



GOBIERNO *de*
GUATEMALA

MINISTERIO
DE ENERGÍA
Y MINAS

RURAL ELECTRIFICATION POLICY 2020 - 2050



Guatemala City, May 2023



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RURAL ELECTRIFICATION POLICY

2020-2050

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PRESENTATION

The Ministry of Energy and Mines, as the governing body for policies related to energy use and consumption in the state of Guatemala, through the Energy and Mining Planning Unit, presents a significant update to the Rural Electrification Policy.

Guatemala has made significant progress through rural electrification programs and projects, which have been funded by the National Electrification Institute, resulting in a national electrical grid coverage rate of 88.14% and an energy access rate of 91.23% to date.

The people of Guatemala need to meet their energy demands for activities such as cooking, water heating, indoor heating, and lighting. According to the census, there are currently 1.78 million Guatemalan households that meet their energy needs for cooking through unsustainable energy sources, such as firewood, as energy resources are not replenished at the same rate as they are consumed.

Under the updated policy, this Ministry reaffirms its commitment to the Guatemalan population, ensuring the safety and supply of electric power for all citizens.

Rural electrification projects are a crucial contribution to the sustainable development of the most vulnerable communities within the Guatemalan population. By having access to electric power, greater opportunities are created to improve access to education, health, and infrastructure.

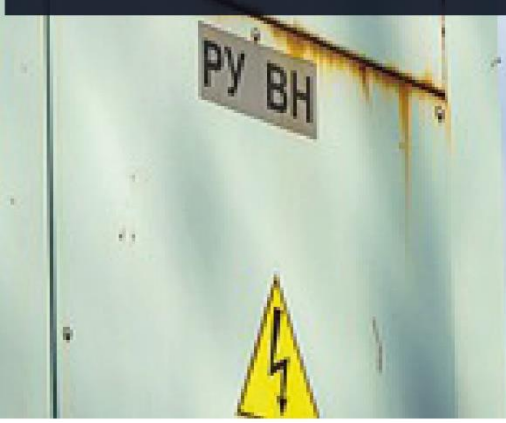
This policy outlines the principles and guidelines that will underpin the plans, strategies, and actions to be carried out to guarantee the electrical supply for nearly three hundred thousand Guatemalan families, according to the 2018 census, who currently do not have this service.

Lic. Alberto Pimentel Mata
Minister of Energy and Mines





GENERAL ASPECTS



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1. General Aspects

The following sections describe the aspects on which the definition of the Rural Electrification Policy is based.

1.1. Objectives

The purpose of this policy is to seek an increase in the number of households with sustainable access to electricity over time, expanding electric coverage by considering the implementation of new supply technologies and identifying areas for electrification through a methodology that allows for the establishment of priority projects, promoting local productivity through electrification projects.

Specific objectives:

- ✓ By 2023, increase the proportion of the population with access to electricity to **90%**.
- ✓ Expand the coverage of electric power services to the Guatemalan population, with an emphasis on those living in rural areas.
- ✓ Prioritize access to public services in rural areas and marginalized urban zones.
- ✓ Create investment projects.
- ✓ Develop a methodology to establish priority electrification projects, considering social, economic, and technical variables.
- ✓ Develop strategic energy planning for the sustainable increase of electricity coverage rates, considering demographic growth.
- ✓ Establish the premises and principles that should guide the development of the Indicative Rural Electrification Plan.
- ✓ Promote the creation of regulatory mechanisms that enable the achievement of the goals set forth in the rural electrification policy.

Strategic Objectives

1. Increase national investment and foreign direct investment.
2. Generate employment in areas of influence.
3. Improve the quality of electric power service for end-users.
4. Promote geographically located electricity generation.
5. Encourage health, tourism, education, and security through electric power services.
6. Improve quality of life indices.
7. Support the economic wall at the border with Mexico, promoting investments from companies in that area and bilateral trade.
8. Promote investments from companies at the border with El Salvador and Honduras and bilateral trade.
9. Promote regional electricity exports and imports in Central America, Mexico, and Belize in the future.



1.2.Guiding Principles

1. Energy Supply Security

Ensure that the supply of primary and secondary energy resources always meets national demand, expanding technological alternatives for rural electrification, considering self-generation of energy with photovoltaic, wind, small hydroelectric plants, generator sets, and hybrid systems.

