Document of the Inter-American Development Bank

BRAZIL

**Conditional Credit Line for Investment Projects (CCLIP) for Financing Productive and Sustainable Investments**

**(BR-O0001)**

**First Program under the CCLIP: Financing Program for Sustainable Energy**

**(BR-L1442)**

**Monitoring and Evaluation Plan**

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**Contents**

I. Introduction 2

A. General Framework 2

B. Scheme for Implementation and Monitoring 3

II. Monitoring 5

A. Indicators 5

B. Data collection and Instruments 7

C. Reporting of monitoring results 7

D. Coordination, workplan and budget for monitoring 8

III. Ex-Post Evaluation 9

A. Main Question(s) 9

B. Existing Knowledge 9

C. Evaluation methodology 14

D. Reporting of evaluation results 17

E. Complementary evaluation 17

F. Coordination, workplan and budget for evaluation 18

1. Introduction
   * + 1. A. General Framework
   1. The Financing Program for Sustainable Energy (BR-L1442), the first program under the Conditional Credit Line for Investment Projects (CCLIP) for Productive and Sustainable Investments (BR-O0001), has the objective of promoting investments in sustainable energy projects so as to contribute to meet Brazil’s goal of diversifying its energy matrix and efficient use of energy, minimizing Greenhouse Gas (GHG) emissions in Brazil.
   2. As described in the Proposal for Operation Development (POD), the problem that the CCLIP aims to address is the lack of adequate financing for those private investments more likely to stimulate productivity and sustainability in Brazil. By increasing access to medium and long-term financing, the CCLIP would enable firms to increase their investment,[[1]](#footnote-1) with focus on three strategic areas (infrastructure investments, clean energy investments and productive investment of SMEs) where a potential for contributions to long-term growth has been identified and a counter˗cyclical intervention is considered more valuable.
   3. The CCLIP is conceived as a flexible instrument with the general goal of promoting productive and sustainable investment in Brazil by channeling long˗term financing for private projects in different sectors. The first program will consist of a single component under which the *Banco Nacional de Desenvolvimento Econômico e Social* (BNDES) – the largest state-owned development bank and the main source of long-term financing in the country – will use IDB funding along with its own resources to provide financial support to private developers of sustainable energy projects through direct and indirect sub loans. More specifically, projects to be financed include: (i) electricity generation from Alternative Renewable Energy (ARE) sources;[[2]](#footnote-2) and (ii) medium to large Energy Efficiency (EE) investment projects, including cogeneration and industrial processes.
   4. The program shall be able to provide a financial instrument that is adequate to the needs of these types of projects. By channeling IDB resources, BNDES increases its capacity to provide the longer terms these projects require due to the high levels of initial costs and the need to match their cash flow profiles and return rates that can guarantee proper implementation of these ventures.
   5. The proposed CCLIP will use US$2,400 million from IDB’s ordinary capital. The first program under the CCLIP consists of a global credit loan operation for US$750 million and co-financed with an additional US$150 million from BNDES. BNDES will use long term resources from the IDB in order to better respond to the financing needs of private investors in sustainable energy infrastructure in Brazil. The total amount of resources from the IDB will be channeled to end users by BNDES directly, or indirectly, through the intermediation of other financial institutions (second tier transactions). Resources will ultimately be used to provide direct loans to finance new ARE or EE projects that are deemed eligible based on the conditions established in the Operating Regulations (OR) of the program. The program is designed to allow for the use of funds based on actual demand for credit; no quotas are established for ARE or EE projects, or for particular technologies in each group.
   6. The borrower and the executing agency of the CCLIP and the first program will be BNDES, with the Federative Republic of Brazil serving as guarantor. BNDES will ensure the necessary administrative and control mechanisms to provide and maintain a transparent and effective administration of the program are in place. Previous experiences of BNDES working with the IDB, along with their leading position in the sector of clean energy over the past decade, makes them a suitable partner with strong will to continue developing the sector.
   7. The intended beneficiaries of the program will be private developers of ARE and EE projects. End users of electricity, be them firms or households, will also indirectly benefit from an enhanced provision and security of supply of the service. In addition, Brazilian population will indirectly benefit from positive externalities associated with the environmental and economic impacts of the program
   8. The purpose of this document is to present the monitoring and evaluation plan of the Financing Program for Sustainable Energy (BR-L1442).
      * 1. B. Scheme for Implementation and Monitoring
   9. BNDES will implement the program under its current organizational structure. The provisions governing program execution, financial institutions’ participation (if needed), and eligibility of each project to be granted access to the use of funds from the program, will be established in the OR agreed between the Bank and BNDES, in accordance with their standards and policies, local laws, and Brazil’s financial industry practice. BNDES will be responsible for supervising the adequate use of program financial resources and for the timely provision of human and technical resources necessary to implement the program.
   10. All norms related to execution of the program will be established in the OR of the program, and the country’s financial norms and legislation. This includes specific procedures, conditions and requirements for individual projects to access resources from the program, including: (i) technical, regulatory and financial criteria for accessing the sub loans; (ii) disbursement mechanisms; (iii) eligibility criteria for the participating financial intermediaries; and (iv) monitoring and evaluation requirements. An agreement between BNDES and each eligible project will provide the precise terms and conditions (i.e. maturity, rates and costs for the end borrower) of the financing, which will depend on the characteristics of the project, its internal rate of return and its risk profile.
   11. It is the responsibility of BNDES to ensure that the sub-borrower is eligible for funding from the program in accordance with the program’s eligibility criteria, as defined in the OR. Monitoring of disbursements for eligible expenditures will be held by the Bank ex post. In coordination with BNDES, the Bank may schedule supervision visits to sub borrowers to verify compliance with contractual conditions of the program with regards to the use of funds.
   12. Operations approved by BNDES and presented to the Bank to be part of the program must be properly identified in BNDES’ accounting systems. Records of the various disbursements to be recognized under the program should be in BNDES accounting systems and be in compliance with what is stated in the loan agreements. These records should allow for identifying financial conditions of each transaction (e.g. currency, maturity, interest rates), the value of the contract, loan proceeds and eventual use of proceeds for monitoring purposes, program funds balances and default rates, if necessary.
   13. For the purposes of proper control of financial transactions and correspondence with the accounting records of the program, a specific account shall be set up or designated by BNDES for the transfer of Bank funds following requests for disbursements. This will also facilitate the preparation of reports of financial progress.
   14. In addition to financial audits of the program by independent external auditors, the Bank may monitor and verify the proper use of resources by developers, either directly or via contracting of appropriate technical consulting, for which all information required to verify the eligibility of loans and sub-loans will need to be facilitated by BNDES.
   15. The program will be executed under a sole component, using US$750 million from IDB’s ordinary capital and co-financed with an additional US$150 million from BNDES and sub-borrowers, for a total program funding of US$900 million. Table 1.1 indicates outputs and corresponding costs for the program.

