Document of the Inter-American Development Bank

Argentina

**Promoting risk mitigation instruments and finance for renewable energy and energy efficiency investments**

**(AR-L1280)**

**Feasibility Analysis**

**BICE Green Financing Program**

1. Introduction
   1. This feasibility study is to assess the viability for the development of a financial strategy to support Argentinian companies in the implementation of renewable energy solutions, energy efficiency, and reduction of greenhouse gas emissions. The main objective of the proposed strategies is to stimulate the demand for “green” financing, and to help BICE’s positioning as the financial entity that articulates these efforts in Argentina.
   2. The feasibility analysis included a bibliographic review of the principal studies, reports, and documents available on potential sustainable energies[[1]](#footnote-1) in different sectors in Argentina, including their current status, opportunities, and perspectives. In addition, interviews were carried out with experts, public actors and related suppliers of different investment opportunity areas with the objective of validating and gather additional information, as well as to identify investment opportunity areas not previously identified. The Annex of this report contains a list of the studies and information sources consulted.
   3. Based on the information collected, an evaluation matrix was designed to evaluate the different opportunity areas based on different criteria. The information collected was fundamental to be able to identify the sustainable energy technologies and subsectors where potential business opportunities could be found for the BICE, as well as to gather statistical data that could help in evaluating the potential of different sustainable energy technologies and potential subsectors. Each criterion was assigned different weightings and an evaluation of each subsector was carried out, in order to get a global score that would allow establishing a hierarchical order of those sectors with greater potential to promote an investment program with the desired objectives and characteristics. Based on this evaluation, the opportunity areas were presented to BICE for it to decide on the priority opportunity areas. The evaluation criteria used to evaluate the opportunity areas are described below in Table 1.1.

**Table 1.1. Evaluation criteria**

| Technology | Borrower's interest | Sector |
| --- | --- | --- |
| Client profitability | Presence of partnerships with  technology suppliers | Market size (number of companies) |
| Energy intensity |
| Availability of long-  established suppliers | Simplicity of implementation (possibility of standardization) | Potential sector growth |
| Easiness of engaging clients/investors |
| Existence of support policies (+) or  subsidies (-) to the subsector |
| Availability of incentives or policies that support the technological implementation | Real current demand for the technology | Existence of partnerships/associations  grouping the sector/subsector |
| Interest of financial intermediaries (FIs) in the subsector |
| Potential to reduce GHG emissions | Impact of the solution on operating costs structure | BICE priority |
| BICE competitiveness in the  sector / subsector |

* 1. Each opportunity was evaluated vis-a-vis the criteria previously described and each criterion was assigned a value from 1 to 5, with 1 representing the lowest and 5 the highest value. Said value was multiplied by the weighting assigned to each criterion. The assessment of each criterion was made based on the information collected from secondary information sources, the interviews carried out and in a qualitative manner based on the experience of the consulting team. The opportunities with a total higher score were submitted for consideration to the BICE to be prioritized. The strategies described in Section IV refer to the opportunities with the best assessment. The following tables show a summary of the results of the evaluation of the technologies and the subsectors. Table 1.2 provides the results of the technology evaluation matrix The complete evaluation matrix appears in the Annex to this report.

**Table 1.2. Technology Evaluation**

| Technology | Sectors | Description | Total |
| --- | --- | --- | --- |
| Biogas Plants | Agroindustrial Sector (e.g., pig farmers, food processing) | Sale of the Network Self-consumption | 85% |
| Biomass Plants | Agroindustrial Sector (e.g., food processing) and Industry (e.g., paper, timber). | Sale of the Network Self-consumption | 73% |
| Thermal Solar Systems (TSS) | Commercial | Complement to the current water heating system | 72% |
| Industrial | Complement to the current water heating system | 72% |
| Energy efficiency of HVAC systems | Commercial (hotels, hospitals, shopping centers) | Replacement of current equipment | 71% |
| Heat recovery systems | Industry (e.g., food processing, chemical, pharmaceutical) | Replacement of current equipment | 71% |
| Commercial (e.g., hotels, hospitals) | Installation of heat recovery equipment | 71% |
| Energy efficiency of cooling systems | Industrial (e.g., agroindustry, meat and milk, aquaculture) | Replacement of current equipment | 69% |
| Energy efficiency in lighting (LED) | Commercial | Replacement of current equipment | 67% |
| Cogeneration systems (electric/thermal) | Industry (e.g., chemical, food processing, dairy) | Self-consumption, network support. | 67% |
| Photovoltaic systems | Industrial | Sale to the network/Self-consumption, network support. | 67% |
| Commercial | Sale to the network/Self-consumption, network support. | 65% |
| Energy efficiency in firing, drying, and smelting furnaces | Industry (e.g., metal-mechanic, glass-ceramic, flooring, glass) | Replacement of current equipment | 65% |
| Energy efficiency of HVAC systems | Residential | Replacement of current equipment | 63% |
| Thermal Solar Systems (TSS) | Residential | Complement to the current water heating system | 63% |
| Energy efficiency in boiler systems | Industry (e.g., food processing, chemical, pharmaceutical) | Replacement of current equipment | 62% |
| Energy efficiency in electric motors | Industry (e.g., metal-mechanic, compressed air) | Replacement of current equipment | 62% |
| EE in boiler systems | Commercial (e.g., hotels, hospitals) | Replacement of current equipment | 61% |
| Photovoltaic systems | Residential | Sale to the network/Self-consumption, network support | 54% |
| Cogeneration systems (electric/thermal) | Commercial Sector (e.g., hotels, hospitals) | Self-consumption, network support. | 49% |

**Table 1.3. Subsector Evaluation**

|  |  |  |
| --- | --- | --- |
| **Commercial Sector** | | |
| Hotel | Boilers, electric motors, cooling, HVAC, lighting, cogeneration, solar water heaters. | 84% |
| Hospitals and clinics | Boilers, cogeneration, air conditioning, lighting | 84% |
| Shopping centers/large surfaces | Air conditioning, electric motors, lighting | 72% |
| **Industrial Sector** | | |
| Food Industry | Boilers, dryers, electric motors, cooling, cogeneration | 88% |
| Chemical/Pharmaceutical | Boilers, electric motors, cogeneration | 88% |
| Pork industry | Biogas Plants | 87% |
| Livestock industry (feedlot) | Biogas Plants | 83% |
| Poultry industry | Biogas Plants | 82% |
| Plastics | Boilers, electric motors, cogeneration | 81% |
| Agriculture industry (Peanut, olive, wine, soybean) | Biomass Plants | 80% |
| Tannery | Boilers, electric motors, cogeneration | 77% |
| Paper | Boilers, electric motors, lighting, cogeneration | 77% |
| Foundry | Furnaces, electric motors | 74% |
| **Residential Sector** | | |
| Buildings (apartments) | Air conditioning, lighting | 60% |
| Houses | Air conditioning, lighting | 57% |