2. Strategic Energy Planning

Energy planning allows defining the necessary actions and methods to comply with the objectives of the National Energy Policy and the international commitments acquired by Guatemala in a strategic way, which will enable achieving the proposed goals and objectives.

The developed methodology will focus on strategic planning through specific actions in rural electrification, such as:

- i. Management and plans of electric power distributors to achieve their electric coverage goals.
- ii. Operations and tasks of INDE to achieve rural electrification objectives and electric coverage.
- iii. Identification of electrification projects for isolated areas far from electric power networks.
- iv. Multilateral loans that allow expanding the financial capacity of INDE and other institutions responsible for carrying out rural electrification projects.

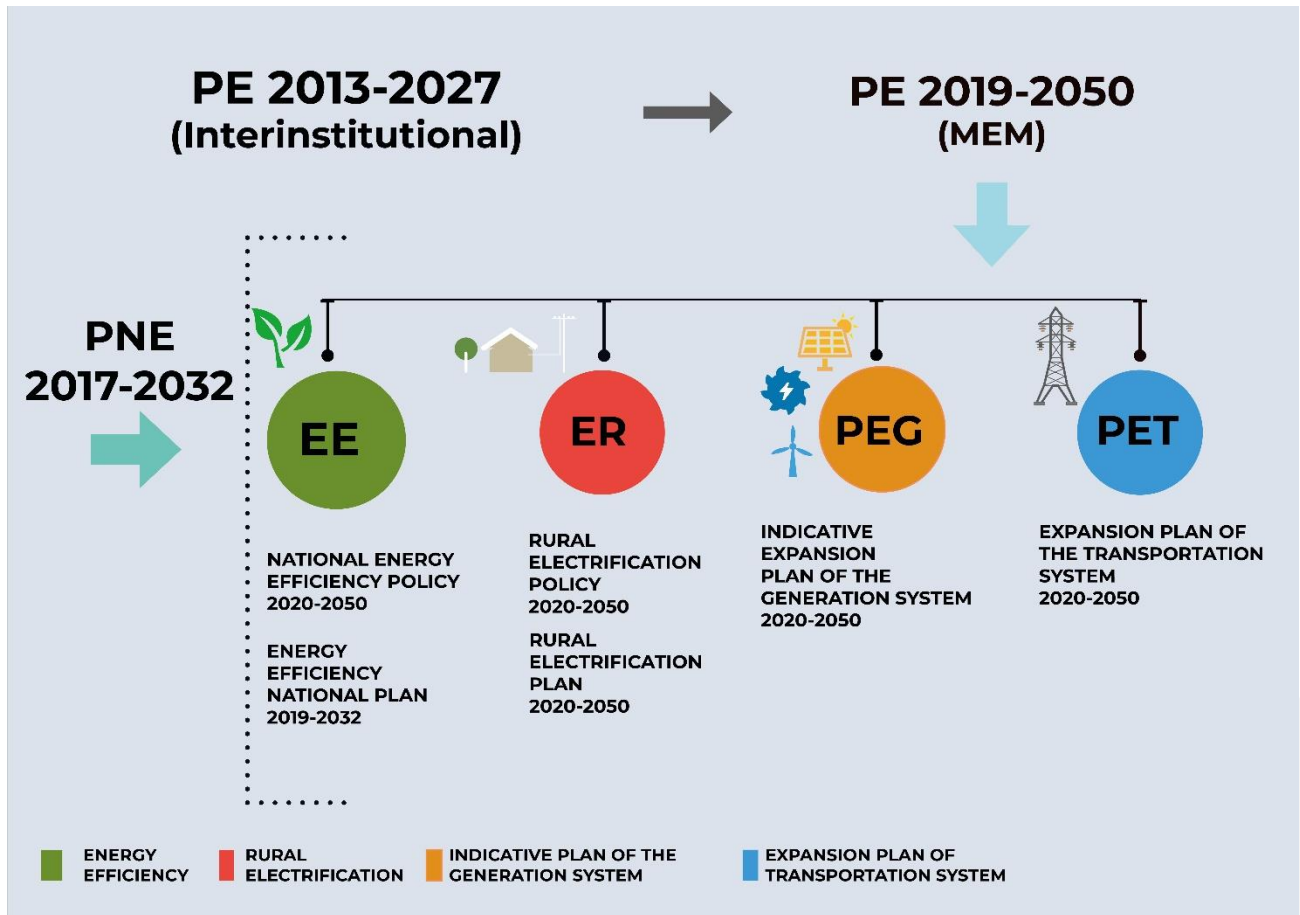
3. Socioeconomic Development Plans upon accessing electricity services

Strategic planning is necessary through inter-institutional efforts to increase the possibilities of integrating those families accessing electric supply into economic development.