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| --- | --- | --- | --- | --- | --- |
| Table 1.1.- Costs of the program by expected output | | | | | |
| Output/Costs | Y1 | Y2 | Y3 | Y4 | **Total** |
| 1. Installed RE generation capacity (excludes hydro) financed by the program (MW) | 180 | 210 | 210 | 120 |  |
| Costs Output 1 (USD million) | 210 | 245 | 245 | 140 | **840** |
| 2. Projects of EE (includes co-generation) financed by the program (number) | -- | -- | 2 | 2 |  |
| Costs Output 2 (USD million) | -- | -- | 30 | 30 | **60** |
| Total Program Financing | **210** | **245** | **275** | **170** | **900** |

1. Monitoring
   * + 1. A. Indicators
     1. The monitoring intends to follow up the execution of the program in order to identify the intermediate milestones achieved in each phase, identify corrective actions if necessary and evaluate its outcomes and fulfillment of proposed targets. The indicators to be monitored will be those included in the Results Matrix and in the Progress Monitoring Report (PMR). Table 2.1 summarizes them and includes information on the source and frequency of collection and reporting process.

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| Table 2.1: Indicators for Monitoring |

| **Indicator** | Unit | Frequency of measurement | Description / Source of verification |
| --- | --- | --- | --- |
| Installed ARE generation capacity (excludes hydro) financed by the program | MW | Annually and Final Program Report | Measures installed capacity that becomes ready to start operations each year.  Source: Annual report on program execution by BNDES. |
| Projects of EE financed by the program (includes co-generation) | Number | Annually and Final Program Report | Measures number of EE projects implemented and on operation (includes co-generation projects)  Source: Annual report on program execution by BNDES. |
| Financing from third parties mobilized by the program | Millions of US$ | Annually and Final Program Report | Includes all sources of financing other than the IDB and BNDES own resources (debt or equity). Target estimate based on the average total investment required per project and a 66/34 debt to equity ratio.  Source: Annual report on program execution by BNDES. |
| Annual electricity generation from RE sources (excludes hydro) by projects financed by the program | GWh | Annually and Final Program Report | Final target was estimated based on an average production factor per RE technology in Brazil.  Source: Annual report on program execution by BNDES. Can be validated with information from national utility. |
| Average annual energy savings from EE projects (including cogeneration) financed by the program | GWh | Annually and Final Program Report | Final target was estimated based on an average capacity and efficiency ratios of EE systems installed.  *Energy savings = MWh produced by the system installed \* [efficiency of system installed – efficiency of original system]*.  Source: Annual report on program execution by BNDES. |
| Greenhouse Gas (GHG) emissions annual reduction, from projects financed by the program | TM CO2e | Annually and Final Program Report | Indicator is based on the CO2e emissions displaced by RE power generation and the EE energy savings once the projects start operation. Final target was estimated based on envisaged ARE production and EE savings, using a specific conversion factor on the average emissions factor of the Brazilian electricity grid, calculated by *Empresa de Pesquisas Energeticas* (115kgCO2/MWh, 2014). This emission factor considers the emissions of every source in the energy mix for power generation in Brazil, thus reflecting that this is already a clean energy matrix.  **Source:** Annual report on program execution by BNDES and conversion factor specific to Brazil electricity grid. |

