

Nicaragua

Energy Sector and Strategic Investment Planning for Renewable Energy

Case Study for the LEADS GP Sustainable Energy and Development World Atlas

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Program Name:

Nicaragua National Energy Policy (2004), Strategic Plan for the Energy Sector of Nicaragua (2007)

Country and Region:

Nicaragua, Latin America and the Caribbean

Years of Implementation:

2004–2025

KEY OUTCOMES

Since 2004, Nicaragua's **National Energy Policy** and **Strategic Plan for the Energy Sector** have established a clear and consistent process for national electrification, nearly doubling electricity access rates to 80 percent by 2015.

This rapid grid development has been sustained by over US \$1.5 billion in clean energy investment between 2006 and 2012, resulting in markedly increased energy self-sufficiency and distribution system efficiency without notably increasing carbon emissions intensity in the country. These national policies, and the broad cross-institutional collaboration that they continue to facilitate, illustrate clearly how rapid electrical grid modernization can be achieved at minimal environmental cost.

INTRODUCTION: THE NEED FOR GRID MODERNIZATION IN NICARAGUA

Located in Central America, Nicaragua is an environmentally and culturally diverse country that is blessed with substantial domestic renewable energy resources.¹ Historically, however, the country has suffered from recurrent energy crises, driven primarily by its heavy dependence on the volatile global market for fossil fuels. Nicaragua has struggled to provide affordable and reliable electricity access to its citizens, stymying social and economic development.

Between 2006 and 2014, as a result of a series of activities carried out in the energy sector under the guidance of the Ministry of Energy and Mines (MEM) and the Nicaraguan Energy Cabinet, Nicaragua drove a rapid transformation of its electrical grid toward renewable energy resources. Both public and private electricity sector companies as well as multilateral development institutions played a critical role supporting this transformation, providing some US \$1.5 billion in investment over the seven-year period.² As a result, the installed capacity of renewable energy plants in Nicaragua grew 109 percent during this period, from 231 megawatts (MW) to 483 MW—representing 60 percent of the country's total electricity generation in 2014.³

This energy sector transformation was catalyzed by Nicaragua's National Energy Policy (2004) and amplified in impact by Nicaragua's Strategic Plan for the Energy Sector (2007). Building off of the success of these sectoral plans and the wide range of effective public policy instruments they introduced, the government of Nicaragua has targeted that the country will provide 90 percent of its electricity needs with renewable energy by 2027.⁴

A CHRONICLE OF THE NICARAGUAN ENERGY REVOLUTION

Early Energy Investments Starting in the 1940s

Initial investments in Nicaragua's electricity sector began in the 1940s and were consolidated beginning in 1954 with the establishment of a state utility company (ENALUF), responsible for the generation, transmission, distribution, and marketing of electricity. The following year, the National Energy Commission (CNE) was created as a regulator, promulgating the first Electricity Industry Act in 1957. It is estimated that in 1963, petroleum resources provided 80 percent of national power generation.⁵ First forays into the renewable energy sector were made in the 1960s, with the construction of two hydroelectric plants.

Decentralization and Conformation of Nicaragua's Electricity Market in the 1980s and 1990s

Initiated in 1979, the Nicaraguan Institute for Energy (INE) was established as the primary regulator and director for national energy policymaking in the electricity sector, with responsibility for the administration, exploration, and management of domestic energy resources. Decentralization of the electricity sector started in 1994 with the inception of the Nicaraguan Company for Electricity (ENEL). ENEL was granted rights for electricity sector development, including the exploration, exploitation, and use of domestic energy resources.

In 1998, Laws Nos. 271 and 272 were passed, laying the foundations for Nicaragua's modern electricity market. Law No. 271 led to the creation of the CNE, which assumed the role of policy and planning. Meanwhile, INE retained oversight of regulatory functions, monitoring, and control of the electricity sector. Law No. 272 established basic principles for the operation of a competitive market for electricity, promoting participation of the private sector.