1.3. Political and Legal Instruments

Article 129 of the Political Constitution of the Republic of Guatemala **declares that the electrification of the country is of national urgency**, indicating that electrification must be carried out based on plans formulated by the State and the municipalities and that any private company may also participate.

Figure 1. Strategic pillars of the Government General Policy 2020 - 2024.



Source: Proprietary Production, MEM.

In addition to the scheme shown in figure 1, the energy plans and policies related to rural electrification in the country are described.

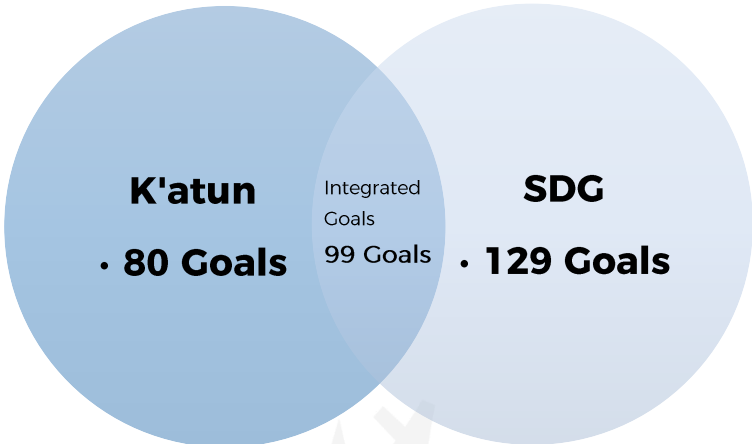


National Development Priorities and Strategic Goals

The different powers of the state, civil society, the private sector, and international organizations signed their commitment to the National Sustainable Development Agenda and how it can be articulated to the K'atun 2032 National Development Plan.

Establishing national priorities aims to seek integrated goals among the 80 goals set in the K'atun development plan and the 129 Goals set in the SDGs, determining that there are 99 integrated goals between the two plans.

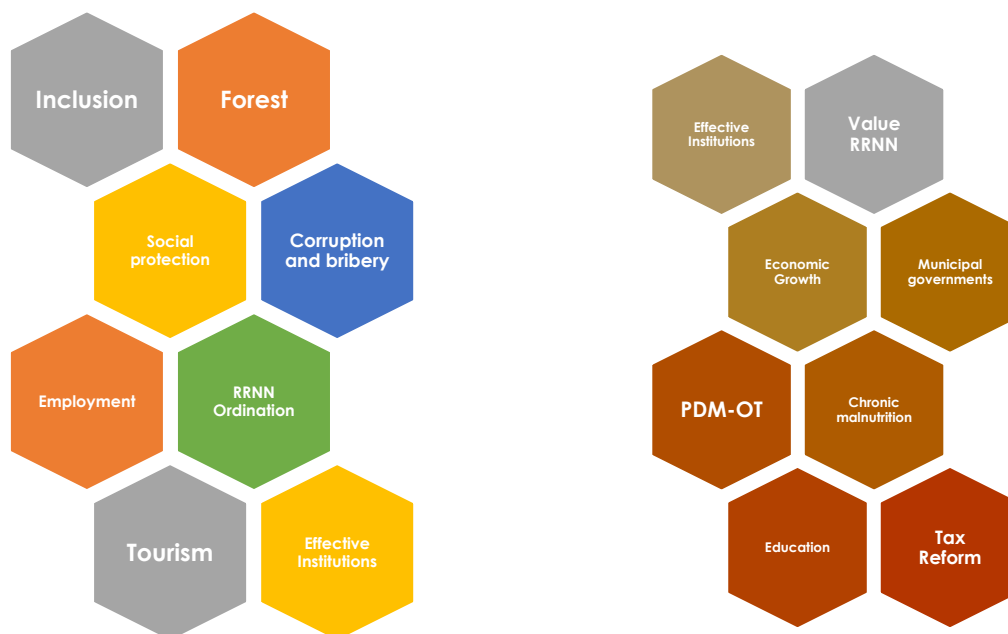
Figure 2. Integrated Goals K'atun 2032 and SDGs.



