both supply and demand. The MCTI, the MME, the ANEEL, and the agents themselves administer this fund.

h. **National System Operator (ONS):** In addition to fees charged for use of the facilities in the Basic Grid, the distributors pay monthly amounts that defray the costs of the activities of the ONS (Law Nº 9,648/1998). The National System Operator has the mission of coordinating and controlling the operations of the interconnected electricity systems, as well as administering and coordinating the electricity transmission services rendered. Each year, the ONS submits its budget to ANEEL for approval, together with the amounts of the monthly contributions paid in by the system members. Its administration is handled by the ONS.

i. **Energy Reserve Charge (EER):** Introduced by Law Nº 10,848/2004, in order to cover the costs arising from contracting reserve energy, including overhead, financial costs, and taxes. These amounts are allocated among the end users of electricity supplied through the National Interconnected System, including free consumers and self-generators, only for the amounts of energy resulting from their connection to the National Interconnected System. The amount of the charge is defined each month by the CCEE, according to a formula established through a resolution issued by ANEEL.

j. **System Services Charge (ESS):** This charge reflects the costs incurred to maintain the reliability and stability of the system in order to keep pace with consumption. This charge is calculated each month by the CCEE and is paid by consumption agents to generation agents. All agents pay in these amounts with consumption profiles in proportion to the consumption subject to this charge, whether contracted or not.

Today, this System Services Charge encompasses reimbursement paid out to the generation agents for costs incurred due to: (i) operating constraints; (ii) rendering ancillary services; (iii) energy security; and (iv) outstripping the Risk Aversion Curve (CAR).  

More specifically, the ESS was introduced for reasons of energy security, to enable the dispatch of energy resources not according to merit order based on costs.

The funds arising from old penalties imposed due to insufficient ballast for sales and insufficient coverage for consumption, penalties due to lack of fuel, penalties for metering and fines for failure to put up the financial guarantees as collateral are also used to lower the outlays of this charge for energy security.

The following table presents the amounts collected through electricity sector charges in 2010:

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28 Risk Aversion Curve (CAR): This resource represents an additional security restriction for maintaining the supply in brazilian hidro-thermal generation system. Each month, the water storage levels must be superior to the target volumes established in this curve, which represents the minimum operative level for each subsystem. In case of the water storage level of any subsystem is below the minimum value of the CAR, the hydrogenation price is increased of a penalty value, which automatically implies the dispatch of thermal power plants necessary to bring the storage level above the CAR. This curve is calculated for two consecutive years by ONS with participation of all agents, and it is approved by ANEEL.

Source: CTEE and ANEEL

29 Source: ANEEL, Available at http://www.aneel.gov.br/aplicacoes/noticias/Output_Noticias.cfm?identidade=4115&id_area=90
In turn, taxes are compulsory payments owed to the Government as required by the law that ensure the funds needed for the Government to perform its activities. The following taxes fall due on monthly electricity bills:

- **Federal Taxes**: Social Integration Program (PIS) and Social Security Financing Levy (COFINS), charged by the Federal Government in order to maintain programs focused on workers and other social programs run by the Federal Government.
- **State Tax**: State Goods and Services Circulation Tax (ICMS), addressed in Article 155 of the Federal Constitution, and payable on the circulation of goods and services within the jurisdiction of the State and Federal District Governments. The ICMS rates are established by State Law, and consequently vary among the States.
- **Municipal Taxes**: Street Lighting Levy (CIP), established in Article 149-A of the Brazilian Constitution, which authorizes municipalities and the Federal District to charge fees in order to defray the costs of street lighting services.

### 4. FACTORS PROMPTING THE NEED FOR PRIVATE SECTOR PARTICIPATION

During the early 1990s, waves of change had been sweeping across Brazil, prompted by a return to democracy on the one hand, with the nation headed by a President elected directly through the ballot

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30 Source: www.aneel.gov.br.
box, while on the other its economy remained shaky, battered by a string of unsuccessful attempts to curb galloping inflation, as noted in item 1 of this case study.

This prompted its newly-elected (in late 1989) government to launch a daring and necessary – although somewhat controversial – privatization plan, prompted by the utter inability of the State to continue operating in all fields of production, inviting the private sector to take over and expand its activities in the iron and steel, mining and petrochemicals industries.

During this initial stage, offering the private sector a stake in the main production segments of Brazil’s industrial sector, the control of large enterprises changed hands, funded by domestic private savings allocated by major investors and pension funds, backed by the Brazil’s National Social and Economic Development Bank (BNDES).

However, this process stumbled at the first hurdle, due to the failure of several economic stabilization plans and the political turmoil that forced President Collor out of office, with the remaining two years of his term completed by President Itamar Franco. Heading up a transition administration and seeking a more robust solution to the problems of inflation, which were proving extremely resistant and almost structural, he gathered together a team to address this challenge, headed by Economy Minister Fernando Henrique Cardoso.

As the driving force behind the Real Economic Stabilization Plan, which effectively triggered an about-turn in the Brazilian economy, Cardoso was elected President from 1995 onwards, with a view of the State very similar to that at the start of the 1990s. This underpinned the preparation of a tightly structured state reform plan, stressing the role of a trimmer and more efficient government, focused on activities typical of the State, and playing a leading role as the Regulator of activities in the public interest performed by the private sector.

Through this approach, the telecommunications sector – long run as a monopoly by Federal Government entities – was transferred to private enterprise through regulated concessions, in a compact transaction that was completed in only a few months, overseen by the Brazilian Telecommunications Industry Regulator (ANATEL).

In the power sector, the initial steps towards private participation were far more complex, for two key reasons: first of all, many of the utilities, particularly in the distribution segment, were run by the States rather than the Federal Government; second, sector-wide defaults required the establishment of a trustworthy electricity trading market, before inviting private capital to underwrite the expansion of the generation and transmission segments.

As a result, the initial steps towards private sector participation took place in two separate areas: self-generation and the award of public utility distribution concessions. In the self-generation segment, the Brazilian Government invited major consumers to participate in the completion of crucial power generation enterprises that the State concessionaires were unable to finish at that time (for example: Itá – 1.450.000 MW and Machadinho – 1.140.000 MW). In the distribution segment, although studies on the restructuring of Brazil’s power sector were still under way in 1995 and 1996, the Brazilian Government granted concessions for two distribution utilities under its control: ESCELSA in Espírito Santo State and Light in Rio de Janeiro.

Soon after, with the backing of the Brazil’s National Social and Economic Development Bank (BNDES), and the strong incentive of renegotiating a broad range of debts with the Federal Government, the States were also encouraged to sell off control of their power distribution utilities. This drive gathered force in 1995 and continued through to 2000. As a result, by the end of this period, stock control of 16 power
distribution utilities had been transferred, representing 152.245 GWh/year in the Brazilian electricity market\textsuperscript{31}, or 42% of the energy consumption on the year 2000.

This drive clearly characterized the efforts underpinning the government policy of establishing a reliable electricity trading market, consisting of power distribution concessionaires controlled by private agents and firmly regulated by Brazil’s Power Sector Regulator (ANEEL). Undeniable evidence of this quest to turn these agents into good payers was the tool introduced through a law \textsuperscript{32} that banned tariff restatement should the distribution utility default on its sectoral obligations.

Subsequently, after electricity rationing in 2001 and a new administration with different privatization guidelines, the drive to transfer control of the distribution concessionaires petered out. However, it must be stressed that contracts and commitments signed so far have been maintained as a government guideline, reflecting a belief in the importance of this stance, in terms of the credibility of Brazil and its power sector.

In terms of the power transmission segment, which is explored in this study together with the distribution segment, the basic reason for private sector participation was more indirect. Initially, transmission line control had to be removed from generation utilities, in order to ensure open access, which did not require any immediate efforts to sell off state-owned assets to private buyers. Second, as federal generation utilities were encompassed by the privatization program through to 2003, there was room for only Brazilian and international private investors or companies under State control to submit bids in the new transmission concessions auctions. Finally, addressed by a specific government policy, the concession agreements and the payment conditions for the transmission agents were designed specifically to prune risks and make projects more bankable, from the standpoint of the financing agencies.