As a result of these reforms, Nicaragua's electricity market in the early 2000s was characterized as follows: 80 percent of electricity generation was provided by private companies, supplying the National Interconnected System (SIN); transmission system operation remained in state hands through the National Company for Electricity Transmission (ENATREL); and the distribution system was privatized and passed into the hands of the Spanish company Union Fenosa (today named TSK).

In the 1990s, the World Bank and the Inter-American Development Bank (IDB) stopped funding energy projects in Nicaragua due to their aggressive funding in this area decades before.⁶ This decision left only private sector investments as a viable option for developing energy infrastructure in the country. Because Nicaragua had already developed petroleum-fueled plants and could find little private investment for other energy sources, no significant power capacity was installed between 1999 and 2006, and imported petroleum remained the primary source of electricity well into the 21st century.

Energy Crisis in the Early 21st Century

In 2003, 72 percent of Nicaragua's electricity was still sourced from expensive imported petroleum.⁷ As a result, electricity prices in 2003 averaged US \$123 per megawatt-hour. These high electricity costs were also the product of the privatization of electricity generation and distribution under Union Fenosa, which applied a 70 percent "distribution fee" markup on electricity rates.⁸ Exacerbating this system, the rise in global oil prices after 2004 increased operating costs significantly for petroleum-fueled thermal plants. These costs were passed along to Nicaraguan electricity consumers.

Combined, these factors rapidly left Nicaragua incapable of paying for imported fuel resources, resulting in widespread power rationing.⁹ Responding to this energy crisis, the country passed initial tax and import duty exemptions

for renewable energy companies in 2005. Nevertheless, by 2006, Nicaragua's energy deficit reached 20 percent of maximum demand, leaving citizens across the country without electricity access for 4 hours and often up to 12 hours daily.¹⁰ Erratic electricity blackouts became a regular occurrence starting in June of 2006 and continuing throughout the year, excepting the few weeks surrounding Nicaragua's presidential elections in November.

NICARAGUA'S PIVOT TO RENEWABLES

The Importance of Leadership and Political Commitment

Responding to persistent energy access issues in the mid-2000s, the government of Nicaragua has led several renewable energy and electrification initiatives to manage these problems at a deeper systemic level. In 2005, Law No. 532 "Law for the Promotion of Electricity Generation from Renewable Sources," Law No. 443 "Exploration and Exploitation of Geothermal Resources," and Law No. 531 "Reform Promotion Act for the Hydroelectric Sub-Sector" were passed, making significant progress for Nicaragua's regulatory system.

Following these reforms, the Ministry of Energy and Mines was established in 2007 with a mandate to transition Nicaragua's energy matrix toward renewables outlined in the 2007 Strategic Plan for the Energy Sector. In the short term, MEM unveiled a series of power plant project feasibility studies and coordinated with other bodies such as PRONicaragua to help interested renewable energy investors comply with requirements for provisional generation licenses.

Integration and Institutionalization

Much of the rapid and safe progress made by Nicaragua in transforming its energy matrix can be attributed to the creation of an effective mechanism to leverage the existing

legal framework and to ensure compliance of all parties, coupled with a comprehensive strategy to promote investments in renewable energy projects.

To adjust the system with regard to electricity demand, the government of Nicaragua signed in 2008 the “Protocol of Understanding State Distribution,” answering key issues raised by electricity customers and stakeholders. Key aspects of the Protocol include:

- Suspension of claims and demands at the international level by the distributor, and suspension of administrative steps by the government
- Collaboration to solve technical problems for generators
- Solutions to reduce commercial losses and underwriting investment plans for distribution infrastructure
- Creation of technical commissions for resolution of all currently available technical, economic, and financial problems.

Prior to the development of the first renewable energy projects under the MEM, a key step taken by the government was to establish regular networks of inter-institutional communication and coordination among the MEM, ENEL, ENATREL, and the newly created state company ALBANISA to strategically manage electricity supply. This coordination was critical to ensuring reliability and stability of Nicaragua’s transmission network SIN during a period of rapid growth in generation capacity (seven thermal power plants were integrated during 2008–09, adding 176.6 MW of capacity).