1. Analysis of the Prioritized Sectors
   1. The opportunity areas with the best assessment may be grouped in: (i) Biogas projects for the pork sector, livestock sector (especially “feedlot”[[2]](#footnote-2)), and the industrial sector (especially food processing), (ii) Biomass projects of agricultural and forest residues, as well as for industry (especially the paper and timber industries), (iii) Industrial and commercial energy efficiency (electric/thermal), especially for the chemical, food processing, dairy, and plastics industries that make intensive use of thermal and electric energy. The technologies include cooling systems, motors, cogeneration, solar preheating of water, boilers, and heat recovery. The following table summarizes the analysis of these three sectors, showing the potential size, as well as the required financing to serve a percentage of the market. Subsequently, the information is described in further detail.

**Table 2.1. Prioritized opportunity areas**

| Technology | Sectors | Description | Estimated market size | Possible line[[3]](#footnote-3) |
| --- | --- | --- | --- | --- |
| Biogas Plants | Pig farmers  Livestock industry (feedlot)  Food processing industry | Sale of energy to the network  Self-consumption | 2,996 pig farms (with more than 50 mothers)  2,000 bovine farms (feedlot)  4,200 food processing and beverage companies | US$77 million financing (serving 637 companies – 8% of potential market) |
| Dry biomass plants (agricultural and forest residues) | Agricultural, forest residues, paper and timber industry. | Sale of energy to the network | Biomass plants for 86 MW | US$42 million financing (serving four projects, equivalent to 35% of the market) |
| Industrial and commercial energy efficiency (electric/thermal) | Industry (e.g., chemical, food processing, dairy) | Solar thermal collectors  Cogeneration systems  Industrial refrigeration  Heat recovery | 75,000 SME companies + large company | US$41 million financing (serving 10% of the potential market – 598 companies) |
| Commercial sector (e.g., hotels, hospitals) | Solar thermal collectors  Cogeneration systems  HVAC |

1. Technologies
   1. Biogas Plants - A waste bio-digester or digester is, in its most simple way, a sealed, hermetic, and watertight container called a reactor, in which organic material is deposited to ferment (animal feces, vegetable waste, etc.) in a given water dilution which through anaerobic fermentation produces methane gas and organic fertilizers rich in nitrogen, phosphorus, and potassium, and, in addition, decreases the polluting potential of the feces.[[4]](#footnote-4) The industries where bio-digesters may potentially be applied include the pig, livestock sector and the food processing industrial sector. Energy generation through biogas plants is one of the preferred technologies under the renovAR program.[[5]](#footnote-5)
   2. Pork Industry in Argentina - The production of pig meat grows about 10% annually. Production increased from 331 thousand tons in 2012 to 438 thousand tons in 2015. The sector has been growing and domestic pig production has been replacing pork imports. Imports fell 23% in 2015 compared with 2014. [[6]](#footnote-6) An important aspect is that various provinces have a health regulatory framework that requires farms to have a waste treatment system.[[7]](#footnote-7) This encourages investment in this type of technologies.
   3. There are about 76,305 registered farms in Argentina. Most of these farms have less than 10 mothers. Farms are measured in terms of number of mothers, and it is estimated that each mother may have between 10 and 25 piglets depending on the productivity of the farm. The following figure shows the segmentation of the farms based on their size. There are around 60 thousand farms with less than 10 mothers, around 13 thousand farms that have between 11 and 50 mothers, 2 thousand farms that have between 51 and 100 mothers, 910 farms that have between 101 and 50 mothers, and 97 farms that have more than 500 mothers.

**Figure 3.1. Biogas plant**



**Figure 3.2 Number of pig farms based on the number of mothers per farm**

* 1. Most pig farms are concentrated in five provinces where 60% of the farms are located: Buenos Aires, Córdoba, Santa Fe, Entre Ríos, and Chaco. This concentration may help in making the financing program promotion more efficient. The following table shows the distribution of the farms in the five provinces based on the number of mothers.

**Table 3.1. Number of farms by province and by farm size (number of mother per farm)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Province | <10 | 11-50 | 51-100 | 101-500 | >500 | % of total |
| Buenos Aires | 12,188 | 3,036 | 463 | 257 | 24 | 21% |
| Córdoba | 7,859 | 2,262 | 461 | 193 | 29 | 14% |
| Santa Fe | 3,670 | 1,201 | 317 | 166 | 12 | 7% |
| Entre Ríos | 4,797 | 442 | 46 | 43 | 9 | 7% |
| Chaco | 6,587 | 1,439 | 129 | 43 | 5 | 11% |
| TOTAL | 35,101 | 8,380 | 1,416 | 702 | 79 | 60% |

* 1. For purposes of estimating the size of the potential market and the potential of bankable projects, those farms with less than 50 mothers have been discriminated. Thus it is estimated that the potential Argentinian market would be about 3 thousand farms. The following table shows the number of farms of the potential market, the investment per farm to implement a biogas project, and the total investment required for all the pig farms.

**Table 3.2. Potential investment required in the pig sector**

**in farms with more than 50 mothers**

|  |  |  |  |
| --- | --- | --- | --- |
| Number of mothers per farm | Number of farms | Average investment per farm (US$)[[8]](#footnote-8) | Total investment (US$) |
| 51-100 | 1,989 | 65,000 | 130 million |
| 101-500 | 910 | 140,000 | 128 million |
| >500 | 97 | 640,000 | 62 million |
| TOTAL “>51” | 2,996 |  | 320 million |

* 1. Pig farms that invest in biogas plants have a double benefit. On the one hand, they comply with regulations for adequate disposal of residues (waste) originating from pig breeding and, on the other, they can use the biogas for the farm’s processes. In addition, they have the benefit of the regulatory framework of renovAR allowing them to propose the project to sell electric energy to the network.
  2. Based on discussions with technology suppliers, investments in biogas plants in a pig farm may have an internal rate of return of between 20% and 30%, and a return on the investment in less than five years. The profit data take into account self-consumption of the energy produced and benefit of the by-products generated by the biogas plant (fertilizers), and do not take into account the renovAR program that would allow the sale of electric energy to the network.
  3. Livestock industry (feedlot) in Argentina - Argentina has a very important livestock industry that may have great potential for the implementation of biogas plants. One of the technical barriers is the collection of animal waste. When animals are dispersed in a large area of land the collection cost makes this type of project unfeasible. However, farms in which animals are held in pens to intensify production ease the waste collection process and make biogas projects feasible. This type of farms are called “feedlots”. In Argentina, there are around two thousand livestock farms under the “feedlot” modality holding 16 million livestock (27% of the total livestock). The following figure shows the distribution of the number of “feedlot” farms based on the number of livestock.