Within this context, 7 (seven) concession auctions were held between 2000 and 2003 in the transmission segment, representing around 5,756 kilometers of 500 kV lines, 2,796 kilometers of 230 kV lines and 5,500 MVA of transformation facilities\textsuperscript{33}. This same concession process still remains in place, with the difference that the State is now a strong player, striving to ensure significant reductions in the revenues needed to implement investments.

However, under this ongoing concession system, when the Regulator holds new auctions, there are no barriers blocking the participation in new enterprises for agents in default with the implementation of transmission enterprises won at previous auctions. This problem has been stressed by private investors as a major stumbling-block hampering their participation today, which will be discussed below.

Consolidating the reasons for prompting private sector participation in Brazil’s power sector, it may be stated that, in addition to coinciding with a government policy implemented during the 1990s that exempted the State from playing the role of a businessman, returning to its regulatory duties, there was also a clear intention of establishing a robust electricity market, prompted by the need to place a further 3000 MW of generation facilities each year. The second reason was prompted specifically by the existing power distribution utilities, which were under State Government control. For the transmission segment, private sector participation was due more to the need for new capital and the structuring of solid regulatory and contract conditions, with enhanced appeal for investors.

\textsuperscript{31} Fonte: www.epe.gov.br - O mercado total do SIN no ano 2000 foi de 307.929 GWh
\textsuperscript{32} Article 10 of Law Nº 8,631/1993
\textsuperscript{33} Fonte: www.aneel.gov.br
5. BASIC CONDITIONS FOR IMPLEMENTING PRIVATE SECTOR PARTICIPATION

5.1 Laws and Legislation

5.1.1 Introduction

After the worldwide oil crisis in the early 1970s, ample available funding on international markets underpinned high growth rates for Brazil through rising debt and an expansionist fiscal policy.

However, in terms of the power sector, the pace of investments slowed from the late 1980s onwards. With the introduction of tariff equalization 34 in 1974 through Decree-Law Nº 1,383, and with electricity consumption rising at rates higher than those of the installed capacity, severe supply problems did not appear by the mid-1990s only because of a highly favorable rainfall cycle, with the Brazilian economy sluggish, hamstrung by hyperinflation.

The collapse of the financing model for this sector prompted ongoing discussions, striving to surmount the crisis and pruning away the institutional red tape that jeopardized any attempt at returning to economic growth. After the interest rates hike, followed by returning flows of foreign funding during the early 1980s, investments in infrastructure expansion – including the power sector – were severely affected by the inadequate financial capacities of the State.

The first step towards surviving this crisis came was the promulgation of Brazil’s 1988 Constitution, which allowed public utility services to be outsourced through powers delegated by the Grantor Authority to companies submitting winning bids. This was the end of the system based on concession areas serviced by huge federal enterprises.

5.1.2 Brazil’s 1988 Constitution

Before exploring the legislation that provided the initial tools allowing private participation in the transition and distribution segments, it is interesting to examine the main articles introducing an innovative approach to this topic in Brazil’s 1988 Constitution. Many of the understandings in place until then in its legal framework were altered by this milestone document.

In terms of jurisdiction for rendering services and operating electricity facilities, as well as indirect aspects of these operations (concessions, permits and authorizations), this Constitution rules:

“Article 21. The Federal Government Shall:

(...) 

XII – operate, either directly or through authorization, concession or permits:

(...) 

b) electricity services and facilities as well as hydro-power complexes on water courses, working closely with the States where the potential sites for these complexes are located;”

The mandatory guidelines to be followed by these concessions and permits are set forth in Article 175 of this Constitution:

34 This attempted to establish equal tariffs all over Brazil, adjusting the return of all the concessionaires through transferring funds from utilities posting profits to others who in the red. This was the Global Guarantee Reserve (RGG) that later developed into the Offset Earnings Account (CRC), with the National Treasury paying out more than US$ 26 billion in 1993.
“Article 175.

Sole Paragraph. The Law will rule on:

I – the regimen for concessionaires and permit-holders rendering public utility services, the special nature of their contracts and extensions thereof, as well as the conditions for lapse, oversight and termination of conditions or permits;

II – user rights;

III – tariff policy;

IV – the obligation to render adequate services.”

As a result, after Brazil’s 1988 Constitution was promulgated, rendering public utility services became the responsibility of the Public Authorities, either directly or indirectly, always through competitive bidding procedures, resulting in the concession areas system.

Until then, each federal enterprise was assigned a generation and transmission concession area: one in the North, another in the South, another in the Northeast, and so on. The State allowed the operation of any transmission, generation and distribution enterprise in the concession area. It is worthwhile noting that almost all the States in South and Southeast Brazil – which are the strongest in economic and political terms – have their own power plants and transmission lines.

These companies were in charge of operating all the enterprises within their concession areas. At the moment, a hydropower plant may be considered by any company, and after the necessary studies, the construction of these plants is tendered out through public auctions.

However, the provisions introduced by the Constitution were not strong enough to prevent a crisis sweeping through Brazil’s power sector. The model in place through to the mid-1990s – with almost all power utilities owned by the Federal or State Governments – was utterly depleted, due partly to a complete lack of the funding required to underwrite the public works needed to upgrade operations and underpin the expansion of the system. In Brazil, privatization began in 1990 under the Collor Administration, when the National Privatization Program was introduced through Law Nº 8,031/90. The BNDES was appointed to manage this Program, through an accounting fund that held the shares of the companies to be privatized. As the fund manager, the BNDES also began to administer, monitor and conduct the sales of the companies encompassed by this Program. For the power sector, privatization began only in 1995.

Within this context, the restructuring of Brazil’s power sector began in 1993, with the promulgation of Law Nº 8,631, which eliminated the guarantee return system, together with unified tariffs extending nationwide, paving the way for tariff recovery.

In addition to eliminating tariff equalization, this new law set the scene for an across-the-board reconciliation of accounts between the concessionaires and the Government. Through this approach, guaranteed return was eliminated.

Known as the Resende Act, this law resolved the debt problem, regulating the financial clean-up required to eliminate tariff equalization, bringing the guaranteed return system to an end, and doing away with mandatory power supply contracts, thus endowing concessionaires with greater tariff freedom.

However, it was only in 1995 that public utility service concessions were regulated, through Law Nº 8,987.
5.1.3 Law Nº 8,987/1995: Public Utility Service Concessions Act

Promulgated on February 13, 1995, the law mentioned in Article 175 of Brazil’s 1988 Constitution became known as the Public Utility Services Concessions Act (Law Nº 8,987), ruling on the concession and permit structure for rendering public utility services mentioned in Article 175 of the Brazilian Constitution, in addition to addressing other matters.

As set forth in its Article 6, the initial requirement for all concessions is the need to render adequate services that respond fully to user needs, as established in this Law, the rules related thereto and the respective contract, under penalty of declaring the concession lapsed (Article 38). Its Paragraph 1 defined ‘Adequate Service’ as: complying with the conditions of regularity, continuity, efficiency, safety, modernity, generality and courtesy in the rendering thereof, together with moderate tariffs.

Additionally, this Law also established the organization of a prior competitive bidding procedure as a requirement for all public utility service concessions (whether preceded or not by public works), as set forth in the specific legislation, in addition to compliance with the principles of legality, morality, disclosure, equality, adjudication based on objective criteria, and compliance with the convocation announcement.

The provisions on the restoration of the economic and financial balance of concession agreements, after the introduction, alteration or elimination of any legal charges or taxes subsequent to the presentation of the bid, through proof of the impact, as well as planned tariff reviews intended to maintain the economic and financial balance addressed in Article 9, enhance the attraction for private capital, whose expectations are focused on guaranteed income.

Finally, the Concessions Act empowered the Grantor Authority to ‘comply and ensure compliance with the regulatory provisions of the services and the clauses in the concession contracts, in addition to encouraging competitiveness.

5.1.4 Law Nº 9,074/1995

Also in 1995, Law Nº 9,074 was promulgated on July 7, establishing the conditions for contracting, extending or granting concessions, permissions and authorizations for working with electricity services and facilities, as well as using watercourses for power generation purposes. The publication of Law Nº 8,987, together with Law Nº 9,074, marked the start of what could be called the first stage of the New Model for Brazil’s Power Sector.