MEM has enforced clear and consistent requirements and procedures to qualify for the development of renewable energy projects. This process includes a thorough assessment of the technical, economic, and financial capabilities of potential developers. These procedures

helped ensure that the developers of initial pilot renewable energy projects were able to overcome technical, financial, and legal barriers. These successful pilot projects were critical in dispelling incorrect assumptions about the risks of investing in the country and in renewable energy technologies generally.

Promoting Strategic Investment

The government’s strategic promotion of energy sector investment opportunities has generated tangible progress toward electrical grid transformation in Nicaragua. The process of investment promotion has been articulated consistently among various government institutions, including MEM, ENEL, INE, and PRONicaragua.

Part of the mandate of PRONicaragua, the government’s investment and export promotion agency, is to promote Nicaragua as an international destination for investment in different sectors, including energy. The field of investment promotion includes three stages of development and management of the business climate: monitoring and positioning of the country’s image internationally; proactive investment promotion (international forums, company visits, etc.); and aftercare service, implying comprehensive support with the requirements and permits of various government regulatory entities.

In addition to investment promotion, PRONicaragua coordinates closely with MEM to evaluate the quality of investment proposals, including detailed investigation of the investor background and credentials. Joint meetings with potential investors visiting the country as well as periodic exchange of information on energy project profiles (pre-feasibility and feasibility) are performed periodically between the two ministries. Since 2007, PRONicaragua has provided support in key moments in the development of renewable energy projects (feasibility or construction phase), as in the case of Blue Power, El Diamante, Amayo, Tumarín, Polaris, and others.



A key aspect for investors is the quality of Nicaragua's wind and geothermal resources. Installed wind projects in the country have an equivalent availability factor greater than 0.42, making them highly attractive. Meanwhile, according to the Energy Sector Strategic Plan, the geothermal potential is 1,500 MW, which is in the exploration phase for some initiatives (Volcano Cosigüina, Telica, Mombacho, and others).¹¹

Responding to this revitalized and coordinated network of investment-promoting entities, multilateral financiers such as the IDB and Central American Bank for Economic Integration (CABEI) have invested heavily in Nicaragua's energy sector. For the Tumarín hydropower project, CABEI provided US \$280 million and IDB US \$150 million. For the wind project Amayo, CABEI contributed US \$70 million in 2009.

As a result of these programs and a broad commitment to developing its renewable energy resources, Nicaragua

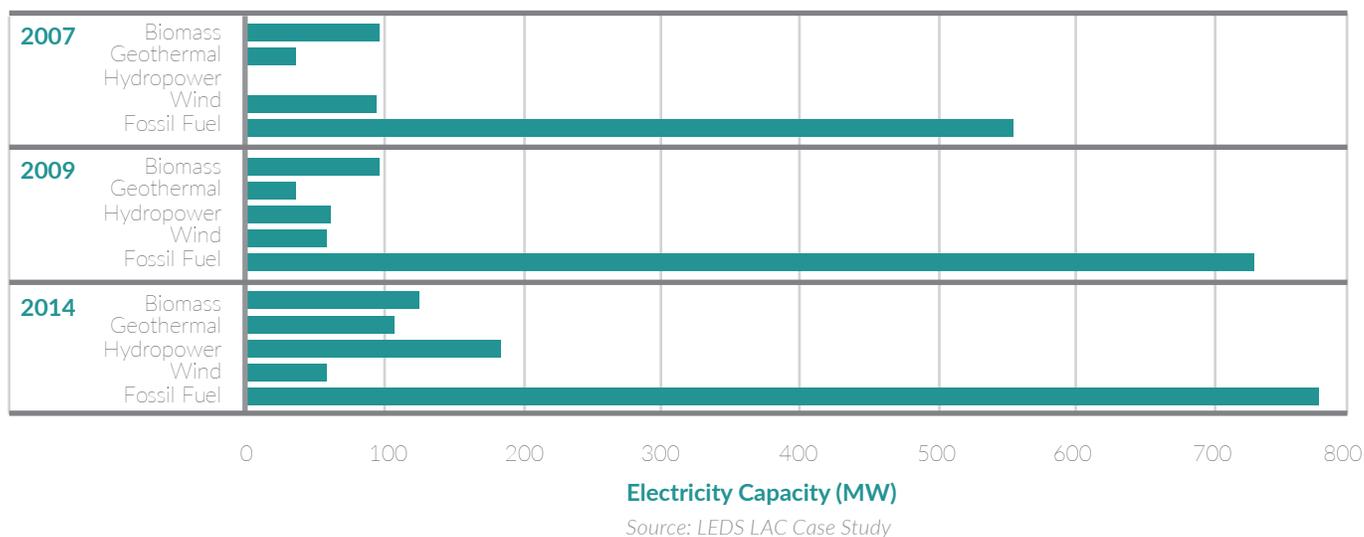
received more than US \$1.5 billion in clean energy investment between 2007 and 2014. This represents the largest investment per capita in Latin America and the Caribbean for clean energy during that period.