**Figure 3.3 Number of “feedlot” livestock farms based on the number of livestock per farm**

* 1. Fifty percent of these two thousand farms have at least 750 livestock each. According to the suppliers, an average investment of US$1 million to US$2 million per farm are required and the recovery period could be more than 15 years without taking into account the renovAR program for the sale of energy to the network.
  2. Food Processing Industry - The food processing sector in Argentina generates wet waste that could be processed in a bio-digester to produce biogas. The food processing industries include the meat processing sectors, fishing and fish processing industry, agroindustry, dairy, animal feed products, bakery industry, wines, etc. There are around 21 thousand companies classified as food processing industry in Argentina. Eighty percent are micro companies, of which 15% are small, 4% are medium-sized companies, and 1% are large companies. The likelihood of these companies investing in a biogas plant is mainly in the small, medium, and large companies which represent about 4,200 companies. Average investment in a biogas plant in an industrial food processing company is around US$250 thousand, with a profitability of about 10% and a recovery period of more than 10 years, according to suppliers.
  3. Investment and Potential Financing - Based on the information gathered from each of the sectors, its potential market size and technology investments, one can assume the financing BICE would have to make available to serve the market. In the pig sector the objective would be to serve 15% of the potential market of biogas plants which would be the equivalent of 449 companies requiring an investment of US$48 million and financing amounting to US$33.6 million (70% of the investment). This investment would result in a reduction of carbon dioxide emissions into the atmosphere equivalent to 550,000 tCO2 annually. In the livestock sector the objective would be to serve 20 “feedlot” livestock farms equivalent to 2% of the potential market (1,000 farms) which would require an investment of US$20 million and financing amounting to US$14 million (equivalent to 70% of the investment) to invest in biogas plants. In the industrial food processing sector the objective would be to serve 168 food processing companies equivalent to 4% of the potential market (4,200 companies) which would require an investment of US$42 million and financing amounting to US$29.4 million to invest in biogas plants. The following table summarizes the investment and financing analysis for each target market.

**Table 3.3. Investment and Financing Requirements for Target Market**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sector | Potential market (companies) | % Target | Target companies | Investment (US$) | Financing (US$) |
| Pig | 2,996 | 15% | 449 | 48 million | 33.6 million |
| Bovine | 1,000 | 2% | 20 | 20 million | 14 million |
| Industry | 4,200 | 4% | 168 | 42 million | 29.4 million |
| TOTAL |  |  |  | 110 million | 77 million |

* 1. Investments in biogas projects face many barriers, among which the following stand out. The investment in this type of projects compete against other investment opportunities of the companies. Companies assess the investment in terms of risk and profit. If companies perceive a high risk their expectations on return of investment would also be high. By contrast, when the investor perceives that the investment represents a low risk his expectations on profit are also lower. Biogas projects may be perceived as high-risk investments given the lack of knowledge on the technology and the lack of trust in the suppliers and the technology.
  2. Biogas projects require an engineering study which is usually performed during the preliminary stage of the project and its budget. The cost of the study is usually paid by the investor. However, investors perceive this investment as a risky initial expense and this discourages investment in these projects.
  3. Long-term finance - Argentina is going through a transitional economic phase where confidence in the markets is returning and this is having an impact on the exchange rate, inflation, interest rates, among others. However, the persisting concerns would have to be eliminated. One of the factors that has been affected is the availability of long-term financing. Most of the financial institutions have yet to offer credits that allow the financing of this type of projects (more than five years). In addition, small and medium-sized companies face greater difficulty than large companies in accessing financing. The few SMEs that have access to financing do so with non˗competitive rates and conditions.
  4. Biomass plants refer to the thermochemical process of converting dry biomass into energy. Dry biomass includes residues from the forest sector, residues from the timber, furniture, and wood industries, etc. Thermochemical processes refer mainly to combustion, pyrolysis or gasification of the biomass.