More specifically, the electricity transmission and distribution concessions granted under this Law were assured the duration required to amortize investments, limited to thirty years as from the signature date of the necessary agreement, and open to extension for no more than a similar period, at the discretion of the Grantor Authority, under the conditions established in the agreement.

When defining the figure of the free consumer35 in Article 15, Law Nº 9,074 also stipulated in its §6 that suppliers and free consumers are assured access to the distribution and transmission systems of public utility services concessionaires and permit-holders through reimbursement of the transmission costs involved, calculated on the basis of criteria established by the Grantor Authority.

The right to open access favored the appearance of new businesses in Brazil’s power sector, as the construction of transmission systems was split off from work on generation facilities, with easier entry to

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35 The current definition of a free consumer establishes a minimum load of 3 MW, which may opt to contract all or part of its electricity supplies from an Independent Power Producer (IPP).
the market, especially for generation utilities. However, open access was not in itself sufficient to attract private capital to this sector.

A significant step towards capitalizing this sector was the unbundling of electricity concessions, separating out power generation, transmission, and distribution and trading activities, which from then on were categorized as independent business segments. The generation and trading segments were steadily deregulated, while the transmission and distribution segments (which are inherently natural monopolies) continue to be treated as public utility services, subject to firmer regulation.

As already noted, companies holding power generation, transmission and distribution concessions that had been signing their concession agreements with the Grantor Authority 36 were required to split up their activities 37 in order to help sweep away the barriers to free competition raised by clustering these activities. Consequently, the possibilities of competition extended. This fragmentation reduced the market clout of these bundled utilities, as prices were now defined and charged independently for the specific power generation, transmission or distribution services. This step also ensured greater transparency for establishing the tariffs charged to consumers and users of the transmission network.

During this reform of the Brazilian power sector, it must be stressed that the legal instruments and the institutional arrangements needed to ensure smooth regulation of these activities did not appear all at the same time. In fact, legal instruments were being promulgated and institutions were being set up over a period of some three or four years.

Even as a start was made on privatizing distribution utilities, concession agreements were still being drawn up that encompassed transmission and generation activities. It was only in 2004 that concessionaires, permit-holders and authorizees engaged in distributing electricity as a public utility service through Brazil’s Interconnected Grid were forbidden to engage in power generation and transmission activities, through the wording given by Law Nº 10,848 to Article 4, §5 of Law Nº 9,074/1995.

Furthermore, Law Nº 9,074 also allowed the extension of concessions granted without competitive bidding procedures prior to Brazil’s 1988 Constitution, where work or operations had already began, but lagged behind schedule, for the length of time needed to amortize these investments, limited to 35 years, provided that a completion plan was presented by the parties involved, approved by the Grantor Authority, with commitments ensuring a stake for private investments of more than one third of the funding needed to complete construction work and bring these plants into operation. This attempt to revitalize halted projects and attract investments was still not sufficient to fuel the recovery of this sector.

Many aspects of this new model result from the suggestions presented in the Power Sector Restructuring Project (RESEB), developed up by British consulting firm Coopers & Lybrand, which culminated in the promulgation of Law Nº 9,648 (27/05/1998) on May 27, 1998. Initially, competitive generation was introduced, with market-defined values, independent transmission, open access, free energy trading by intermediaries, and the expansion of the generation assets being the responsibility of the interested investors, being these either from public or private sector. This proposal also made provision for introducing other institutions to this market, such as the National System Operator (ONS).

5.1.5 Law Nº 9,427/1996

Subsequently, the Federal Government Gazette published Law Nº 9,427 on December 27, 1996, which established Brazil’s Power Sector Regulator: ANEEL, a semi-autonomous government agency under a

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36 The Concessions Act (Law Nº 8,987/1995) established mandatory auctions for awarding power generation, transmission and distribution concessions.
37 Through Decree Nº 1,503, promulgated in May 1995, the enterprises in the Eletrobras Group were included in Brazil’s National Privatization Program (PND), being unbundled as they were sold off. The first of them (ESCELISA) was privatized in July 1995.
special regime, linked to the Ministry of Mines and Energy (MME), with head offices and law courts in the Federal District. Its purpose is to regulate and oversee power production, transmission and trading activities, in compliance with Federal Government policies and guidelines.

The main aspects of the sphere of competence assigned to ANEEL through this law, related to the transmission and distribution segments are listed below:

- to promote (...) bidding rounds for contracting public utility service concessionaires and permit-holders for power production, transmission and distribution (...);
- to administer the concession contracts or permits for public utility services related to electricity, and concessions for the use of public asset as well as overseeing (...) concessions, permits and electricity-related services;
- at the administrative level, to settle disagreements among concessionaires, permit-holders, authorizees, independent power producers and self-generators, as well as between these agents and their consumers;
- to establish the administrative fines to be imposed on concessionaires, permit-holders and authorizees rendering electricity services and operating the related facilities;
- to establish the goals to be attained periodically by each power distribution concessionaire and public utility service permit-holder, in order to ensure universal access to electricity;
- to implement a priori and a posteriori control of legal acts and other matters to be executed among concessionaires, permit-holders, authorizees and their controllers, subsidiary or associated companies and other subsidiary for associated companies under common control, imposing constraints on the mutual establishment of rights and obligations, especially for commercial matters and even refraining from such act or contract; and
- to define the usage tariffs for the transmission and distribution systems, and undertake the regular tariff reviews addressed in the contracts.

It is stressed that the establishment of an independent Regulator that is well-qualified in technical terms underpinned the development of the trust and confidence required to consolidate private sector participation in Brazil’s power sector. Over the past fifteen years, despite many spats over specific issues between the Regulator and the agents, there is unanimous agreement that the presence of this institution was a vital factor for attracting private investments to Brazil’s power sector, whose generation park has expanded by 56.656,54 MW (74%)\(^{38}\), its Basic Grid has been extended by 68.234 km\(^{39}\) (110%) of lines at 230 kV and 500 kV, the limited distribution quality ratings have fallen from an average of 27,19 hours interruption per consumer in mid-1990 to less than 18,4 hours\(^{40}\) today.

5.1.6 Law Nº 9,648/1996

It was the quest to establish a new institutional, commercial and regulatory model that would establish solid basis for the future development of Brazil’s power sector that the government contracted a specialized firm for a project that provided input for Law Nº 9,648, in 1998. Through this approach, the Brazilian Government hoped to attain some goals that included establishing conditions for maintaining the privatization program while making new investments more attractive to the private sector, through fair risk allocation.

In order to harmonize the operations of Brazil’s power system, the National System Operator (ONS) was set up by this law, replacing the Interconnected Operations Coordination Group (GCOI) established by

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\(^{38}\) Há ainda um total de 48.055,95 MW outorgados, porém em construção.

\(^{39}\) \(^{40}\) Fonte: ONS PAR 2012-2014

Fonte: www.aneel.gov.br
Law Nº 5,899, in 1973. The system operation and control, including the power generation and the transmission operations in the Brazilian Interconnected Grid were implemented by the ONS, which is a non-profit corporate entity established under private law, through authorization issued by the Grantor Authority, overseen and regulated by ANEEL and consisting of the holders of concessions, permits or authorizations, as well as free consumers connected to the Basic Grid.

In addition to setting up the ONS, this Law also established that the power purchases and sales among concessionaires or licensees must be contracted separately from access and use of the transmission and distribution systems, with ANEEL in charge of regulating the tariffs and establishing the general conditions for contracting access to and use of the power transmission and distribution systems by concessionaires, permit-holders and licensees, as well as free consumers. This separate contracting process was vital for endowing Brazil’s generation segment with a keener competitive edge, since it became possible to quantify how much is paid for the transmission service, leaving energy to be traded freely and transmitted over the wires for the transmission and distribution segments.

With the association between open access and the separation of power purchases from network use, direct sales became possible between generation utilities and free consumers, regardless of where the latter are connected to the transmission or distribution systems.

As a result, the transmission and distribution concessionaires render power transmission services, while the users (generation utilities and free consumers) have the right to open access for the transmission and distribution systems, being empowered to connect up to these networks and use them through reimbursement of the transmission costs.