Investment has been key to Nicaragua's ability to achieve the high share of renewable energy in its electricity grid today. This share reached 56 percent in 2015, with the first day of that year seeing 83 percent of electricity demand supplied by renewables.¹² Development of domestic renewable energy resources enabled the country, a longtime energy importer, to export 43.3 gigawatt-hours of electricity in 2015.¹³ Nicaragua has targeted meeting 90 percent of its electricity needs through renewables by 2027, which will further increase this export potential.¹⁴ Although transmission losses in the country still exceed the global average, Nicaragua decreased these losses from 30.5 percent in 2001 to 15.4 percent in 2013.¹⁵

DEVELOPMENT IMPACTS OF THE NICARAGUAN ENERGY SECTOR REFORM

Following the deployment of Nicaragua's revamped National Energy Plan and Strategic Plan for the Energy Sector, the country has experienced significant cross-sectoral benefits. These benefits extend far beyond transformation of Nicaragua's energy sector from fossil fuels toward a diversified matrix of renewable energy resources.¹⁶ (See Figure 1.)

Figure 1. Installed Energy Capacity Transformation in Nicaragua



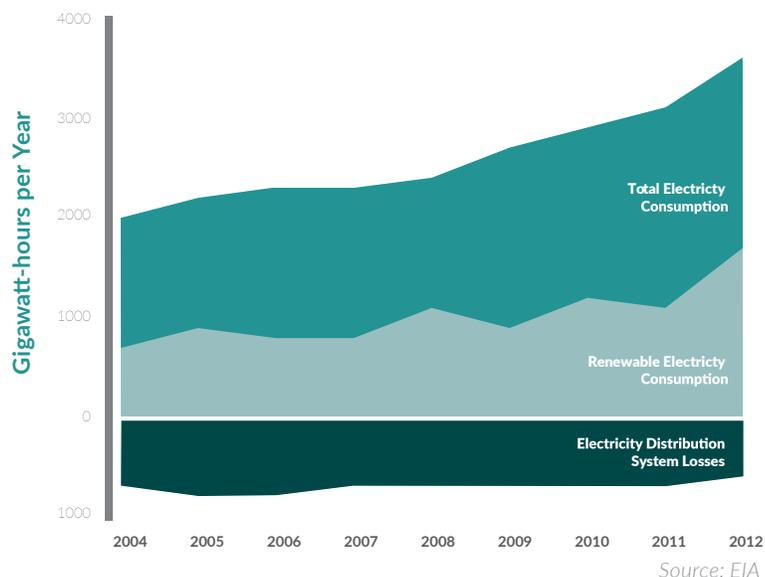
Economic Impacts

- Electricity consumption rates have increased, while distribution system losses have held steady.¹⁷ (See Figure 2.)
- Energy self-sufficiency reached 60 percent in 2013, up 8 percent from 2003 levels.¹⁸ (See Figure 3.)
- Nicaragua received over US \$1.5 billion in clean energy investment between 2006 and 2012.¹⁹
- By 2013, Nicaragua had the fifth highest share of gross domestic product (GDP) invested in renewable energy globally.²⁰

Social Impacts

- By 2015 the electrification rate in Nicaragua was 80 percent, up from 47 percent in 2004, which was unusually low even for the region.²¹ (See Figure 4.) In general, this increased electrification has been uniform across all cities in Nicaragua.²² In 2012 alone, national grid distributors gained 25,000 newly qualified and rate-paying electricity customers that existed previously with unregulated grid connection.