Source: Proprietary Production, SEGEPLAN.

The integration of these objectives was synthesized into 16 MED's objectives, which are cross-cutting both for the K'atun Development Plan and the Sustainable Development Goals.

Figure 3. Strategic Development Goals.



Source: Proprietary Production, SEGEPLAN.

Government General Policy

The Government of Guatemala, committed to fulfilling national and international agreements acquired throughout the country's diplomatic history, has presented the General Government Policy, with a horizon from 2020 to 2024. Considering that all actions and efforts for the country focus on improving the living conditions of the Guatemalan population, in their social, political, economic, and environmental surroundings, this policy presents five strategic pillars.

Figure 4. Strategic pillars of the General Government Policy 2020 – 2024.

Government General Policy

- Economy, Competitiveness and Prosperity
- Social Development
- Governance and Security in Development
- Accountable, Transparent and Effective State
- Relations with the World

Source: Proprietary Production, with information from the Government General Policy 2020 - 2024.



Identifying the country's commitments and the current context of Guatemalan society, country solutions are formulated, which contain goals, actions, and indicators. Regarding the energy sector and rural electrification, the following points stand out.

Figure 5. Interaction of Government Policy with rural electrification in Guatemala.

4.1 Economy, competitiveness and prosperity	Strategic Objective: to promote economic growth and sustainable employment growth	Sector objective: Promote the development of renewable and non-renewable energy sources compatible with environmental conservation.	Strategic action: to expand the coverage of electricity service to the Guatemalan population, with emphasis on the population living in rural areas.
	Strategic goal: By 2023, the proportion of the population with access to electricity has been increased to 90%.	Measuring indicator: proportion of the population with access to electricity	
		Baseline: 88.14 % (2017)	
		Directly responsible: MEM	

Source: Proprietary production with information from the Government General Policy 2020-2024.



Figure 6: Core Concepts of the National Innovation and Development Plan.