* + 1. It should be noted that projects funded by the program may have environmental and social impacts that require an effective evaluation system for proper mitigation and management. To mitigate these risks, the IDB will define an Environmental and Social Management System (ESMS) that will enable the identification of potential impacts and risks and ensure that the sub-borrowers will implement environmental and social assessment, prevention, mitigation and management measures consistent with IDB safeguard policies (see [Environmental and Social Management Report](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661721), ESMR). The ESMS will integrate all applicable Brazilian norms and will also be integral to the OR, being therefore a requirement to the first disbursement. The ESMS shall include environmental and social requirements complementary to the agreed results framework requirements.
       1. B. Data collection and Instruments
    2. BNDES will collect the necessary data for monitoring and present annual reports to the IDB. In some cases, the IDB will make calculations required for some indicators, based on the information provided by BNDES in the annual reports. BNDES own information systems are considered sufficient and appropriate for monitoring the proposed indicators. Secondary sources of information (especially international and government agencies publications) are also acceptable for contributions and/or complementing of information, as per description of indicators. Table 2.1 above presents the main indicators to be monitored during the execution of the operation.
    3. From the Bank’s side, the project team composed by specialists from IFD/CMF and INE/ENE, with support from the country office in Brazil, will be in charge of following up the execution, monitoring and evaluation of the program. The executing agency and the Bank have committed to carry out monitoring meetings according to a regular schedule to be agreed upon between the two parts (see Table 2.2).
       1. C. Reporting of monitoring results
    4. The Institutional Funding and International Relations Department of the BNDES (AF/DECRI), in its capacity as project coordination unit, will be the channel of communication and contact with the IDB. In this regard, it shall perform the following activities: (i) coordination and supervision of the activities, (ii) monitoring compliance with contractual commitments, and (iii) coordination of monitoring and supervision visits, including IDB follow up missions related to the program.
    5. BNDES will report to IDB through annual reports including the defined indicators and any other relevant information on the performance of the program. Based on the information provided by these reports, BNDES and the IDB could decide to introduce adjustments to the program. BNDES will deliver the reports within 60 calendar days after the end of each year of the program’s implementation. The reports will include information regarding the evolution of the indicators, as well as financial information regarding the use of the resources and the state of the program’s account. The Bank will be entitled to request additional information, if necessary.
    6. Finally, BNDES will present a final evaluation report to the Bank up to six months after the end of the disbursement and execution periods. This report shall contain all relevant information to assess if objectives of the program and targets for each indicator have been met.
       1. D. Coordination, workplan and budget for monitoring
    7. BNDES will be responsible for the execution, supervision, technical and administrative coordination of the program and for performing the necessary reporting duties to the Bank.
    8. Program resources are to be fully committed and disbursed within four years from the effective date of the loan agreement. Due to the phased approach of the program, resources from the IDB may be disbursed in a different schedule than BNDES counterpart resources.
    9. Costs of monitoring activities described in this plan are mainly derived from labor costs of IDB and BNDES staff involved in the program. Resources to cover these costs will come from IDB operational budget, plus any standard administrative costs associated to IDB and BNDES staff involved in the program. The organizational structure of BNDES and the proven capacity of its human resources ensure the compliance with all tasks and commitments related to this plan. It is estimated that the Bank will dedicate 0,5 FTE (full time employee) per year for program monitoring. All BNDES counterpart will be deployed in-kind.

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| --- | --- | --- | --- | --- | --- | --- |
| Table 2.2: Monitoring workplan and budget | | | | | | |
| Activity | **Y1** | **Y2** | **Y3** | **Y4** | **Responsible[a]** | **Budget (USD)** |
| Coordination meetings and supervision visits[[3]](#footnote-3) | 2 | 2 | 2 | 2 | BNDES/IDB | 24,000 |
| Preparation of annual reports on program execution | 1 | 1 | 1 | 1 | BNDES | In-kind |
| Audits | 0 | 1 | 1 | 1 | BNDES/IDB | 30,000 |
| Final report | 0 | 0 | 0 | 1 | BNDES | In-kind |
| Total |  |  |  |  |  | **54,000 + in-kind** |

[a] BNDES responsibilities in terms of budget are all considered to be payable in-kind.