Figure 2. Electricity Consumption and Losses, 2004–2012



Environmental Impacts

- Carbon emissions per US \$1 GDP (purchasing power parity) fell by 0.028 kilograms of carbon dioxide from 2003 to 2011.²³ (See Figure 5.)
- Total greenhouse gas emissions levels stayed largely constant from 2003 to 2011.²⁴ (See Figure 6.)

Figure 3. Energy Self-sufficiency, 2003–2013

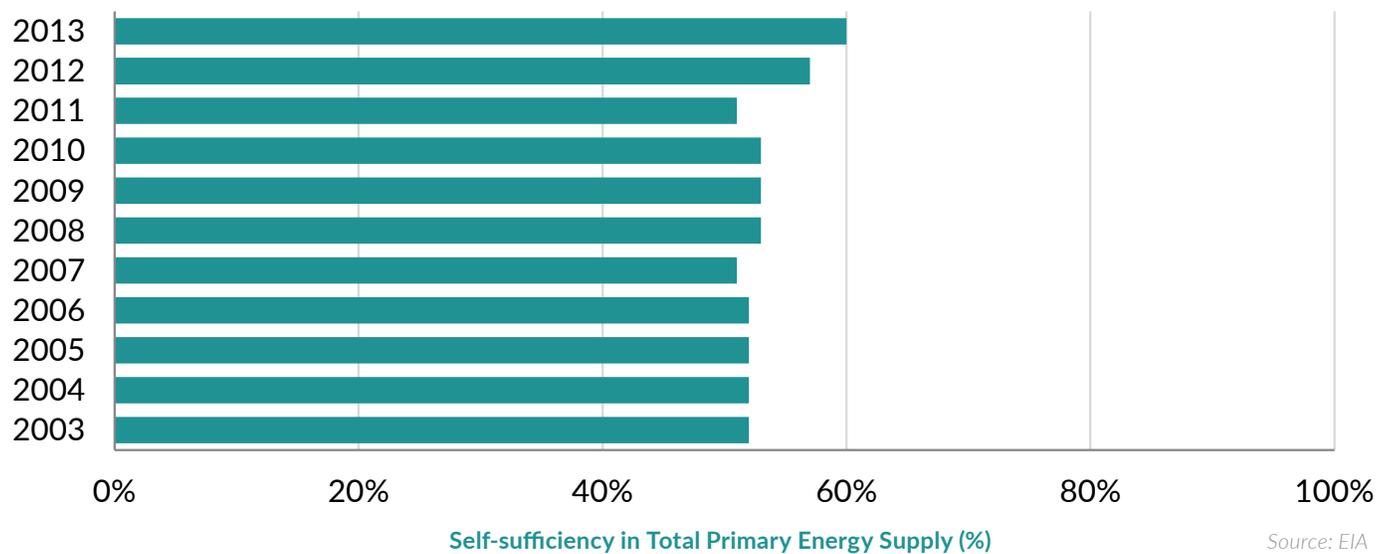


Figure 4. National Electrification Rate

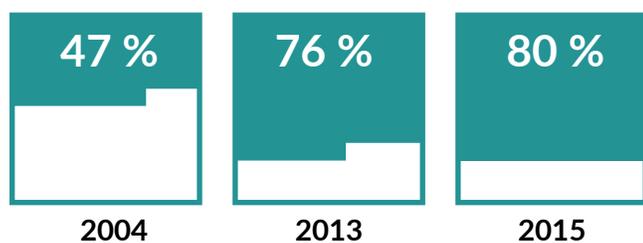


Figure 5. Carbon Dioxide Intensity, 2003–2011

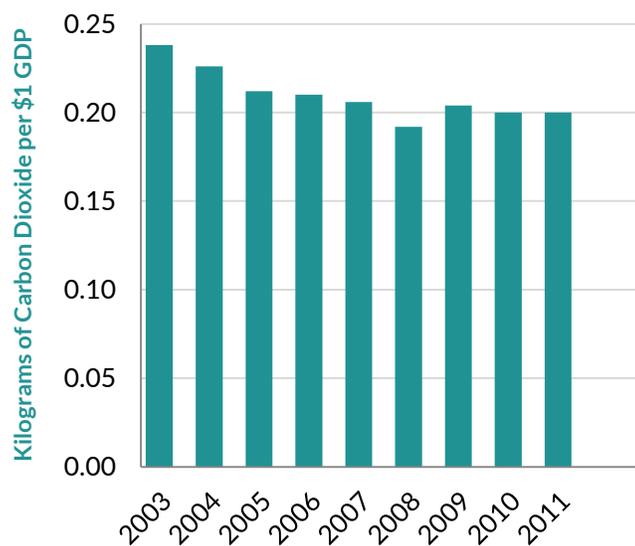
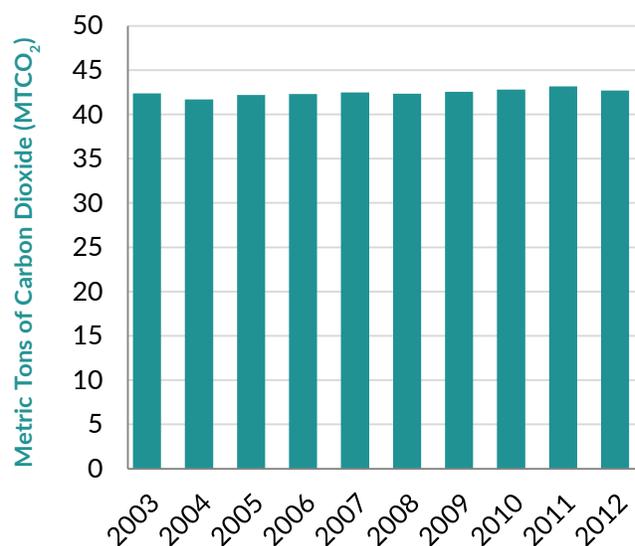


Figure 6. Total Annual Greenhouse Gas Emissions, 2003–2012



SUCCESS FACTORS AND REPLICABILITY

Leadership and Political Commitment from the Central Government

The leadership and commitment from the central government continues to play a critical role in Nicaragua's energy transformation. With the passing of several important laws in the electricity sector, the government strengthened the legal and regulatory framework for renewable energy. Starting in the 1980s with the trend toward decentralization in Nicaragua's electricity market, the government passed several laws that laid the foundation for the country's modern electricity market, establishing principles for the operation of a competitive market. In the 2000s, the government promoted and established the basic legal conditions governing hydro and geothermal resources. Meanwhile, the government deployed the Nicaragua National Energy Policy (2004) and the Strategic Plan for the Energy Sector of Nicaragua. These key policy designs guided the country toward renewable energy through a comprehensive strategy.

Key to the success of this legal framework was the institutionalization of policy recommendations across

relevant agencies and stakeholder groups. The government's Energy Cabinet operated as the central decision-making body, assigning specific missions to all agencies and institutions involved in the electricity market. To ensure compliance and communication among agencies and stakeholder groups, MEM was established to coordinate institution functions and to enforce energy transition requirements.

Private Sector Investment Promotion

Nicaragua's success in increasing investment in its domestic renewable energy resources has relied heavily on the government's strategic use of investment promotion agencies to unlock private sector participation. PRONicaragua, the official investment promotion agency, has played a critical role in this effort. By acting as a medium between potential investors, government ministries, and project developers, PRONicaragua facilitated the exploration and development of pivotal renewable energy projects that have contributed significantly to de-risking investment in Nicaragua's energy sector while facilitating the involvement of international financiers such as the IDB and CABEL.

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