**Figure 3.4. Biomass Gasification Plant**



* 1. There is a large amount of dry residues in Argentina that can be exploited to produce energy, such as olive oil, citrics, forest, yerba mate, peanut, wine, and rice husk residues, paper manufacturing residues, etc. The excess of agricultural residues affects the balance of nutrients in the subsoil, and this harms certain agricultural activities that would require subsequent treatment to level the nutrients. The provinces generating the most residues in Argentina are: Tucumán (881,000 t), Jujuy (303,700 t), Entre Ríos (229,000 t), Corrientes (208,500 t), Córdoba (180,300 t), Salta (137,800 t), and Mendoza (114,400 t).[[9]](#footnote-9)
  2. Initiatives have been undertaken in Argentina to support the development of projects to take advantage of the biomass, such as in the case of Probiomasa. The Probiomasa initiative is an initiative of the Ministries of Agroindustry and of Energy and Mining with the administrative technical assistance from the United Nations Food and Agriculture Organization (FAO). The main objective of Probiomasa is to increase the production of thermal and electric energy derived from biomass at the local, provincial, and national levels to generate clean energy and, at the same time, open new agroforestry business opportunities, stimulate regional development, and contribute to mitigate climate change.
  3. The Argentinian government has considered the generation of biomass energy as one of the technologies included in the renovAR program. The investment required for these plants is estimated to be around US$2 million for each installed MW, and generation plants between 5MW and 10MW of installed capacity require investments between US$11 million to US$22 million. The estimation of the potential size of biomass projects is based on the market response regarding the first auction where two contracts were awarded with a total capacity of 14 MW at a purchase price of energy by the government of US$110/MWh for 20 years; one plant with 2MW and another with 12MW. Investments in biogas plants usually have a 10% return taking into account the price set by the renovAR program.
  4. The objective of the government and of renovAR program is to reach an installed capacity of renewables of 7,600MW, thus the market response to the first auction could be extrapolated to estimate the projection of biomass projects in subsequent auctions. Biomass projects represent 1.13% of total installed capacity (1,281MW) awarded in the first auction, which would equate to having 86 MW of generation installed capacity originating from biomass projects in subsequent auctions and an investment of around US$200 million.
  5. Taking as an example the analysis of the peanut production sector. In 2016 there were around 24 peanut production companies: 4 large, 9 medium-sized, and 11 small. These companies allocate 300 thousand hectares to peanut production and generate around 450 thousand tons of residues each year. The residues of these companies would be enough to provide residues to energy plants with a total installed capacity of 45MW, which would require an investment of approximately US$100 million.
  6. Investment and Potential Financing - Based on the information gathered of the potential biomass market, the response in the first auction, and the investments required by this type of projects, one can assume the financing BICE would have to make available to serve the market. The target could be four biomass plants of 5MW each with an average investment of US$11 million in each plant (or a combination of smaller and more projects). The four plants would be equivalent to 35% of the potential market (86MW) and would require a total investment of approximately US$60 million and financing amounting to US$42 million.
  7. Biomass projects are heavily dependent on the availability of the residues (biomass) to be able to generate energy, thus certainty in the long term depends in large measure to guaranteeing the supply of this resource. In addition, biomass must be available at a relatively close distance from the plant to avoid transportation costs that would make the projects unfeasible. Large companies and cooperatives are best positioned to guarantee the supply of residues. In addition, it is important to stress the economic feasibility of the biomass plants depend on the regulatory framework established by renovAR. Biomass projects face other barriers (similar to those of biogas projects), and these barriers are: (i) lack of long-term financing; (ii) high initial costs of the engineering and feasibility studies; and (iii) lack of technical knowledge of investors and high uncertainty in project and developer, as well as the bidding process.
  8. Energy Efficiency in Companies - Energy efficiency projects refer to the replacement of obsolete and inefficient equipment for new equipment that consume less electric energy to perform the same job. The savings generated by the reduction in energy and maintenance costs should be sufficient to allow the recovery of the initial investment in a relatively short period of time (normally less than 5 years) by the investor. Based on some interviews carried out and some existing studies identify an important potential in energy efficiency in the Argentinian industrial and commercial sectors since the existing equipment has not been modernized or replaced in the last years. In Argentina, there are 540 thousand industrial, commercial, and service companies, of which 86% are small companies, 13% are SMEs, and 1% are large companies. The potential market size, without micro-sized companies, is 75,000 companies.
  9. Based on the experience in other projects in the region, it is estimated that around 8% of these companies have the potential to implement improvements that would lead to an EE investment project. This is equivalent to 6 thousand companies and a potential market of US$700 million that would result in savings of 2 million MWh per year and a reduction in subsidies amounting to US$1 billion (taking as reference the energy price of the Chilean market). Recovery of the investment in energy efficient equipment depends also in the energy cost. Although Argentina has energy costs far below the energy costs of the region and do not reflect the real cost, the government is making efforts to normalize these costs and it is expected that in the medium- and long-term energy costs stimulate the companies to have more efficient equipment.
  10. Investment and Potential Financing - The financing of energy efficient equipment resides mainly in the replacement of equipment such as: air conditioning, electric motors, industrial cooling, boilers, water preheating with solar energy, micro co˗generation, heat recovery, compressed air, among others. Investments in these energies may range between US$20 thousand up to US$1.5 million depending on the technology. The recovery period of the EE investment at current prices is between five and ten years, but based on the projections of the energy price adjustments being carried out by the government, it is expected that within two to three years these investment recovery periods will be between three and five years.
  11. A BICE financing program for EE may have a target of 598 companies to be financed (equivalent to 10% of the potential market). These companies would require average investments of US$100,000 for each project, which translate into total investments amounting to US$59 million and provide financing amounting to a total of US$41 million. These projects could result in reductions of carbon dioxide emissions equivalent to 14,000 tCO2 annually.
  12. Some of the most important barriers facing EE projects are: (i) usually EE projects are not priority projects for the companies; (ii) businessmen are used to investing to grow, produce more or sell more and there is no culture to invest in environment-friendly systems; (iii) currently there is an energy cost that does not stimulate the culture of energy saving, even if industry is highly intensive in energy consumption; (iv) high perception of the risk on the performance of the projects to achieve the promised savings; (v) the difficulties faced by most of the companies in having access to medium and long-term financing; and (vi) the financial cost and the terms are not conducive to EE projects.

1. Financing Program, Strategy and Mechanisms
   1. BICE’s financing program could encompass the three sectors discussed above. However, it is important to note that each opportunity area faces different barriers and require different strategies to help structure the demand for the resources that would be made available. The biogas sector and the biomass sector face very similar barriers thus the same strategy would apply to both. However, the EE sector has characteristics and barriers that require a different strategy. The following table summarizes the market target, the investment and the financing estimated to be required to serve the three prioritized opportunity areas. Annex 2 of this document describes some of the financial conditions established by the green climate fund.

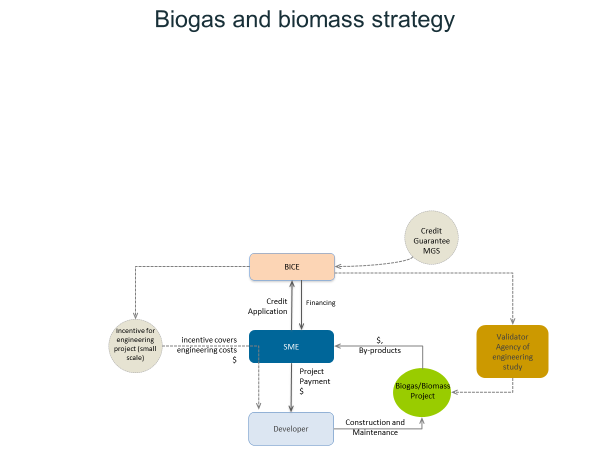
**Table 4.1. Potential Market, Investment and Financing of the BICE Program[[10]](#footnote-10)**

|  |  |  |  |
| --- | --- | --- | --- |
| Opportunity areas | Target | Investment (US$) | External Financing (US$) |
| Biogas | 637 companies (8% of potential market) | 110 million | 77 million |
| Biomass | 4 projects (35% of potential projects) | 60 million | 42 million |
| Energy efficiency | 598 companies (10% of the market) | 59 million | 41 million |
| TOTAL |  | 229 million | 160 million |

* 1. The following sections focus in describing two strategies that may help structure the demand for biogas, biomass, and energy efficiency projects.