As a result, and specifically with regard to the transmission segment, it became apparent that it was only when Law Nº 9,648 was promulgated, ten years after Brazil’s 1988 Constitution that a set of rules was firmly in place for attracting capital to this area, resulting in the first auction selling off a transmission concession in 1999, even if its effects could only be ascertained subsequently.

The goal was to expand Brazil’s transmission system through private funding. “There is no doubt that the State has no further resources to invest, and we need private funding”, stressed the Minister of Mines and Energy at that time Rodolpho Tourinho (O Estado de São Paulo newspaper – May 26, 1999).

Until 1999, the transmission network was operated solely by bundled enterprises (with generation and transmission assets, as well as distribution, in some cases) or by enterprises resulting from corporate split-ups undertaken for privatization purposes, but still under State control. However, from that year onwards, ANEEL launched the expansion of these facilities, through auctions selecting the corporate groups that would handle the construction and operation of the network. The winner would be the bidder presenting the lowest tariff.

As a result, the first enterprise was fully built and operated by private enterprise in 2001: a transmission line running 505 kilometers between Taquaruçu and Sumaré in São Paulo State. This auction was held in 1999 through a competitive bidding procedure (Tender Announcement Nº 007/1999 – ANEEL). The annual expansion of power transmission lines in Brazil is presented below:
Regulation was included on Brazil’s political agenda as a consequence of a privatization process that stressed public utility privatization and concession strategies.

5.1.7 Law Nº 10,848/2004

Finally, Law Nº 10,848 was promulgated on March 15, 2004, a milestone for the New Model of Brazil’s Power Sector, substantially altering the wording of preceding laws, with regard to the participation of private capital.

More specifically, this law altered Law Nº 9,427, promulgated in 1996, clearly establishing the power of the Grantor Authority to draw up the Concessions Plan, define the guidelines for the bidding procedures, and organize the competitive bidding procedures held to contract public utility service concessionaires for power production, transmission and distribution activities, as well as awarding concessions for hydropower complex sites.

Promulgated concomitantly on the same day, Law Nº 10,847 established an ancillary entity for the Grantor Authority: the Empresa de Pesquisas Energéticas – EPE, which would provide the necessary skills and technical input for the government to address the challenges of planning and opening up investment opportunities in Brazil’s power sector in a professional manner. This enterprise conducts the studies needed to present medium and long term plans to the Ministry of Mines and Energy (MME), ensuring that transmission and generation concessions keep pace with projected demands and regional and energy source diversification policies in the National Energy Balance (BEN).

5.2 Economic Aspects

5.2.1 Overview

A new chapter in the history of Brazil’s power sector began with promulgation of Law Nº 8,631 (Resende Act), on March 4, 1993, during the administration headed by President Itamar Franco, who took office after the impeachment of Fernando Collor in 1992. From 1973 to 1993, there was a single electricity tariff in Brazil, regardless of the characteristics of the concession area and the generation costs of each utility. Adopted during the administration headed by President Médici through Decree Nº 1,373, issued on December 10, 1973, the purpose of tariff equalization was to even out social inequalities. This mechanism artificially ensured payback for the concessionaires, without requiring any counterpart efforts pursuing thrifty, efficient operations.
The Resende Act eliminated tariff equalization and guaranteed return for power utilities, in addition to conducting an across-the-board reconciliation of debts and credits between the Federal Government and state-owned enterprises in this sector, with a face value of around US$ 26 billion.

The amount needed to clean up these utilities – at that time equivalent to almost 25% of the Brazilian debt – was in fact underwritten by the National Treasury, reflecting the utter depletion of the centralizing model for Brazil’s power sector. This Act also introduced the mandatory signature of supply agreements between generation and distribution utilities.

Another legal instrument that also ushered in sweeping changes was the Economic Stabilization Program, introduced towards the end of the Franco Administration in July 1994. This drastically reshaped the entire economic context, introducing the Real as Brazil’s new currency and slashing inflation rates. The power sector moved into a new phase with the transfer of assets from the State to private enterprise, with the Regulator State prevailing over the Investor State. This was the political alternative selected at the ballot-box, prompted by the financial inability of the public sector to allocate investments. President Fernando Henrique Cardoso was elected President during the first round of balloting on October 3 that year.

With a new President in office, the shift in the State stance was reflected in a wide variety of economic segments, including telephony, mining, finance and transportation.

### 5.2.2 Assumptions: Moderate tariffs and private sector involvement

As already mentioned, in 1995, Law Nº 8,987 included a specific chapter on the Tariff Policy stating that the tariffs for public utility services awarded will be established by the price presented in the bid winning the auction preserved by the rules of review set forth in this Law, the tender announcement and the contract. Furthermore, this Law also stipulated that these contracts could make provision for tariff review mechanisms in order to maintain their balance. 41

In addition to allowing tariff reviews whenever any taxes or legal charges were introduced, altered or eliminated, after the submission of the bid and with proven impact, other than income taxes, this law also allowed the concessionaires to bring in alternative, supplementary or ancillary revenues from other sources or from associated projects. Through this approach, moderate tariffs were pursued, underpinned by incentives attracting private capital to the public power sector.

To do so, the Brazilian Government invested in steps attracting private capital, in exchange offering compensation for what might well be called the Credibility Cost, which was high in Brazil at that time. In order to rebuild the confidence of investors grown wary after a string of events prompting mistrust, such as the declaration of a moratorium and the freeze on bank accounts, the Government transferred its powers to Regulators that were set up from 1996 onwards, delegating the management of these contracts to them, including the responsibility for ratifying restatements and reviewing tariffs and the pertinent rules as set forth by law, and overseeing contracts (duties assigned by the Grantor Authority through Item V of Article 29 of Law Nº 8,987, delegated to ANEEL through Article 3 of Law Nº 9,427 / 1996).

In brief, attracting foreign capital through privatization and ushering competition into this sector depended on stable regulations that would reduce investor risks. This prompted the need to establish an independent Regulator that could provide an institutional shield for the power sector.

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41 It also stipulated that, should any unilateral alteration to the contract affect its initial economic and financial balance, the Grantor Authority must re-establish this concomitantly with the alteration.
5.3 Economic Regulation for Leveraging the Participation of Private Capital

In order for private capital to participate competitively in power transmission and distribution activities, long term economic conditions were required, which needed to be just and fair for investors and users of these services, at one and the same time.

Consequently, massive efforts were deployed to define the ways of evaluating these services, seeking fair compensation for the agents while avoiding distortions related to rendering services with the status of a natural monopoly and subject to possible asymmetrical information with the Regulator. In order to examine how private agents rated and contributed to fine-tuning aspects related to the economic regulation of the power transmission and distribution sectors, the following items explain how these evaluations are conducted and these services are charged, stressing that a period of maturation was required to reach this stage, from the conceptualization of the Power Sector Restructuring Project (RESEB) in 1998 through to the consolidation of this New Model, through making adjustments to the original framework.

5.3.1 Evaluation of Transmission Services

The above-mentioned legal requirements have stipulated that transmission facilities of importance to Brazil’s interconnected power system must necessarily be integrated with the Basic Grid, operated independently by the National System Operator (ONS) and allowing open access for power generation agents, distribution concessionaires, and free consumers. Furthermore, these provisions allowed the electricity transmission activity to be characterized as a business separate from the generation and distribution segments, with prices and revenues specific to this activity.

In order to determine the value of the services rendered, the method used was to assign assured revenues to each asset associated with a public utility service concession. It must be borne in mind that, due to the natural composition and necessary expansion of the transmission network, it was not possible to establish a single approach for pricing the assets, with three distinct groups being identified, addressed separately below.

Assets in place before 1998

Many of the transmission assets already in place prior to the restructuring of Brazil’s power sector (1995 – 1998) had to be reassessed by the Regulator. The revenue requirements were calculated based on the required return on non-depreciated assets and the pertinent operating costs. These amounts were supposed to be recovered by the revenues from electricity sales by the concessionaires in operation at that time, whose concessions were split between the generation and transmission segments.

Due to the difficulties inherent in assessing the value of transmission business in state-owned companies formerly integrated with generation, it was decided that the revenues due to transmission companies through 2015 would be subject only to limited tariff adjustments excluding the costs of new investments.