1. Ex-Post Evaluation

* + - 1. A. Main Question(s)
    1. This section includes a proposal for a feasible plan to evaluate the program at closure. An ex-post cost benefit analysis will be employed. In particular the analysis will try to answer the following questions:

1. *What is the electricity production [current and projected] from ARE projects financed by the program?*
2. *What is the energy savings [current and projected] from EE projects financed by the program?*
3. *How much additional funding (public and private) was the program able to leverage in the development of projects financed by the program?*
4. *Have the projects financed by the program contributed to reduce GHG emissions?*
5. *Have the projects financed by the program contributed to diversify the energy matrix in Brazil?*
   * 1. The ex-post analysis of the program will also seek to measure the economic results of its implementation with regards to both the size of the induced investment and the benefits of the technologies incorporated to the system. To this end the ex post economic analysis will follow the methodology used for the ex-ante economic analysis linked to the program proposal (see [Economic Analysis](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661106)).
     2. Due to the long-term nature of the projects to be financed, real data available by the end of the execution period will not be sufficient to run the ex-post cost-benefit analysis without relying partially on certain projections. The evaluation exercise included in this plan will be made at the time of program completion, time at which data collected will be used to adjust projections on the expected results. After that, arrangements will need to be made for a discussion on an optimal timeframe for further actual data collection during the expected lifetime of the projects financed[[4]](#footnote-4).

* + - 1. B. Existing Knowledge
    1. The *Plano Decenal de Expansão de Energia* 2024 (PDE), that is the government’s ten-year expansion plan for 2015-2024, establishes an energy matrix with a larger share of ARE sources at the end of this timeframe. This allows the country to reach their targets on GHG emissions established in the *Política Nacional sobre Mudança do Clima* (PNMC) and international agreements on climate. The national decree 7.390/10, which regulates the PNMC, provides that the plan for mitigation and adaptation to climate change for the energy sector is the PDE itself, as its expansion scenario is fully compatible with the goals established in the PNMC. Thus, the PDE 2024 appears as an important instrument for the definition of a mitigation scenario, as it incorporates a set of actions, which will contribute to the country’s development with low carbon emissions. Among the measures incorporated into this plan are increased energy efficiency and increasing installed capacity from ARE sources.
    2. According to the PDE’s projections, total capacity installed is expected to increase 74GW by 2024, though in the short term (by 2018) increases appear to be more centered on large hydroelectric rather than ARE[[5]](#footnote-5). In order to meet this goal in a secure and economic way, and following environmental legislation, the development of the PDE had a mandate to prioritize the role of ARE (wind, biomass and solar) to deliver electricity safely and in line with Brazil's commitment to support its economic growth on a clean energy matrix.
    3. Although water is in general considered a renewable source, large hydroelectric power plants, which currently account for more than 60% of the Brazilian electricity matrix, not only make the system vulnerable to climate change but also can represent high risks due to a strict environmental and licensing process associated to their size. In this context, the planned expansion is based on run˗of-the-river hydro, and emphasizes the importance of diversification and expects to complement large hydro by either ARE (which the program finances) or thermal capacity, in a way that guarantees security of the electric system in the future. This policy is clearly incorporated in the projections of the revised PDE 2024, especially from 2019 onwards, with ARE sources showing an average 10% increase in capacity annually.
    4. One of the main components of the abovementioned planned ARE’s expansion and diversification is wind energy. Brazil has great potential for the use of this technology in power generation: in 2001, its potential was estimated in 143 GW (*Atlas do Potencial Eólico*) but considering more recent developments in the technology, experts consider this potential to be a lot higher, reaching up to 500 GW, 75% of which is concentrated in the northeast region. Brazil has an important advantage on the quality of their winds (good conditions in terms of speed, direction and stability), which provides the country with an attractive average production factor with respect to other large producers of wind power: 38% in 2015, compared to 18% in China, 33% in United States and 24% in Spain. In fact, wind technology has become very active in Brazilian power auctions since 2009, achieving more and more competitive prices over time. This initial success has given impulse to the sector and has contributed to the development of local value chains and competitive production costs[[6]](#footnote-6). By 2024, the Brazilian government aims to have 24GW of wind capacity installed (11.6% of the country’s energy matrix). This represents a 240% increase with respect to current capacity.
    5. Solar capacity is still not representative in Brazil (27 MW), but efforts have been made through auction processes to start incentivizing its development since 2014. Soon (in 2017–2018) winning projects will need to secure financing to start operations to fulfill their contractual obligations. This in turn will contribute to the development of the market locally, including value chains (as was the case for wind) which will help developers overcome exchange rate risk and hence reduce one of their biggest vulnerabilities when deciding on their investments. By 2024, solar capacity is targeted to be in the order of 7 GW. Other RE (including PCH and biomass) are also expected to gain more relevance within the power generation matrix, increasing to 27% of total capacity by 2024 compared to the 16% they had in 2014 (PDE 2024).
    6. Brazil has a long history in promoting EE at final user level, for example: (i)The Brazilian Labeling Program, launched in 1984, (ii) the National Electricity Conservation Program (PROCEL) created in 1985 and executed by ELETROBRAS, which includes several subprograms; and (iii) the National Program for the Rationalization of the Use of Oil Products and Natural Gas (CONPET). Only in 2015, PROCEL contributed to a saving of 11.7 billion kilowatt hours (kWh) in the electricity sector, equivalent to 2.5% of the entire national electricity consumption that year. This result represents the annual electricity consumption of approximately 6.02 million homes in Brazil. Nonetheless, despite these efforts, the energy intensity in the Brazilian economy has remained approximately stable since the 1970’s, while the electricity intensity increased, indicating the possibility of promoting more decisively the efficiency in energy and electricity use. According to the PDE, gains in energy efficiency should reach 5.3% of electricity consumption in 2024, which corresponds to 44 TWh of energy saved that year. In the industrial sector, it is expected that there will be conservation of 3.6% compared to the electricity demand expected for 2024. The amount corresponds to approximately 13 TWh or the generation of hydroelectric power 3.2 GW. In total, in the period 2015˗2024, the expected energy savings in the electricity sector are 226 TWh.
    7. The Energy Efficiency Program (established in 1999) institutes the use of 0.5% of distribution net operational revenue in EE programs, which resulted in investments of the order of US$150 million per year, although investments happened mainly in the residential sector and energy reduction impacts have not been verified. The Energy Efficiency Law 10.295 (2001) establishes compulsory levels of EE and power consumption levels for equipment and machinery. Moreover, the National Energy Efficiency Plan, launched in 2011, stipulates specific guidelines, and targets by sector, in order to reach 10% energy savings by 2030. The Intended Nationally Determined Contribution (INDC), presented at COP21, committed to: (i) increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar; and (ii) achieving 10% efficiency gains in the electricity sector by 2030.
    8. IDB’s previous experience with development banks in the region –specifically NAFIN in Mexico and BROU in Uruguay – in the development of financing solutions for clean energy projects has proven viable and effective with a number of programs[[7]](#footnote-7), all of which had objectives related to the support of private sector investment in power generation using renewable sources. In the case of Mexico, for example, these interventions are considered to have contributed effectively to the momentum gained by wind sources in the country. Wind installed capacity in Mexico rose from levels below 100 MW in 2006-08, to almost 600 MW in 2011 and over 1,000 MW in 2012. According to the *Asociacion Mexicana de Energia Eolica* (AMDEE) this is the result of a combination of factors, including the existence and availability of sources of financing, a solid legal and regulatory framework, and the high efficiency of the plants due to the quality of the resource in the country. Production costs have decreased significantly during the last 15 years, becoming competitive with conventional sources of energy (PwC, citing AMDEE). The ex ante cost-benefit analysis[[8]](#footnote-8) for the proposed program found that the net cash flows discounted at a rate of 12% produce a net present value (NPV) for the program of US$326.98 million.
    9. Renewable energy sources have been proven a viable and effective option for environmental sustainability and reducing GHG emissions. In this regard, Saidur et al. (2011) conclude that wind energy can help reduce acid rain and climate change, as it does not produce greenhouse gases. According to the authors, a million KWh of wind power can prevent the emission of 600 tCO2e. Tsoutsos et al. (2005) consider renewable energy as a key element to abate climate change. Regarding EE, particularly cogeneration, there is also evidence of the positive impact it has on the abatement of greenhouse gases (IDB , 2000).