1. A. Biogas and Biomass
   1. The strategy includes various mechanisms to stimulate investment in biogas and biomass plants, and seeks to mitigate the barriers and risks faced by the biogas and biomass projects. The strategy includes the following mechanisms:
   2. Financing with appropriate conditions. It is important to make financing available with competitive interest rates and with terms of five to ten years in order to make this type of project viable. The objective is to be able to cover the lack of long term financing and in suitable conditions for this type of projects.
   3. Credit guarantee. An important barrier is the difficulty facing companies in accessing credit. The mechanism seeks to incorporate some existing reciprocal guarantee societies (MGS) to help companies in accessing financial resources. The objective is to create partnerships and standardize the evaluation of these projects and of the companies to facilitate the implementation of this instrument.
   4. Standard contract. Standardize a contract between the client and the project developer to help both parties negotiate and transparently clarify the responsibilities and achievements of the developer. The objective is to facilitate the negotiation between both parties and to establish the responsibilities of the developer.
   5. Incentive to cover the cost of engineering studies. The incentive seeks to cover the initial cost corresponding to project engineering. The incentive would be given to those projects that have been pre-authorized for credit. The cost of project engineering would be partially covered and would be reimbursable when the project becomes operational. The objective is to reduce the barrier represented by the initial disbursement to perform the engineering studies, a cost that often prevents the development of these projects.
   6. Technical validation of the engineering study. An independent agency validates the quality of the engineering project (the technical proposal). The mechanism will require the development of validation protocols for biogas and biomass projects. The objective is to reduce the client’s perception of risk on the technology and quality of the project. The validation will also help in developing trust with the involved financial institutions.
   7. Validation of suppliers. Identification and validation of the technical capacity of different suppliers and project developers of biogas and biomass plants. The validation also helps suppliers in building credibility. The mechanism will require the development of validation protocols of project developers. The objective is to create trust between the different actors (clients and financial institutions).
   8. Capacity strengthening. Training programs to potential clients on the benefits, risks, and on how to mitigate investment risks in biogas and biomass plants. The objective is to eliminate the lack of knowledge barrier on technology, as well as its benefits. The training program would also help in the promotion of this type of projects.
   9. Promotion strategy. The program considers the development of a portfolio of initial projects that help to generate the first projects. The mechanism includes working with project developers and helping them generate the first projects under the program. The objective is to develop trust in the market by showing that there is a portfolio of initial projects.
   10. Financing Flow. The following diagram describes the financing flow of the biogas and biomass projects.

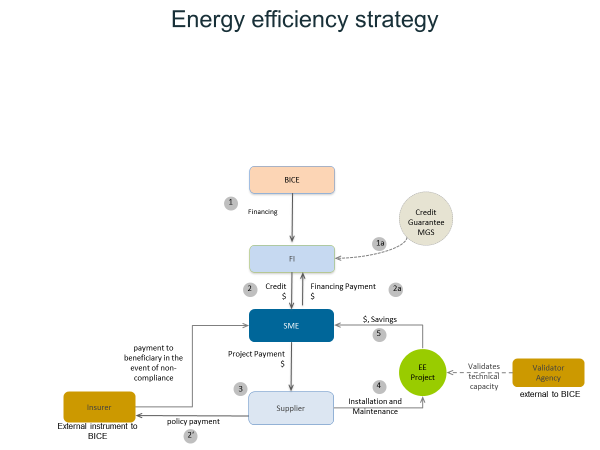
**Figure 4.1. Financing Flow of Biogas and Biomass Projects**



* 1. The financing flow describes the following actions:
     1. The SME and the project developer sign a contract to develop a biogas or biomass project.
     2. Following a favorable feasibility study, the SME requests support (incentive) to BICE to partially cover the cost of the engineering technical and economic feasibility study of the project. This incentive is provided in form of a short-term loan.
     3. The SME signs a commitment to pay the incentive (short term loan) back in case the project is executed, and expressed its interest of a long-term loan for the project.
     4. The technical and economic feasibility engineering study is validated performed by an independent agency to evaluate the quality of the project and the developing engineering firm (Option A) or by the project developer (Option B).
     5. BICE arranges the incentive to partially cover the cost of the technical and economic feasibility study of the project.
     6. If the project developer (Option B) performs the technical and economic feasibility study, a second engineering firm can be hired to evaluate the consistency of the technical and economic feasibility study to provide the bank and the SME client with the necessary confidence that the project is sound.
     7. The SME applies for a credit from BICE; BICE may act as a first-tier bank or second-tier bank distributing the financing for the biogas or biomass projects.
     8. [Optional] A reciprocal guarantee society offers a credit guarantee (where necessary and applicable). The BICE/bank evaluates or rejects the credit application.
     9. The SME signs a commitment to pay back the creditlong-term loan.
     10. The project will generate an income flow to the SME, either from sale of energy, or self-consumption of energy, or sale of fertilizer byproducts (e.g. fertilizer) produced by the plant.

1. B. Energy Efficiency
   1. The strategies consider various mechanisms whose objective is to stimulate investment in energy efficiency projects and to mitigate the barriers faced by these projects. The strategy includes the following mechanisms.
   2. Financing with appropriate conditions. It is important to make financing available with competitive interest rates and with terms of 5 years in order to make this type of project viable. The objective is to be able to cover the lack of long-term financing and in favorable conditions. The financing seeks to emulate a “project finance” funding scheme where the savings generated by the project are sufficient to cover the credit commitments.
   3. Credit guarantee. An important barrier is the difficulty facing SMEs in accessing credit. The mechanism seeks to incorporate some existing reciprocal guarantee societies to help companies in accessing financial resources. The objective is to create partnerships and standardize the evaluation of these projects and of the companies to facilitate the implementation of this instrument.
   4. Standard contract. Standardize a contract between the client and the supplier to help both parties negotiate and transparently clarify the responsibilities of the developer. The contract establishes guarantees on the performance of the project and the generation of savings. The objective is to reduce the client’s perception of risk on this type of projects and help the supplier in building trust.
   5. Energy savings insurance. The role of the risk mitigation instrument is to guarantee the commitment established in the contract by the supplier. In case savings are not achieved, and the supplier does not want or cannot compensate the damage to the client due to lack of performance of the project, then the insurance would pay the client the difference corresponding to the savings not achieved.
   6. Validation of the project and the supplier. The validation would have three interventions; the first one would be during the project evaluation stage where the validator has to evaluate whether the project has the capacity to generate the promised savings and whether the supplier has the capacity to commit itself to execute the project. The second intervention would be to verify that the installed equipment corresponds to the promised equipment; the third intervention would be when and if there is disagreement between the client and the supplier with regard to the performance of the project. The mechanism will require the development of validation protocols of suppliers and projects. The objective of the mechanism is to build trust and support the technical evaluation of the insurer.
   7. Capacity strengthening. Training programs for suppliers on how to incorporate EE as part of their business, as well as help them with the use of the program mechanisms to increase their EE equipment sales. The objective is to involve the greatest number of suppliers of EE equipment (air conditioning, boilers, motors, etc.) so that they become the major promoters of the program.
   8. Promotion strategy. The program considers the development of a portfolio of initial projects that help to generate the first projects. The mechanism includes identifying and engaging suppliers, as well as help them to generate the first projects under the program. The objective is to develop trust in the market by showing that there is a portfolio of initial projects.
   9. Financing Flow. The following diagram describes the financing flow of the energy efficiency projects.