New transmission assets

Once identified and tendered out by the Grantor Authority, expansion programs could now be undertaken by state-owned or private agents wishing to set up and operate transmission facilities, subject to control by the ONS. They took part in competitive bidding processes whose winners were awarded concessions

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42 Consumption of ≥ 3 MW and demonstrating in technical and economic terms that this is the best connection option.
43 Revenue cap tariff system, where the agent receives the stipulated revenues only if the asset remains available to the system for 100% of the time.
valid for thirty years, granted to the lowest revenue bidder for the services required. The revenues were subject to annual adjustment.

For competitive bidding procedures up to 2006, no tariff reviews were planned, unless revenues were 50% below forecast during the second half of the concession period. For competitive bidding procedures from 2007 onwards, the rule was altered, introducing four-year tariff reviews aimed to ensure the required revenues by restating the amounts assigned by the Regulator to the regulated cost of third party capital. The rule for revenue dropping 50% below forecast was no longer applicable.

**Expansions and Reinforcements**

As it is not always possible to run a competitive bidding procedure in order to award a new concession for transmission facilities, either because these are reinforcements to a facility already in place, or because this need was identified with a tight implementation timeframe, a special approach was needed for transmission concessionaires to add assets, with authorization from the Regulator.

For these cases, it was established that the revenues assured for the concession would be set by the Regulator on the basis of the New Replacement Value (NRV) of the assets in question and efficient operating costs. Thus, in addition to annual monetary restatement, ANEEL conducts a tariff review every four years for expansions and reinforcements, during which the required return on investment and the proportions of company equity and third party capital are examined, maintaining the economic parameters established four years previously; the operating costs are re-assessed through the benchmarking method, and at the first review, the assets are restated at their NRV. Although less complex, this type of review is conceptually similar to that used for the electricity distribution segment.

To summarize, the revenues needed to provide adequate cost recovery for existing assets, expansions, reinforcements and extensions, determine transmission costs. Although determined in different ways, these amounts are consolidated each year by the Regulator for individual concessions, taking into account scheduled start-ups during the subsequent year and deviations noted during the previous year. The total amount constitutes the revenues that must be brought in as payment for use by consumers, as explained in Section 5.3.3.

### 5.3.2 Evaluation of Distribution Services

Similar to the transmission segment, distribution activities are characterized as a natural monopoly, with their regulatory framework established by legal reforms in 1995, 1998 and improved in 2004, although with different nuances. Initially, due to the capillary characteristics of these facilities, concessions were still awarded by area, with guaranteed monopolies on electricity transmission services at distribution voltages (known as “wire services” in Brazil), as well as the delivery of energy to consumers not classified as free.

Second, the policy framework for providing compensation for these services was established on the price cap basis\(^{44}\), which sets the maximum unit price for the service, rather than the maximum revenues to be brought in, subject to annual adjustments\(^{45}\) and periodic reviews\(^{46}\). This means that the distribution agent must bear market risks in its concession area, incentivized to expand the customer base only when rising revenues offset expansion costs.

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\(^{44}\) Price-cap

\(^{45}\) In order to restate the value of the tariff charged in monetary terms and share out gains in productivity that are pre-determined with the service users

\(^{46}\) In order to reassess the services rendered through benchmarking
Finally, fees charged for energy purchased from third parties – as the same agent may not perform generation and distribution activities – became neutral, with the price paid by the distributor being transferred to consumers purchasing its electricity. The same occurs with the transmission system access costs, used by the distributor.

Within these arrangements, the value of the services rendered by the distribution utility was established at the time of the tariff review as the amount required to recover efficient operating costs and prudent investments. Thus, for periods of around four years, depending on individual concession agreements, the Regulator uses benchmarking techniques to assess the adequate rate of return, the NRV of assets brought into operation during the past few years, and efficient operating costs. Through these parameters, it determines the breakeven point for revenues brought in by the concessionaire. These amounts constitute the basis of the calculation of the tariffs by consumer class that will be charged for the next four-year period, always subject to annual restatement.

It must be stressed that through this evaluation system, the return for the distribution concessionaire is tied to rendering electricity transportation and delivery services to end consumers, with electricity sales treated as transferring purchases under strict regulations imposed by the Grantor Authority, without obtaining any type of advantage through such transactions.

### 5.3.3 Setting Transmission Tariffs: Locational Cost (approach for voltage ≥ 230 kV)

The solution offering the greatest security for capital attracted through new investments to the Brazilian power sector was locational cost, implemented from 1988 onwards and tailored to the nation’s transmission and generation sector expansion needs. Through this approach, network usage costs were separated from the costs of the electricity consumed by all users, using the locational cost concept to determine the usage tariff to be charged. Furthermore, as the characteristics of the transmission and distribution network are quite different, particularly with regard to the number of users, the method used to define transmission and distribution tariffs was established differently, as shown below.

For the location cost, two characteristics are important for determining the amount to be charged: (i) whether the user is a power generator or an electricity consumer; and (ii) the maximum use of the system by a user during a specific period, usually one year, and at what load level (light, medium or heavy). Added to these data is the need to determine, on a regulatory basis, the value of all the assets in the transmission network.

With this information and using a tailored load flow program, the Regulator can assign a value to each point in the network and for each load level, which must be paid by the power generator or electricity consumer at a specific point on the network. This amount is directly related to the network assets closest to the connection point and the amount of power generation/user load, indicating a tariff by load level, to be applied to the amount of the contracted demand, also by load level, for payment on a monthly basis, defined in R$ /kW/month.

The direct findings – which are intuitive – of a location signal simulation, in the strictest sense, indicate that all the costs of a specific substation and the lines running to it are paid by load, where there is far more load than generation, for example, with the generation utility even paid to connect up to it. Furthermore, over long radial segments with low loads, the costs assigned to the users result in extremely high tariffs. Finally, as the amounts of use vary and the network topology also expands, the amount to be paid at each location varies erratically for each simulation period, which is generally annual.

All these observations meant that, in actual practice, the methodology required tweaking at some points: (i) to avoid major discrepancies in values among network users, it was decided that a network fee would be paid by all users, in direct proportion to use, at around 70% (known as the “stamp” amount); (ii) the
total cost of the network would be underwritten almost equally by generation utilities and consumers; and (iii) the amount established for new generation utilities should be more stable, at least during the initial period as the enterprises come on-stream.

The current stage of this tariff approach has been reached during the past 15 years, with a series of improvements and adjustments, particularly in the treatment offered to the generation utilities, due to the need for more foreseeable payments, and the network value assigned to the “stamp” amount. Finally, it is worthwhile stressing that there are only less than two thousands 47 transmission grid users, consisting of generation and distribution utilities, together with major consumers.

5.3.4 Cost by voltage level (approach for the distribution segment)

Despite a large “stamp” amount, working with the distribution segment through location signal has not yet proved practicable in Brazil, due to the capillarity of this type of network. Instead, tariffs are defined at marginal cost by voltage level, with the users of a specific distribution voltage level thus paying tariffs (R$/kW/month) that encompass the costs of all the assets for voltage levels that are equal to and higher than that being used.

Once again, this concept is intuitive, as it makes sense to imagine that users at 34.5 kV, for example, pay for the assets and services associated with this voltage level, as well as an amount proportional to the use of higher voltage levels, including the costs incurred by the distribution utility for the Basic Grid, established through the method explained in the previous section. This also simplifies the principle of tariff isonomy within a concession area. All users in the same class and at the same voltage level pay the same tariff in that concession.

The advantage of this method is its relative simplicity, from the standpoint of establishing tariffs, as well as from a legal perspective, as there is no way of claiming any absence of isonomy in the concession structure. However, this same simplicity becomes a weak point from the standpoint of large users with the right to connect to the Basic Grid under the Open Access Act.