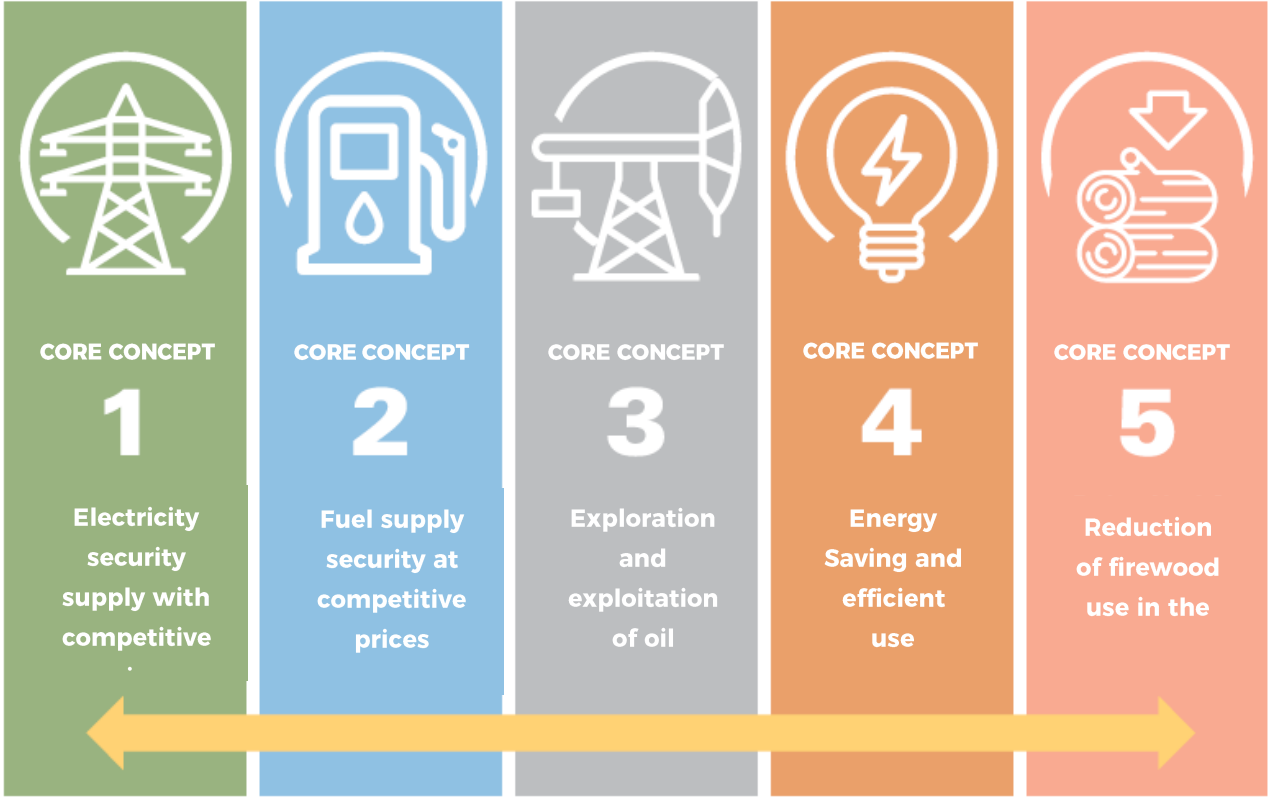
Government General Policy 2020-2024

Figure 2 shows the objectives and the goal formulated by the current Government General Policy regarding rural electrification in Guatemala, deducing the direct responsibility of the Ministry of Energy and Mines; the creation of this document provides the guidelines and roadmaps that will allow the fulfillment of this Government General Policy.

Energy Policy 2013-2027 and its updates

The expansion of electrical coverage at the national level is one of the "Operational Objectives" of the Energy Policy 2013-2027, where the implementation of a strategic plan for rural electrification is determined. For this reason, the Ministry of Energy and Mines, in compliance with the objective set out in the first operational axis of the Energy Policy 2013-2027 and in what its updates provide, has determined as a priority action the implementation of this Rural Electrification Policy.

Figure 7: Core Concepts of the Energy Policy 2013-2027.



Source: National Energy Plan, MEM.

Plan for National Development K'atun 2032

The K'atun 2032 National Development Plan proposes that energy is a fundamental factor for social development and the improvement of the population's living conditions; it favors overcoming poverty and increasing family income; it supports the development of social, productive, commercial, and agricultural activities. It also contributes to raising the quality of habitability, as it allows access to household electricity and the provision of various basic services, including access to water for human consumption (Secretariat of Planning and Programming of the Presidency, 2014).

In the Chapter "Natural Resources Today and for the Future", priorities, goals, results and guidelines are established that define the purposes of compliance on issues related to energy, in such a way that "Access to quality energy with national coverage" is established as a development priority. Therefore, the goal described by K'atun 2032 is to reach an index of 100% Energy Coverage in rural areas, for domestic use.

Organic Law of the National Electrification Institute -INDE-

The organic law of INDE, which was conceived by Decree No. 64-94 of the Congress of the Republic of Guatemala, establishes the autonomy of this state agency with the intention of restructuring the administrative, financial and political management of the institution, with the purpose of contributing as another entity in the field of electrification to the technical and rational development of all kinds of energy sources (Organic Law of the National Electrification Institute -INDE-, 1995).

Subsection a) of Article 4 of Decree No. 64-94 establishes that INDE may carry out all actions aimed at providing a prompt and efficient solution to the shortage of electric energy in the country and ensure that there is at all times energy available to satisfy the normal demand, to promote the development of new industries and the use of electricity in rural regions, in accordance with the policies defined by the State". Likewise, Article 24 of this law establishes that: "When INDE has a financial surplus, it will be obliged to invest it as a priority in rural areas, in accordance with the development plans established by the Ministry of Energy and Mines".

Sustainable Development Goals (SDGs)

Guatemala officially adopted the Sustainable Development Goals (SDGs) at the United Nations High Level meeting held in September 2015. This Agenda is focused on people, peace, planet, prosperity and a partnership for development.

Of the Sustainable Development Goals, the one related to the energy issue is SDG 7, which refers to Affordable and Sustainable Energy, which includes the target:

- ✓ **By 2030**, ensure universal access to affordable, reliable and modern energy services.

Figure 8: Sustainable Development Goals 7.



Source: Sustainable Development Goals, United Nations.