**Figure 4.2. Financing Flow of Energy Efficiency**



* 1. BICE acts as second-tier bank for the purpose of influencing the Fis to start financing EE projects. BICE offers long-term financing and concessional conditions making its line appealing.
  2. The SME applies for credit to the bank. The FI offers financing to the SME. The reciprocal credit guarantee facilitates the requirements and the credit evaluation by the FI to the SME.
  3. The SME signs a contract with a supplier to develop an EE project. The objective of the project is to generate savings that generate a cash flow to the SME to meet its credit commitments.
  4. The supplier applies for insurance where the beneficiary would be SME in case that the supplier does not meet its commitments.
  5. An independent agency validates the project and the supplier. The validating agency also validates the results in case of disagreement between the supplier and the client. The SME has a series of guarantees that reduce the risk on the performance of the project (contract, insurance, validation).

1. Annex Information Sources

A. Primary Information Sources

Ministry

* Ministry of the Environment and Sustainable Development - Lic Prem D. Zalzman, Director of New Technologies for Sustainable Development
* Undersecretariat of ER; Sebastian Kind, Maximiliano Morrone, Mauro Soares
* Undersecretariat of EE; Marco Bergel, Andrea Heins (telephone)
* Undersecretary of Bioindustry, Secretary of Added Value Ministry of Agroindustry; Mariano Lechardoy (telephone)

Banking Institutions

* BICE – Patricia Castro, Rodrigo Mignone, Ricardo Bebczuk, Rodolfo Alba, Francisco Vila, Vanina Messere, Rafael Robles, Fernando Devoto
* Banco Galicia – Ignacio Badaloni; Corporate Banking
* Banco BBVA – Augusto Buda; Investment Banking.

Project Developers/Technology Suppliers

* Isla Power (Photovoltaic), Antonio Antonopoulos
* El Sol ingeniera – Luis Scholand (Consultants)
* Turbomaquinarias – Eng. Carlos D. Weihmüller (president), José M. Menica / Edgardo Vescovo (Capstone)
* Solartec S.A. – Fernando J. Salgado; Suppliers of FV systems and solar water heaters.
* MAN Diesel & Turbo – Diego Biancotti; Suppliers of cogeneration equipment
* Ifbio –Juan Pablo Corbella, Eng. Mauro Barberis - Biogas Plants
* Fiasa; Daniel Lisei, Daniel Sanz, (Thermosolar Suppliers)
* AGVE – Juan Benassi, Developer of biomass plants
* Tecnored - Eng. Horacio Germán Pinasco, Biomass Plants

Other actors

* National Securities Commission – Daniel Ibañez
* CAME (Adviser)/ Jinko Solar (BD) – Luz María Barbero
* Alejandro Motta – Investor and consultant; green entrepreneurship in Rosario

B. Secondary Information Sources

* AHK-Geschäftsreise in den Hispano-MERCOSUR 2.HJ 2013 - 14.-18.10.2013 Photovoltaik und Kleinwindkraft Marktinformationen zu Argentinien. Cámaras Alemanas del Mercosur.
* Enabling PV Argentina. A framework analysis of the conditions for the Use of Solar Energy. Dic 2015. Eclareon.
* Estudio del estado del arte en el uso de la energía solar para calentamiento de agua, 2009, IDEE/Fundación Bariloche.
* Finanzierungsstudie - Finanzierungsmöglichkeiten für Projekte deutscher Unternehmen in Argentinien, Uruguay und Paraguay im Bereich der erneuerbaren Energien (Photovoltaik und Kleinwindkraft), ICON Institute 2013
* Generación de Energía a Partir de Residuos Olivícolas, Universidad Tecnologica Nacional Facultad Córdoba.
* KPMG – Taxes and incentives for Renewable Energy Argentina (2013) https://home.kpmg.com.
* Reportes de Asociación Argentina Productores Porcinos
* Reportes de mercado, Instituto Nacional de Tecnología Agropecuaria.
* Servicio Nacional de Sanidad y calidad Agroalimentaria
* Zielmarktanalyse 2013. Solar und Wind in Argentinien, Paraguay und Uruguay – Marktsituation und Potentiale mit Profilen der Marktakteure.
* Zielmarktanalyse Argentinien 2015 - Biomasse und Biogas mit Profilen der Marktakteure, Cámara de Comercio Argentina – Alemana
* Zielmarktanalyse Argentinien 2015 - Energieeffizienz in der Industrie mit Profilen der Marktakteure, Cámara de Comercio Argentina – Alemana.

Banking Institutions

* BICE – Patricia Castro, Rodrigo Mignone, Ricardo Bebczuk, Rodolfo Alba, Francisco Vila, Vanina Messere, Rafael Robles, Fernando Devoto
* Banco Galicia – Ignacio Badaloni; Corporate Banking
* Banco BBVA – Augusto Buda; Investment Banking.