Massive areas in most of the concessions awarded in Brazil require vast high voltage networks (138 kV and 69 kV), established by the distribution utilities, generally designed to service load centers that are fairly remote from the points of access to the Basic Grid (≥ 230 kV). Major consumers are generally located in large consumption hubs that are usually close to a Basic Grid access point. Together, these two factors have the following effects:

- The cost of using a distribution utility at a high voltage level (138 kV for example) are elevated by the huge networks at this voltage needed to service its entire concession area, becoming high when compared to extending a section of the Basic Grid in order to offer access to a major consumer;
- Consumers already connected to the high voltage distribution network and eligible to apply for access to the Basic Grid when their load rises and when the decision leads to lower overall cost for the system 48 generally have a strong economic incentive for leaving the distribution utility 49. This is often due to the marked difference in tariffs between the high voltage distribution network and the Basic Grid, rather than any technical need to step up the voltage level in order to receive better services.

47 http://www.ccee.org.br
48 Comparison of the costs of implementing access to the Basic Grid with the reinforcements needed to ensure ongoing services at the distribution voltage to which it is connected, including losses in the system, over a five-year time frame.
49 The condition for a consumer to leave the distributor for the Basic Grid is that any impact on tariffs must be offset through indemnity paid to the distributor whose network has idle capacity due to this departure. Furthermore, investments in access to the Basic Grid or the reinforcements needed for the distributor will be for the account of the consumer with the increased load.
This situation is uncomfortable for the distribution utility, as its customers have an incentive to withdraw from its network, as well as for the Grantor Authority, which must analyze applications submitted by consumers and issue permission for them to access the Basic Grid. A valid way of resolving this conflict, in the view of concessionaires and consumers, would be to establish usage tariffs for the high voltage distribution network (at least 138 kV and 69 kV), through the same method as the Basic Grid, meaning by location signal, with an adequate percentage for the “stamp” amount.

5.4 Aspects of Private Capital Participation in the Transmission and Distribution Segments

Both the transmission and distribution segments were designed as public utility services, open to exploitation either directly or delegated to private players, charging public tariffs and with administrative agreements containing clauses that ensure their economic and financial balance.

In the specific case of the transmission segment, the concession agreement rules the relationship between the transmission utility and the Grantor Authority, with the transmission concessionaires reimbursed through their Permitted Annual Revenues. The rights to revenues guaranteed through ensuring the availability of the facilities, regardless of network usage, was an essential element for attracting private capital to the transmission segment. This step may be viewed as a public policy through which risks are allocated to the consumer, in order to ensure greater energy security.

One of the challenges facing this segment, in terms of private capital participation, is the quality of these players. Inadequate technical, economic and financial requirements allow companies to participate that might even offer these services at lower prices, despite their lack of familiarity with the nuances of this segment, thus underestimating difficulties and undervaluing the business. This may result in a series of complications during the works stage, including delays, abandoning the enterprise and even the need to repeat the procedures for a new bidding round.

By mid-2010, ANEEL had auctioned off some 38,800 kilometers of new transmission lines, and a total of 60,600 MVA of transformation capacity, expanding the Basic Grid of Brazil’s Interconnected System. These enterprises attracted domestic and international investors, mainly from Spain, Italy, Colombia, Portugal, Argentina and China, as well as State and Federal enterprises, the latter after the end of National Privatization Plan in 2003 and 2004.

With regard to the distribution segment, which is a natural monopoly, the current tariff review process is currently trimming only the portion of the tariff earmarked as payback for the investments made by distribution utilities and their operating costs. The Regulator sees a clear reduction in the distribution business risks, with this new not shared widely by investors.

Along these lines, the agents in general identify the presence of the following types of risks: i) regulatory risk as the tariff review methodology has altered for each cycle; ii) social risk that influences the market and may significantly affect distribution utility investments and operating costs, generally at the regional level and differing among the many (63) concessions awarded in Brazil; and iii) political risk underpinned by public policies that use sector resources inappropriately, such as programs designed to ensure universal access to electricity and benefits for the low-income segment.
6. **CONCESSION AWARD MECHANISMS**

Private Sector Participation in Brazil’s Transmission and Distribution Segments built up with the implementation of the Restructuring of the New Model for Brazil’s Power Sector, as outlined above.

Within this context, it is important to stress the role of possible private investors in the expansion of the system. The legal provisions mentioned above paved the way for larger stakes held by private funding in system assets, once the State began to focus firmly on planning and operations, rather than building facilities. Consequently, private sector participation became extremely interesting for implementing new projects or even for the control of existing assets.

As a result, the following aspects require analysis:

- Aspects of attracting investments to Brazil by private entrepreneurs; and
- Concession award mechanisms to private entrepreneurs or through public-private partnerships.

### 6.1 Transmission Segment

During the period prior to the restructuring processes outlined above, transmission facilities were associated with generation activities. Thus, the same entrepreneur in charge of building a power plant also had to lay the transmission system as far as a point defined through planning. However, as already explained, this approach did not encourage the expansion of the transmission system, as the Grantor Authority was reluctant to acknowledge these costs.

The unbundling of the generation, transmission and distribution utilities, and above all the establishment of the transmission segment as an area independent of the others, paved the way for private investors to move into this field, which was previously dominated by state-owned enterprises.

Based on these precepts, until 1999, the transmission network was operated solely by bundled enterprises, with generation and transmission assets as well as distribution) facilities in some cases, or by companies resulting from corporate spin-offs during the privatization process that were still controlled by the State. 50

However, from that year onwards, an expansion process was launched for these facilities, based on auctions to select the business groups in charge of the construction and operation of the network, as outlined by Brazil’s Power Sector Restructuring Project (RESEB) project. Public utility service concessions in the transmission segment are awarded to bidders offering the largest discount on the initial Permitted Annual Revenues of the auction, meaning the lowest tariff for the system.

Since 1999, fifteen auctions have been held, with 67 projects awarded, with a total of 21,317 kilometers of transmission lines. These auctions attracted the public and private capital, with private capital prevailing (13,250 kilometers in 39 transmission lines), in addition to public-private involvement (12 lines totaling 4,842 kilometers). 51

Major incentives for Private Sector participation in transmission auctions are:

- System defined for this area, ensuring payback on investments throughout the entire concession period. The tariffs charged by the transmission utilities are regulated by a newly-implemented

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51 New Model for Brazil’s Power Sector – Maurício Tolmasquim
The revenue-cap model, which establishes the ceiling revenues to be transferred to the company each month, as payment for full availability of the transmission line. This model encompasses incentives for pursuing cost efficiency, based on yardstick competition, reflected in regular tariff reviews and price-based auctions; and

- As natural monopolies, these public utility services ensure shield investors against market swings.

Despite its advantages, this system was not deployed evenly at the start. As transmission assets were already in place during the power sector restructuring process in 1995 - 1998, they were assessed by the Regulator, which took into account return for non-depreciated assets and the related operating costs, in order to define the corresponding revenues. The amounts calculated were withdrawn from the revenues brought in through electricity sales to the existing concessionaires at that time, whose concessions were divided between the generation and transmission segments.

Since then, new facilities have been auctioned off through the transmission auctions in batches attracting bids from competitors, with no distinction between public or private capital.

This outline thus leads to the conclusion that there are different concession award mechanisms, depending on the type of transmission facility involved:

- Facilities in place by 1999: assessed by the Grantor Authority and included in concession agreements awarded to the companies owning the assets, largely bundled (power generation, transmission and distribution facilities);
- New facilities, from 1999 onwards:
- auctioned off and awarded to the bidder offering the lowest Permitted Annual Revenues for the construction, maintenance and operation of these facilities throughout the entire concession period (established by Federal Law № 9,074/1995, at 30 years open to extension for a further 30 years);
- authorization for existing Concession Agreements: Resolution ANEEL nº 443/2011 defined which facilities are rated as upgrades and improvements to the existing facilities, authorized for the owner of the facility, with Additional Permitted Annual Revenues granted for these projects, awarded by the Grantor Authority to the concessionaires in question; and
- Exclusive Use of power generation complexes: the transmission facilities are covered by the concession award or authorization, being implemented by the entrepreneur which also maintains them, with no right to additional return, as the implementation costs were included in the sale price of the power produced by these enterprises;

Private participation is possible through all these mechanisms, either by acquiring existing facilities, or through bidding in auctions selling off new transmission facilities.