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| Table 3.1: Key Outcome Indicators |

| **Indicator** | Unit | Frequency of measurement | Description / Source of verification |
| --- | --- | --- | --- |
| Financing from third parties mobilized by the program | Millions of US$ | Annually and Final Program Report | Includes all sources of financing other than the IDB and BNDES own resources (debt or equity). Target estimate based on the average total investment required per project and a 66/34 debt to equity ratio.  Source: Annual report on program execution by BNDES. |
| Annual electricity generation from ARE sources (excludes hydro) by projects financed by the program | GWh | Annually and Final Program Report | Final target was estimated based on an average production factor per RE technology in Brazil.  Source: Annual report on program execution by BNDES. Can be validated with information from national utility. |
| Average annual energy savings from EE projects (including cogeneration) financed by the program | GWh | Annually and Final Program Report | Final target was estimated based on an average capacity and efficiency ratios of EE systems installed.  *Energy savings = MWh produced by the system installed \* [efficiency of system installed – efficiency of original system]*  **Source:** Annual report on program execution by BNDES. |
| Greenhouse Gas (GHG) emissions annual reduction, from projects financed by the program | TM CO2e | Annually and Final Program Report | Indicator is based on the CO2e emissions displaced by RE power generation and the EE energy savings once the projects start operation. Final target was estimated based on envisaged ARE production and EE savings, using a specific conversion factor on the average emissions factor of the Brazilian electricity grid, calculated by *Empresa de Pesquisas Energeticas* (115kgCO2/MWh, 2014). This emission factor considers the emissions of every source in the energy mix for power generation in Brazil, thus reflecting that this is already a clean energy matrix.  **Source:** Annual report on program execution by BNDES and conversion factor specific to Brazil electricity grid |
| Power generation from ARE sources (excludes hydro) in Brazil as a share of total generation | % | Final Program Report | This measure includes all new investments added to the system, including those supported by the program. This impact is related to ARE projects under the program. Target estimate is based on country’s authority projections.  Source: Data from the *Ministério de Minas e Energia* and the *Balanço Energético Nacional* |
| Energy intensity to GDP | tep/US$ | Final Program Report | Measures the quantity of energy required to generate US$1 of GDP. This impact is related to EE and cogeneration projects under the program.  Source**:** IMF and official figures from the *Ministério de Minas e Energia* and the *Balanço Energético Nacional* |