Project Developers/Technology Suppliers

* Isla Power (Photovoltaic), Antonio Antonopoulos
* El Sol ingeniera – Luis Scholand (Consultants)
* Turbomaquinarias – Eng. Carlos D. Weihmüller (president), José M. Menica / Edgardo Vescovo (Capstone)
* Solartec S.A. – Fernando J. Salgado; Suppliers of FV systems and solar water heaters.
* MAN Diesel & Turbo – Diego Biancotti; Suppliers of cogeneration equipment
* Ifbio –Juan Pablo Corbella, Eng. Mauro Barberis - Biogas Plants
* Fiasa; Daniel Lisei, Daniel Sanz, (Thermosolar Suppliers)
* AGVE – Juan Benassi, Developer of biomass plants
* Tecnored - Eng. Horacio Germán Pinasco, Biomass Plants

Other actors

* National Securities Commission – Daniel Ibañez
* CAME (Adviser)/ Jinko Solar (BD) – Luz María Barbero
* Alejandro Motta – Investor and consultant; green entrepreneurship in Rosario
  1. Evaluation Matrix

Technology Evaluation

|  |  |  |  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NO. | Technology | Sectors | Description | Client profitability | Availability of long-established suppliers | Existence of incentives or policies that support the technological implementation | Potential to reduce GHG | Clients’ interest in the technology | Existence of partnerships of technology suppliers | Simplicity of implementation (possibility of standardization) | There is a real current demand for the technology | Impact of the solution on the operating costs structure | Total |
|  |  |  |  | 100 | 60 | 50 | 100 | 50 | 30 | 80 | 50 | 70 |  |
| 1 | Biogas Plants | Agroindustrial Sector (e.g., food processing) | Sale of the Network Self-consumption | 4 | 3 | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 85% |
| 2 | Biomass Plants | Agroindustrial Sector (e.g., food processing) and Industry (e.g., paper, timber). | Sale of the Network Self-consumption | 4 | 3 | 4 | 5 | 4 | 5 | 2 | 3 | 4 | 75% |
| 3 | Cogeneration systems (electric/thermal) | Industry (e.g., chemical, food processing, dairy) | Self-consumption, network support. | 3 | 5 | 1 | 4 | 4 | 2 | 4 | 3 | 3 | 67% |
| 3 | Cogeneration systems (electric/thermal) | Commercial Sector (e.g., hotels, hospitals) | Self-consumption, network support. | 2 | 3 | 1 | 4 | 2 | 1 | 3 | 2 | 2 | 49% |
| 4 | Photovoltaic systems | Commercial | Sale of the Network Self-consumption, network support. | 2 | 4 | 4 | 5 | 3 | 4 | 4 | 1 | 2 | 65% |
| 4 | Photovoltaic systems | Industrial | Sale of the Network Self-consumption, network support. | 2 | 4 | 4 | 5 | 4 | 4 | 4 | 1 | 2 | 67% |
| 4 | Photovoltaic systems | Residential | Sale of the Network Self-consumption, network support. | 1 | 4 | 4 | 5 | 3 | 4 | 2 | 1 | 1 | 54% |
| 5 | Thermal solar systems (water heater) | Commercial | Complement to the current water heating system | 4 | 4 | 1 | 5 | 3 | 4 | 4 | 1 | 4 | 72% |
| 5 | Thermal solar systems (water heater) | Industrial | Complement to the current water heating system | 4 | 4 | 1 | 5 | 3 | 4 | 4 | 1 | 4 | 72% |
| 5 | Thermal solar systems (water heater) | Residential | Complement to the current water heating system | 3 | 4 | 1 | 5 | 3 | 4 | 2 | 1 | 4 | 63% |
| 6 | Energy efficiency of HVAC systems | Commercial (e.g., hotels, hospitals, shopping centers) | Replacement of current equipment | 3 | 5 | 1 | 4 | 4 | 5 | 4 | 2 | 4 | 71% |
| 6 | Energy efficiency of HVAC systems | Residential | Replacement of current equipment | 2 | 5 | 1 | 4 | 4 | 5 | 4 | 2 | 2 | 63% |
| 7 | Energy efficiency of cooling systems | Industrial (e.g., agroindustry, meat and milk, aquaculture) | Replacement of current equipment | 3 | 5 | 1 | 4 | 4 | 5 | 4 | 1 | 4 | 69% |
| 8 | Energy efficiency in electric motors | Industry (e.g., metal-mechanic, compressed air) | Replacement of current equipment | 2 | 5 | 1 | 4 | 3 | 5 | 4 | 1 | 3 | 62% |
| 9 | Energy efficiency in boiler systems | Industry (e.g., food processing, chemical, pharmaceutical) | Replacement of current equipment | 2 | 5 | 1 | 4 | 3 | 3 | 4 | 1 | 4 | 62% |
| 9 | Energy efficiency in boiler systems | Commercial (e.g., hotels, hospitals) |  | 2 | 5 | 1 | 4 | 2 | 3 | 4 | 1 | 4 | 61% |
| 10 | Energy efficiency in firing, drying, and smelting furnaces | Industry (e.g., metal-mechanic, glass-ceramic, flooring, glass) | Replacement of current equipment | 4 | 4 | 1 | 4 | 3 | 1 | 4 | 1 | 4 | 65% |
| 11 | Heat recovery systems. | Industry (e.g., food processing, chemical, pharmaceutical) | Replacement of current equipment | 4 | 4 | 1 | 4 | 4 | 5 | 4 | 1 | 4 | 71% |
| 11 | Heat recovery systems. | Commercial (e.g., hotels, hospitals) |  | 4 | 4 | 1 | 4 | 4 | 5 | 4 | 1 | 4 | 71% |
| 12 | Energy efficiency in lighting (LED) | Commercial. | Replacement of current equipment | 3 | 4 | 1 | 4 | 4 | 5 | 4 | 2 | 3 | 67% |