### 6.2 Distribution Segment

Although the General Concessions Act (Federal Law № 8,987/1995) stipulates that all concessions must be preceded by competitive bidding procedures, this did not occur for all concessions in all segments at the time when Brazil’s 1988 Constitution was promulgated, particularly in the distribution segment, which were delegated through decrees prior to this event.

Consequently, private sector participation in distribution utilities that were previously state-owned took place through transferring corporate control, with the sale of percentages of company control and management to private groups that saw the lengthy concession period (up to 30 years, open to extension) as an attractive investment. However, at this stage the companies still remained bundled, meaning that they continued to operate in the power generation, transmission and distribution segments.
During the first wave of changes, while the privatization logic of the 1990s still prevailed, government-run and state-owned enterprises were acquired by the private sector, with the duration of their concession agreements extended by Federal Law Nº 9,427/1996. Furthermore, the promulgation of Federal Law Nº 9,074/1996 required these companies to be unbundled, spinning off segments and signing concession agreements for each of them, as explained below.

With the introduction of the New Model for Brazil’s Power Sector in 2004, there was a wave of nationalization, in terms of the planning and expansion of this sector, although still with the intention of stepping up competition in the generation and trading segments, while regulating the transmission and distribution areas. Consequently, state-owned enterprises with planning that included privatization remained under State control, giving rise to the hybrid system still in place today.

Introduced by Federal Law Nº 9,074/1996 and altered by Federal Law Nº 10,848/2004, the unbundling of distribution activities was a milestone for the participation of private capital in the Brazilian power sector. The procedure prior to Law Nº 9,074/1996 hampered competition, due to the following aspects:  

- Bundled companies with strong market control can block the entry of new agents, with adverse effects on competition;
- This hampers the discovery of self-dealing transactions, meaning cross-subsidies between a regulated segment (distribution) and a competitive segment (generation), even if limited. Consequently, the earnings of a bundled company might well not represent the real situation of each segment, and might even result in losses for consumers; and
- With a single enterprise controlling several segments in a single area, there were difficulties in paving the way for competition and / or inflows of new capital to the market, whether public or private.

Separating these segments, as addressed in these Regulations, meant that the existing distribution utilities were not auctioned off, as they owned many assets that were not depreciated, with investments still under way. It was thus agreed that these activities must be separated, with each segment signing a Concession Agreement with the Grantor Authority, represented by ANEEL, through which the conditions are established for rendering services to consumers, in addition to the obligations and penalties for failure to comply with these conditions.

However, this attempt was not successful, as unbundling and free contracting between the distribution and generation segments did not reach the desired goals, as the distribution concessionnaires continued to trade electricity only with generation utilities within their own groups, not encouraging competition.

This practice was addressed through the new model implemented in 2004, through the provision set forth in the above-mentioned Federal Law Nº 10,848 / 2004, making power purchases a regulated activity. Moreover, this provision stated that, under the aegis of the Brazilian Grid, concessionaires, permit-holders or authorizees offering public utility distribution services could not engage in power generation or transmission activities, or any other activity outside the purpose of the concession, permit or authorization.

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52 Idem
Thus, although Federal Law Nº 8,987/95 (General Concessions Act) assigned all the risks of the distribution business to the entrepreneur\(^{53}\), investors initially viewed the Distribution Segment as a low-risk business, due to certain factors:

- Possibility of gains in scale and on the market, as electricity consumption has been rising steadily in Brazil since the mid-1990s;
- Possibility of gains in efficiency, as there is a manageable portion of the tariff through which the entrepreneur can cut costs and fine-tune procedures in order to boost its profits, called Regulation Through Incentives;
- Absorption of gains in productivity through to the first regular tariff review, scheduled for four or five years after the start of the concession; and
- Low economic risk for the investment, due mainly to the fact the distribution activities constitute a natural monopoly.

Consequently, private investors controlling private distribution enterprises had experienced a time of high expectations and growth, while allocating massive investments, justified by this outlook and regulation through incentives applied to the distribution tariffs.

However, when the first effects of private management began to appear in this sector, reflected in the profits brought in by investors, the current market trend began, focused on gains designed to moderate tariffs through the Regulator. This policy has been pruning the earnings of entrepreneurs while ratcheting up the risks involved in the distribution business.

Thus, as no distribution concessions have been awarded for quite some time, the types of concession open to private capital are limited to transfers of corporate control in the current operations, similar to the situation in place during the 1990s.

As an example of this motion, it is possible to mention some acquisitions occurred in the sector. This is the case of CEMAR, the distribution company from the state of Maranhão that was acquired on the privatization process in 2000 by the group Pennsylvania Power & Light (PPL), and whose control changed to Equatorial Energia group in the year 2004. In the recent case of Elektro, the management of the distribution company responsible for supplying 223 cities in the state of São Paulo and other 05 in the state of Mato Grosso do Sul was acquired by Abengoa from Ashmore Energy International Limited (AEI), being the first a Spanish company with other important participants in Brazil.

Among the transmission companies these motions are much more frequent and varied. It can be mentioned the TSN – Transmissora Sudeste Nordeste case, which was controlled by the Italian group Terna S.p.A, responsible for implementing one of the circuits from the Brazilian southeast/north interconnection: in 2009, the State government controlled company CEMIG GT has acquired its control. Furthermore, there is the case of State Grid, Chinese company that acquired the control of the Brazilian transmission company Plena Transmissora in 2010.

With this background, the current context as outlined above is less focused on a policy of attracting private capital to Brazil’s power distribution segment, thus dimming the appeal of this segment.

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\(^{53}\) Law Nº 8,987/1996, Article 2 Item II: “award of public utility service concession: the delegation of the rendering thereof by the Grantor Authority through a competitive bidding procedure to a corporate entity or consortium of companies demonstrating the capacity to render such services at its own account and risk and for a specific period.”
7. LESSONS LEARNED AND IMPROVEMENTS PURSUED

Private sector participation in power distribution and transmission activities in Brazil was effectively introduced through the restructuring of this sector from 1995 onwards, with a specific legal framework that is still being constantly upgraded. Legal milestones promulgated in 1998 and 2004 are particularly noteworthy, with significant differences in approach between laws issued in 1998 and 2004.

The initial steps focused mainly on ensuring that this sector was institutionally well structured (with a Regulator, Independent Operator, Wholesale Electricity Market etc) and extremely attractive to private capital (lower risks, concession agreements with pre-set economic clauses, BNDES financing etc). The 2004 laws focused more on supply security (contracting 100% of demand, centralized planning and a steady flow of new enterprises to be auctioned off, etc.) as well as moderate tariffs (ban on self-dealing, splitting the market into regulated and open sectors, generation concessions awarded through the lowest prices on the regulated market, etc).

Two aspects warrant particular attention in these drives to attract the private sector: the quest for more efficient management of these utilities while expanding the scope of their services; and the introduction of attractive conditions for new investors, without losing sight of the quest for moderate tariffs over the medium term.

With regard to the efficiency of the distribution sector, it became clear that private sector participation enabled solutions and levels of efficiency significantly higher than those achieved by most of the enterprises that remained under state control. New procedures for procurement, for networks operation and modernization and for improvement of customer services, and an entirely new approach for company management fueled by private dynamics paved the way for earnings that were shared with customers over time through their transfer to distribution service prices.

Among the factors driving this quest for efficiency were regulatory incentives offered to concessionaires, which could absorb gains in efficiency between two consecutive tariff reviews (periods of four or five years, depending on the concession). This type of regulation ensured the appeal of the business, with beneficial effects for concessionaires over the short term, while paving the way for moderate tariffs over the medium and long terms, as any gains in efficiency achieved by distribution utilities are absorbed into the tariffs during the subsequent tariff cycle. In brief, this ensures a trend towards fine-tuning costs and investments with positive repercussions for ensuring moderate tariffs.

For the transmission concessions, consisting of specific enterprises identified through centralized government planning, public auctions pursued efficiency more effectively than enterprises whose requested revenues were tied to the availability of the assets built, maintained and operated by the concessionaire.

Winning a public auction that really results in efficient prices is the outcome of efforts directed towards lowering risks as much as possible, from the standpoint of the entrepreneur. Thus, the regulation of this segment shared out payments for transmission services rendered by these concessionaires among all the parties accessing the Brazilian Grid (generation and distribution utilities and major consumers).