* + - 1. C. Evaluation methodology
    1. The evaluation proposed will follow an ex-post cost-benefit analysis, based on the data collected for a set of indicators detailed above. Following the recommendations of the Toolkit for the application of the DEM, the ex post cost benefit analysis uses the same framework defined in the ex-ante economic analysis and replaces ​​assumed values ​with actual values.
    2. **Justification for the selected methodology.** This method is appropriate because: (i) the relatively small population of projects/developers and the concentration of projects in areas with resource potential (in the case of ARE) does not allow for a construction of a control group for an experimental or quasi˗experimental exercise for the evaluation; and (ii) the availability of public and verified information on individual projects supplying energy to the system allows for a more robust evaluation on the performance of projects.
    3. The ex post cost benefit analysis can be considered a reassessment of the cost benefit analysis made as part of the program proposal, once the magnitudes effectively involved are known. In this sense, it is clear that the key elements of a cost benefit analysis ex post are similar to those of a cost benefit analysis ex ante.
    4. The analysis is based on the comparison of two scenarios**[[9]](#footnote-9)**:

1. In the scenario “with” the program, the funding of BNDES allows the investment of a portfolio of clean energy projects (wind, solar and energy efficiency). The cost for energy supply incurred in this scenario is expressed as: (i) investment costs; and (ii) operation and maintenance costs (O&M) disaggregated for each type of technology. Investment costs occur during the investment phase, while maintenance costs occur during the life of the projects. These costs reflect the economic cost of supplying clean energy. Energy efficiency projects are exemplified as cogeneration projects, and allow the reduction of energy consumption and have also investment and O&M costs. In this scenario, emissions are reduced, both from clean generation, and from energy efficiency. Total costs for all investments are included incorporating all sources of financing.
2. In the alternative scenario (“without program”), it is assumed the clean energy portfolio of the program is not implemented – without financing from the BNDES, no wind or solar developer has the capacity to finance 100% of these investments by themselves and other sources of financing are not currently available. As a result, the equivalent amount of energy that would have been produced by these projects must be provided to the system by a mix of traditional sources (small hydro, thermal), and the cost of providing this energy is assumed to be the average marginal cost of the system.[[10]](#footnote-10),[[11]](#footnote-11) It is assumed that in this scenario, energy has the emissions rate of the current electricity matrix. This is a conservative assumption,[[12]](#footnote-12) given that in the absence of ARE projects, and with the difficulty of large hydro developments, the energy might actually be provided only by additional fossil fuels that can be implemented in the short-term, with higher emissions instead of at the rate of emissions of the current energy matrix. Furthermore, in the without project scenario there are no energy savings from energy efficiency projects.
   * 1. When calculating and projecting the benefits and costs, the methodology proposed will be adapted for each type of eligible sub project, following the principles below:
3. ARE investment and O&M costs are determined based on the total additional capacity installed (in MW) that is expected to be deployed and become operative as a result of the program, and the energy generated and injected to the system by these projects (GWh) during their life time, assuming an average capacity factor for each type of technology. Economic benefits derive from the difference between the expected energy supply costs of the projected scenario in which the system incorporates investments financed by the program (scenario with program) and the expected energy supply costs of a projected scenario without program. Projections will be made for a period of 20 years. Additionally, the externalities associated with the reduction of GHG emissions are also included as an economic benefit of the program. [[13]](#footnote-13)
4. EE investments will be evaluated over the base of the amount of energy saved in the projects financed by the program. Benefits are represented by the foregone costs that are implied by saving such amounts of energy instead of consuming them from the electricity grid plus the abated costs associated to the reduction of GHG emissions also resulting from savings of electricity that would have been provided by the grid. The value of these foregone-costs in the scenario without program shall be zero, as no savings in energy are expected in the absence of an EE technology in place. Projections will be made for a period of 20 years[[14]](#footnote-14).
5. Total new ARE capacity and energy saved by EE projects is determined based on a tentative pipeline of projects provided by BNDES, including the programming in which those projects are expected to be approved for financing and start operations.
   * 1. A net present value (NPV) is calculated by projecting the net economic flows over the estimated useful life of each type of projects, and discounting them at a rate of 12%[[15]](#footnote-15). The NPV of the program is obtained as a key indicator to determine its economic viability.
     2. **Treatment and control groups**. The selected methodology does not require the assignment of treatment and control groups. However, the ex-post cost-benefit analysis will rely on the counterfactual without-project scenario – as defined in the ex-ante cost-benefit analysis and in ¶3.16 – with updated data.
     3. **Data collection**. BNDES will collect the necessary data as indicated in Table 3.1, and will submit annual reports to the IDB. Information systems and existing databases in BNDES and government and international institutions related to the energy sector, are considered sufficient to monitor the proposed indicators. Institutions related to the energy sector in Brazil have extensive information that can serve the purpose of the proposed assessment, as well as a clear commitment to making this information public and use it for the purpose of improving and developing the initiatives planned for the future.