HISTORICAL CONTEXT

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2. Historical Context

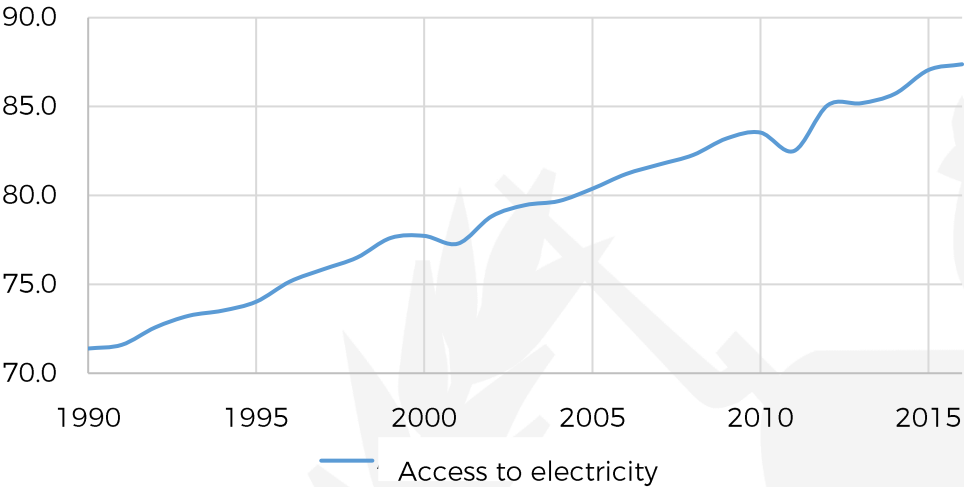
Since the opening of the electricity market, INDE's Rural Electrification Plan has achieved an electricity coverage rate of over 88.14%.

Currently, there are regions where coverage levels are still less than 50%, and there is an urgent need to implement programs and projects to improve electrification levels.

2.1. International Context

Since the early 1990s, there has been worldwide progress in increasing electrical coverage, but there is still a significant gap to be addressed. The development of distributed generation systems, as well as the reduction in the cost of solar panels and charging centers, would enable the accelerated construction of isolated systems.

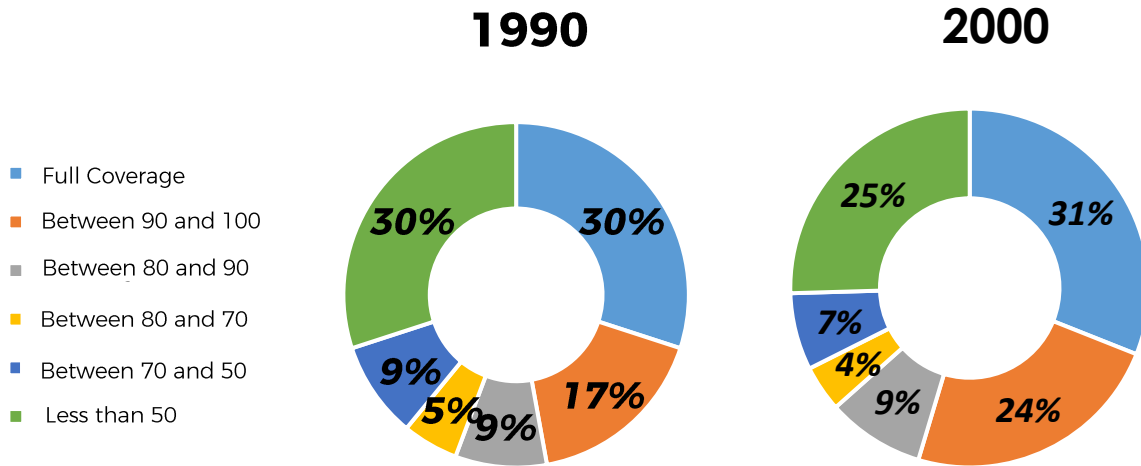
Graph 1: Worldwide access to electricity.



Source: World Bank.