**Subsector Evaluation**

| No. | ITEM TECHNOLOGY | ECONOMIC ACTIVITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Market size (number of companies) | BICE priority | Energy intensity | Potential growth of the sector | Easiness of engaging clients/investors | Existence of support policies (+) or subsidies (-) to the subsector | BICE competitiveness in the target sector/subsector | Existence of partnerships/associations grouping the sector/subsector | Interest of FIs in the subsector | TOTAL |
| 90 | 100 | 80 | 30 | 50 | 80 | 100 | 30 | 50 |  |
| Commercial | | | | | | | | | | | | |
| 1 | Hotel | boilers, electric motors, cooling, HVAC, lighting, cogeneration, solar water heaters. | 5 | 5 | 4 | 4 | 4 | 1 | 5 | 5 | 5 | 84% |
| 2 | Hospitals and clinics | boilers, cogeneration, air conditioning, lighting | 5 | 5 | 4 | 4 | 4 | 1 | 5 | 5 | 5 | 84% |
| 3 | Shopping centers/large surfaces | air conditioning, electric motors, lighting | 3 | 5 | 3 | 4 | 4 | 1 | 4 | 5 | 5 | 72% |
| Industrial | | | | | | | | | | | | |
| 4 | Food Industry | boilers, dryers, electric motors, cooling, cogeneration | 5 | 5 | 5 | 5 | 4 | 1 | 5 | 5 | 5 | 88% |
| 5 | Chemical/Pharmaceutical | boilers, electric motors, cogeneration | 5 | 5 | 5 | 5 | 4 | 1 | 5 | 5 | 5 | 88% |
| 6 | Foundry | furnaces, electric motors | 2 | 5 | 5 | 3 | 4 | 1 | 4 | 5 | 5 | 74% |
| 7 | Paper | boilers, electric motors, lighting, cogeneration | 3 | 5 | 5 | 3 | 4 | 1 | 4 | 5 | 5 | 77% |
| 8 | Tannery | boilers, electric motors, cogeneration | 3 | 5 | 4 | 3 | 4 | 1 | 5 | 5 | 5 | 77% |
| 9 | Plastics | boilers, electric motors, cogeneration | 3 | 5 | 5 | 4 | 4 | 1 | 5 | 5 | 5 | 81% |
| 10 | Pork industry | biogas plants | 4 | 5 | 4 | 4 | 4 | 3 | 5 | 5 | 5 | 87% |
| 11 | Livestock industry (feedlot) | biogas plants | 5 | 5 | 3 | 3 | 4 | 3 | 4 | 5 | 5 | 83% |
| 12 | Poultry Industry | biogas plants | 5 | 5 | 4 | 3 | 4 | 3 | 3 | 5 | 5 | 82% |
| 13 | Agriculture Industry | biomass plants | 5 | 5 | 3 | 3 | 3 | 2 | 5 | 5 | 4 | 80% |
| Residential | | | | | | | | | | | | |
| 14 | Houses | air conditioning, lighting | 5 | 1 | 3 | 3 | 2 | 1 | 5 | 1 | 3 | 57% |
| 15 | Buildings (apartments) | air conditioning, lighting | 5 | 2 | 3 | 3 | 1 | 1 | 5 | 1 | 4 | 60% |

* 1. GCF Conditions

The following table describes some of the financial conditions established by the Green Climate Fund for projects with sovereign guarantee.

|  |  |
| --- | --- |
| Description | Terms |
| Currency | US$ |
| Maturity | 20 years from the date of effectiveness of the loan contract. |
| Disbursement Period | 5 years from the date of effectiveness of the loan contract. |
| Grace Period | 5 years from the date of effectiveness of the loan contract. |
| Repayment of Principal | After the end of the grace period, biannually, within the fifteen (15) day period after June 30 and December 31 of each year. |
| Amount of repayment of Principal | A thirtieth (1/30) of the total amount disbursed to BICE during the disbursement period. |
| Interest Type and Rate | Fixed. 75 basic points per year. |
| Accrual of Interest | Interest is accrued biannually, from the date of disbursement from the IDB to BICE and shall be calculated on the amount of the pending principal of the loan. |
| Interest Payment | Interest shall be paid biannually within fifteen (15) days following June 30 and December 31 of each year. |
| Commitment Fee | Up to 75 basis points per year. |
| Payment of Commitment Fee | The commitment fee shall be paid biannually within fifteen (15) days after June 30 and December 31 of each year and shall be calculated on the amount of reimbursable non-disbursed funds from GCF to the IDB. The commitment fee shall apply from the date of effectiveness of the loan contract. |
| Service Fee | 50 basis points per year. |
| Payment of Service Fee | The service fee shall be paid biannually within fifteen (15) days after June 30 and December 31 of each year and shall be calculated on the pending principal amount. The service fee shall apply from the date of each disbursement from the IDB to BICE. |
| Final Payments | At the end of the loan contract, the pending principal amount, interest, and fees shall be immediately paid to the IDB. |

1. In this report, sustainable energy is defined as renewable energy and energy efficiency. For a background document on the national context in Argentina, please see [Appendix Feasibility Analysis](https://idbg.sharepoint.com/teams/EZ-AR-LON/AR-L1280/_layouts/15/DocIdRedir.aspx?ID=EZSHARE-972212929-23). [↑](#footnote-ref-1)
2. Feedlot emerged from the need to intensify production, and consists in holding the animals in pens where they are fed in troughs. [↑](#footnote-ref-2)
3. The line is based on a total financing amount of US$160 million and additional counterpart funds amounting to 30% capital from investors (companies). Financing resources may be a combination of international resources and co-financing from BICE. [↑](#footnote-ref-3)
4. <http://www.equiposylaboratorio.com/sitio/contenidos_mo.php?it=2756>. [↑](#footnote-ref-4)
5. <http://www.energiaestrategica.com/biomasa-biogas-las-tecnologias-rezagadas-esta-primera-licitacion-del-programa-renovar/>. [↑](#footnote-ref-5)
6. <http://www.clarin.com/rural/ganaderia/produccion-porcina-alcanzo-maximo-historico_0_EkXKTcaix.html>. [↑](#footnote-ref-6)
7. <http://www.senasa.gov.ar/cadena-animal/porcinos>. [↑](#footnote-ref-7)
8. Data provided by suppliers. [↑](#footnote-ref-8)
9. Please see the following reports on the availability of agricultural waste sources in different regions and provinces in Argentina. German-Argentinean Chamber of Commerce (2015). [Zielmarktanalyse Argentinien 2015 - Biomasse und Biogas mit Profilen der Marktakteure](http://www.ahkargentina.com.ar/fileadmin/ahk_argentinien/Descargas/Publicaciones/ZMA/Zielmarktanalyse_Argentinien_20150622.pdf) (page 48), Argentinean Ministry of Energy and Mines (2009) [Analysis of the Energy Balance derived from biomass energy in Argentina [*Análisis del Balance de Energia. derivada de Biomasa en Argentina*]](https://www.minem.gob.ar/archivos/Reorganizacion/probiomasa/WISDOM_Arg_Informe_Final.pdf) FAO (2016) [Spacial analysis of the energy balance derived from biomass for the Argentinean province of Salta [*Análisis espacial del balance energético derivado de biomasa*].](http://www.fao.org/3/a-i6456s.pdf)  [↑](#footnote-ref-9)
10. The line is based on a total financing amount of US$160 million and additional counterpart funds amounting to 30% capital from investors (companies). Financing resources may be a combination of international resources and co-financing from BICE. [↑](#footnote-ref-10)