     4. BNDES has access to external sources of information, in addition to rigorous internal requirements for evaluating projects that apply for funding with program resources, so it is expected that this will facilitate the collection of information for the proposed analysis of the impact of the program. The Institutional Funding and International Relations Department (AF/DECRI) will act as coordinator in the preparation of reports and liaison with the Bank.
     5. BNDES makes systematic field visits to monitor the projects that receive financing from their programs. Supervision visits are also carried out by Bank’s staff members, an activity that is included in this monitoring and evaluation plan.
     6. Since the ex-post cost benefit analysis aims to replicate the ex-ante cost benefit analysis, replacing the assumptions or estimated values ​​with values ​​effectively verified, information to be gathered shall be equivalent to that used in the corresponding ex ante analysis. As a reference, some of the information to be obtained on sub projects once these are recognized under the program, including number of projects, contracted price of energy (income), installed capacity, operating capacity, production/efficiency factors, time of start of operations, investment costs, O&M costs, emission factor, etc. (see [Economic Analysis](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661106)).
        1. D. Reporting of evaluation results
     7. The Institutional Funding and International Relations Department (AF/DECRI), in its capacity as project coordination unit, will act as coordinator in the preparation of reports and liaison with the Bank.
     8. BNDES will report to IDB through annual reports on the defined indicators and in the detailed performance of the program. Based on the conclusions of these reports, BNDES and IDB could introduce adjustments to the program. The executing agency will deliver the reports within 60 calendar days after the end of each year of the program’s implementation. The reports will include information regarding the evolution of the indicators as well as any other information considered relevant to the performance of the program. The Bank will be entitled to request additional information, if necessary. Periodical monitoring meetings are also scheduled (Table 2.2).
     9. Finally, BNDES will present a final report to the Bank up to six months after the end of the disbursement and execution periods. This report shall contain all relevant information to assess if objectives of the program and targets for each indicator have been met.
     10. The Bank, through its IFD/CMF and INE/ENE divisions, with support from the Office of Strategic Planning and Development Effectiveness (SPD), will collaborate with BNDES in any aspects required and requested for this evaluation plan. If available and necessary, the Bank may provide technical and financial support (see Table 3.2) to carry out the activities of specialized analysis on the economic assessment.
         1. E. Complementary evaluation
     11. In addition to the annual reports and the scheduled contacts for monitoring of the operations, the borrower and the Bank will conduct a midterm evaluation within twenty-four (24) months from the effective date of the loan contract or when 50% of IDB resources have been disbursed – whichever occurs first. The evaluation will assess progress in accomplishing program objectives and outcomes based on the Results Matrix in order to identify any corrective action required.
     12. A Project Completion Report (PCR) will be carried out six months after the end of the disbursement period. The PCR will evaluate the fulfillment of targets and review the results of the operation. BNDES shall be ready to provide the information necessary for the Bank to properly conduct the PCR.
         1. F. Coordination, workplan and budget for evaluation
     13. For the implementation of this assessment, it is expected that IDB will use its own staff, with the assistance of and in coordination with the BNDES, This working scheme is considered adequate and sufficient to ensure the quality and success of the evaluation work. For activities that require additional or specific expertise, consultancy services may be hired by the IDB (see Table 3.2).
     14. It will be the responsibility of the Bank, through its IFD/CMF division, to supervise the execution of the ex post cost-benefit analysis from the data collected in accordance with the plan proposed. To this end, IFD/CMF will be supported by the INE/ENE division, which has been significantly involved in the operation at all times. It is noteworthy that IFD/CMF has a group of specialists focused on climate finance that will participate in the revision of the final report.
     15. It is expected that the information required for the calculations of the cost benefit ex post will be available from national sources as indicated in Table 3.1. and from the reports produced by BNDES and included in the monitoring activities. Some of the information required will be generated within existing information systems of BNDES, and in this sense it does not entail additional costs. Other information is periodically generated by government agencies (e.g. EPE, ANEEL), in the normal course of its operations. Since the information is expected to be easily available, it is assumed that any complementary consultancy services that may be needed will not increase costs of the evaluation significantly. All costs of the activities listed in this plan will be financed by the IDB, using the supervision budget included in the transactional funds of the IFD/CMF division. Its completion is expected by the end of the execution period of the program (see Table 3.2). BNDES and the IDB have the structure and resources to ensure compliance with the tasks and commitments in this assessment plan. Any further evaluation with more specific purposes, longer timeframes or seeking to determine externalities resulting from the execution of the program may be carried out if considered relevant, but will not be incorporated as part of this Monitoring and Evaluation Plan.
     16. Within BNDES, the Institutional Funding and International Relations Department (AFI/DECRI) will be responsible for the preparation and coordination of program evaluation activities. From a technical and operational perspective, BNDES is able to fulfill its responsibilities competently and has sufficient administrative and operational capacity, and qualified personnel to provide all inputs necessary to assess the effectiveness of the proposed program. In addition, the institution understands the benefits of optimizing the use of lessons learned to improve their programs.