One of the most striking lessons learned during the past fifteen years of experience underscores the importance of implementing the concepts developed. Private agents entering the business were attracted by the recommended concepts, particularly with regard to the absorption of gains in efficiency and the economic regulation established in the contracts. Better understanding by society of the regulatory tools deployed, as well as the actual functioning of this sector, frequently required significant adjustments to the provisions and stances adopted by decision-takers.
This prompted a series of events that modified the conditions of the concepts as originally established:

- The agents underestimated the risks of managing alterations to the energy, transmission and cost components built into the distribution tariffs and called for the economic neutrality of these components during the 2001 energy crisis; this was implemented immediately to some extent, and consolidated a few years later through amendments to the concession agreements.
- The Regulator became deeply concerned with the profits brought in by some distribution agents, resulting in the introduction of mechanisms ensuring earlier uptake of gains in efficiency, in contrast to the initial concept of absorbing tariff cycle gains only in the subsequent cycle;
- The understanding of the economic clause in the new transmission concession agreements that was adopted by the Federal Fiscal Regulator (the Federal Audit Court) required regular tariff reviews to be introduced during the past six years for these contracts, adjusting the value of the return intrinsically built into the winning bid presented at the auction, due to variations in financing conditions by government entities.
- Service quality requirements became more important, and were included as items defining tariffs for power distribution utilities, while failure to comply with these requirements resulted in financial reimbursements for consumers by concessionaires; and
- In some cases, in order to ensure sharp reductions in new transmission concession prices, bidder qualification requirements were relaxed, with higher risks of failure to comply with the obligations accepted by these agents. This decision is one of the reasons behind the systematic delays noted in the energization of major concessions in the Brazilian Grid, prompting the Regulator to review the qualification requirements for new auctions that are being scheduled.

This Report confirms the regulatory dynamics that address the management of a strategic area, such as the power sector, requiring constant adjustments and adaptations in order to keep pace with changing circumstances. It is thus important to have a legal framework in place that is firm enough to establish clear conceptual guidelines, while also steering the regulatory adjustments that become inevitable over time.

In closing, it may be concluded that the efforts under way in Brazil to allow and encourage private sector participation in the power transmission and distribution segments have been successful. The necessary improvements that can always be implemented are pointing towards the consolidation of the conceptual conditions for distribution tariff regulation, avoiding shifts in approach for each four-year tariff review cycle. In the transmission segment, more stringent qualification requirements are needed for agents bidding in new concession auctions, in order to minimize the risks of energization delays for projects that are crucial for all users, thus underpinning nationwide power supply security for Brazil.

8. FINAL REMARKS

This case study was conducted on the basis of a bibliographic survey, examination of the pertinent legislation and interviews with specialists (see table below) in a wide variety of areas who were (and still are) involved in taking major decisions and implementing important actions related to the Brazilian power sector, to whom I offer my thanks and attribute much of the knowledge conveyed here.

For preparing the text, the author was supported by priceless contributions from engineers Michele Nunes Freires and Lorena Melo Silva, as well as economist Renata de Oliveira e Silva, who contributed greatly to the depth of the information presented here.
The text was translated into English by Carolyn Brissett, whose efforts allowed this survey to be of greater use for the purposes of the World Bank.

Additionally, engineer Antonio Marra de Lima offered an effective contribution to the fine-tuning of the concepts and ideas presented here.

Finally, with the recommendation of Pedro Antmann and under the coordination of Victor Loksha, whose ongoing supervision and broad-ranging understanding eased difficulties encountered along the way, it was possible to complete this Case Study on the Private Sector Participation in Brazil, hoping that these experiences and lessons learned will ensure a smoother path for all countries seeking solutions that will expand and enhance their electricity services.

<table>
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<tr>
<th>Name</th>
<th>Role Played on the New Implementation</th>
<th>Nowadays’ Activities</th>
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<tbody>
<tr>
<td>Elena Landau</td>
<td>She was one of the main sponsors on the privatization process occurred during the governments of Fernando Collor and Fernando Henrique Cardoso. She headed, as the director of BNDES between 1994 e 1996, the Federal Government Privatization National Program.</td>
<td>She is, nowadays, economist and lawyer. Being in the practice of law, she also deals with Economic and Regulatory law issues.</td>
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<td>Nelson Hubner</td>
<td>He was the Chief of Staff of the Minister of Mines and Energy Dilma Roussef in 2003, moment on which he worked on the restructuring of MME and on the consolidation of the electric sector’s New Model. He was the Minister of Mines and Energy between 24th may 2007 and 21st january 2008.</td>
<td>Nowadays, he is the General-Director of Electric Energy National Agency (ANEEL) since 13rd may 2009.</td>
</tr>
<tr>
<td>Firmino Ferreira Sampaio Neto</td>
<td>He was the president of ELETROBRAS between 1996 and 2001. Meanwhile, he was the president of Eletrobras Thermonuclear between 2000 and 2001. He has also presided the distribution company COELBA for 14 years and was member of several Administration Councils from electric sector companies such as CHESF, FURNAS, Binational Itaipu, CEMIG, Eletrosul, and other.</td>
<td>He is member of the Administration Council of CEMAR – Energy Company of Maranhão since 2004, also being Director President of Equatorial Energy Group since 2010.</td>
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<td>Marcelo Maia de Azevedo Corrêa</td>
<td>He was the Director President of VBC Energia S.A. from 1997 to 2004 and was the president of the Administration Council of CPFL – Piratininga between 2001 and 2002. He was member of the Audit Council of RGE – Rio Grande Energia, from 1997 a 1999 and of CPFL – Paulista in 2000.</td>
<td>He is the Director President – Executive Board of Neoenergia Group. He also is part of the Administration Council of ONS – National Operator of the System, in addition to the councils of companies such as COELBA, CELPE and other.</td>
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<tr>
<td>Name</td>
<td>Background</td>
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<td>Solange Maria Pinto Ribeiro</td>
<td>She started her career at CHESF – Hydroelectric Company of San Francisco River, where she stayed for 15 years. Between 1998 and 2000 she worked for NERA- National Economic Research Associates, in the United States, dealing with the economic and regulatory issues related to the electric energy industry restructuring. She has accompanied RESEB – Brazilian Electric Sector Restructuring Project, and between 2000 and 2004 she worked at the regulatory area of Eletropaulo Metropolitana.</td>
<td>She is the Regulation Director – Executive Board of Neoenergia Group.</td>
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<tr>
<td>Paulo Pedrosa</td>
<td>He was the Director of ANEEL from 2001 to 2005, and president of ABRACEEL (Brazilian Association of the Electric Energy Trading Agents) from 2005 to 2010. He has also worked at Eletronorte, CHESF and at the Infrastructure Committee of the Brazilian Federal Senate.</td>
<td>Executive- President of ABRACE (Brazilian Association of Great Industrial Consumers and Free Consumers of Electric Energy) since August 2010.</td>
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<tr>
<td>Otavio Castello Branco</td>
<td>Between 2001 and 2002, he was the Infrastructure Director of BNDES – National Bank of Economic and Social Development.</td>
<td>Now he is the associate responsible for the infrastructure sector and member of the Executive Committee of Pátria Investimentos, of which he is part since 2003.</td>
</tr>
<tr>
<td>Hermes Chipp</td>
<td>He was an employee of Eletrobras since 1971, acting mainly on the electric operation planning area of the former GCOI – Interconnected Operations Coordination Group. Between 1998 and 2005 he was the director of the Operation’s Planning and Programming area at ONS – National Operator of the System.</td>
<td>He is currently the General Director of ONS.</td>
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<tr>
<td>Maurício Tiomno Tolmasquim</td>
<td>He was the Executive Secretary of Ministry of Mines and Energy between 2003 and 2005, when Dilma Roussef was the minister. During this time, he coordinated several technical studies, including the establishment of the New Model of the Electric Sector. He was the provisional minister of Mines and Energy during 2005.</td>
<td>He is now president of Energy Research Enterprise (EPE), and also member of the National Energy Policy Council (CNPE) and the Power Sector Monitoring Committee (CMSE).</td>
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