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| Table 3.2: Evaluation workplan and budget | | | | | | | |
| Activity | **Y1** | **Y2** | **Y3** | **Y4** | **Y5** | **Responsible[a]** | **Budget (USD)** |
| Collection of data for outcome indicators[[16]](#footnote-16) |  |  |  | 1 |  | BNDES/IDB | 12,000 |
| Data Projections and Analysis |  |  |  | 1 |  | BNDES | In-kind |
| Preparation of final evaluation: Cost-Benefit Analysis Ex-post |  |  |  | 1 |  | BNDES/IDB | 10,000 |
| Final report: distribution and discussion |  |  |  |  | 1 | BNDES | In-kind |
| Total |  |  |  |  |  |  | **22,000 + in-kind** |

[a] BNDES responsibilities in terms of budget are all considered to be payable in-kind.

1. “*Documento de Marco Sectorial de Respaldo para PyME, Acceso y Supervisión Financieros*” (IDB, GN˗2768). [↑](#footnote-ref-1)
2. Conceptually, ARE excludes large hydro. It is expected that ARE projects in the portfolio will use wind and solar technologies. Small hydro will not be eligible. [↑](#footnote-ref-2)
3. Includes travel and per diem costs of required travel. Coordination meetings may be carried out remotely, via video or call conference. [↑](#footnote-ref-3)
4. Due to the long-term nature of project development, some of the results will only happen after the end of the execution period. [↑](#footnote-ref-4)
5. Empresa de Pesquisa Energética (EPE) and Plano Decenal de Expansão de Energia 2024 (PDE). [↑](#footnote-ref-5)
6. See [Financiamento de Energias Renováveis Alternativas no Brasil](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661714). [↑](#footnote-ref-6)
7. Various programs under the CCLIP ME-X1006 (ME-L1051, ME-L1081, ME-L1109 y ME-L1119) and the program UR-L1099 under the CCLIP UR-X1011. [↑](#footnote-ref-7)
8. See [Economic Analysis](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661106). [↑](#footnote-ref-8)
9. See [Economic Analysis](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661106). [↑](#footnote-ref-9)
10. By definition, the marginal cost of the system represents the variation of the operating cost required to meet one additional MWh of demand, using existing resources. The analysis considers that without the program, the energy not supplied by ARE sources would need to be supplied by other energy sources (at a marginal cost for the system). It is worth emphasizing that the analysis is made from the point of view of the electricity system, which in the absence of ARE developments, would need to provide the same amount of energy with a marginal cost. See [Economic Analysis](http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=40661106). [↑](#footnote-ref-10)
11. Without the program, the lack of financing would also affect the overall ARE investments in the medium term in the country, as the supply chain of ARE technology providers would be affected by the lack of investment, generating shortfalls in supplies of equipment, and less investors in ARE projects would be attracted to the market. As a result, in this scenario it is assumed that the proportion of ARE in the matrix does not grow. [↑](#footnote-ref-11)
12. A more pessimistic assumption would be that in the absence of the program, no energy is provided to the system, and as a result there is a need for restrictions in energy supply. The cost of energy not supplied in the Brazilian system is approximately R$3.000/MWh, which would make the program extremely viable from an economic perspective. This scenario is not considered, as currently the Brazilian electricity sector is structured and regulated in order to guarantee that all demand is covered. [↑](#footnote-ref-12)
13. Technical note No. IDB-TN-623. [*Beneficios para la sociedad de la adopción de fuentes renovables de energía en América Latina y el Caribe*](http://publications.iadb.org/bitstream/handle/11319/6465/Beneficios%20sociales%20TN-623.pdf?sequence=1). [↑](#footnote-ref-13)
14. For the purposes of the economic evaluation, energy efficiency projects are represented by co˗generation projects, in which an additional amount of energy is produced by power generation plants, and as a result, energy consumption from the grid is reduced. The ex-post economic evaluation will be based on the actual energy efficiency projects implemented, once the program is finished. [↑](#footnote-ref-14)
15. Following IDB guidelines for economic analysis of programs financed by the IDB, it is recommended to use a discount rate of 12% for all IDB operations. [↑](#footnote-ref-15)
16. Includes travel and per diem costs of required travel. [↑](#footnote-ref-16)