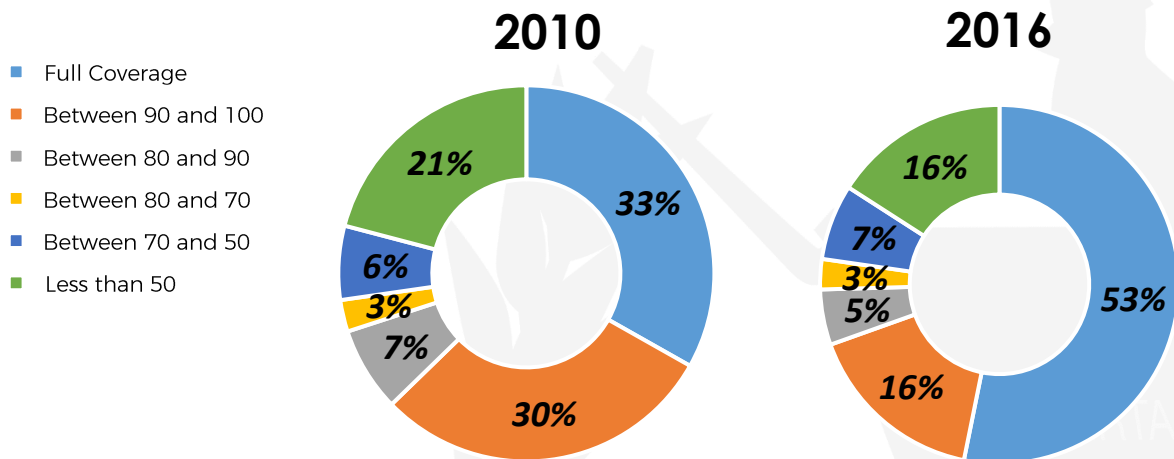
Of course, it is important to understand that everything is a process, and during the previous 28 years many countries have achieved complete coverage. The following shows the levels of electrical coverage with data from up to 220 countries.

Graph 2: Global distribution of electrical coverage, years 1990 and 2000.



Source: World Bank.

Graph 3: Global distribution of electrical coverage, years 2010 and 2016.



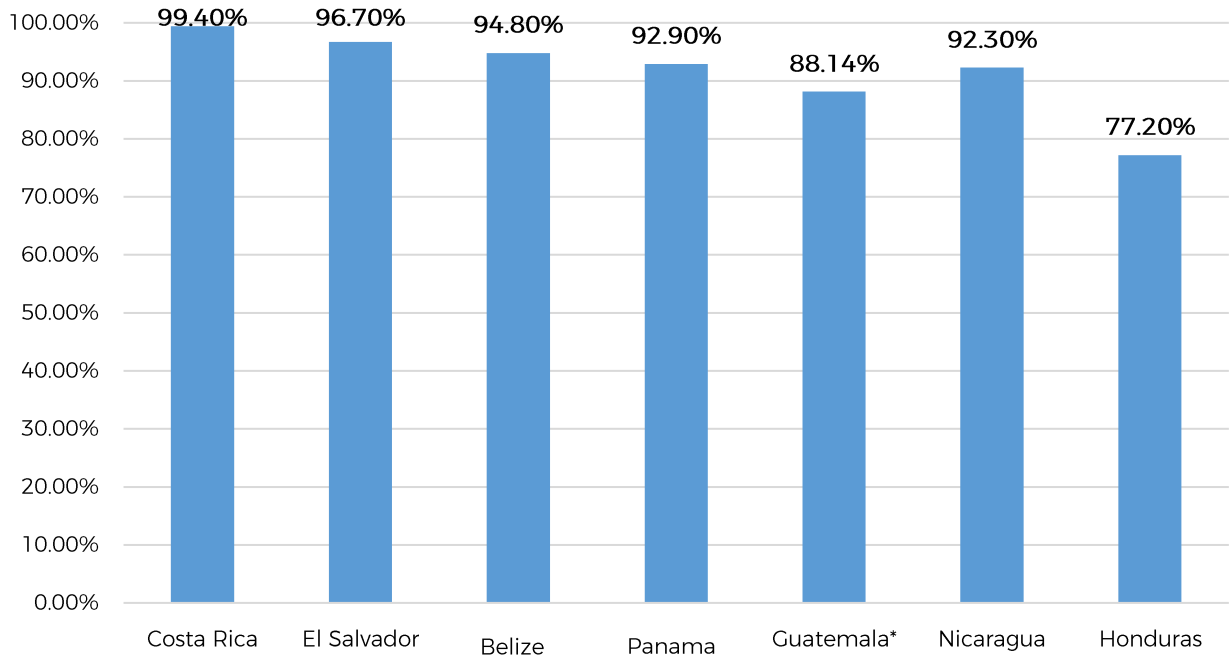
Source: World Bank.



2.2.Regional Context

The SICA region is one of the regions worldwide with the highest poverty conditions, and to this is added that currently in the SICA region there are approximately more than 5 million people who do not have electricity service.

Graph 4: Percentage of electricity coverage at the regional level for the year 2016.



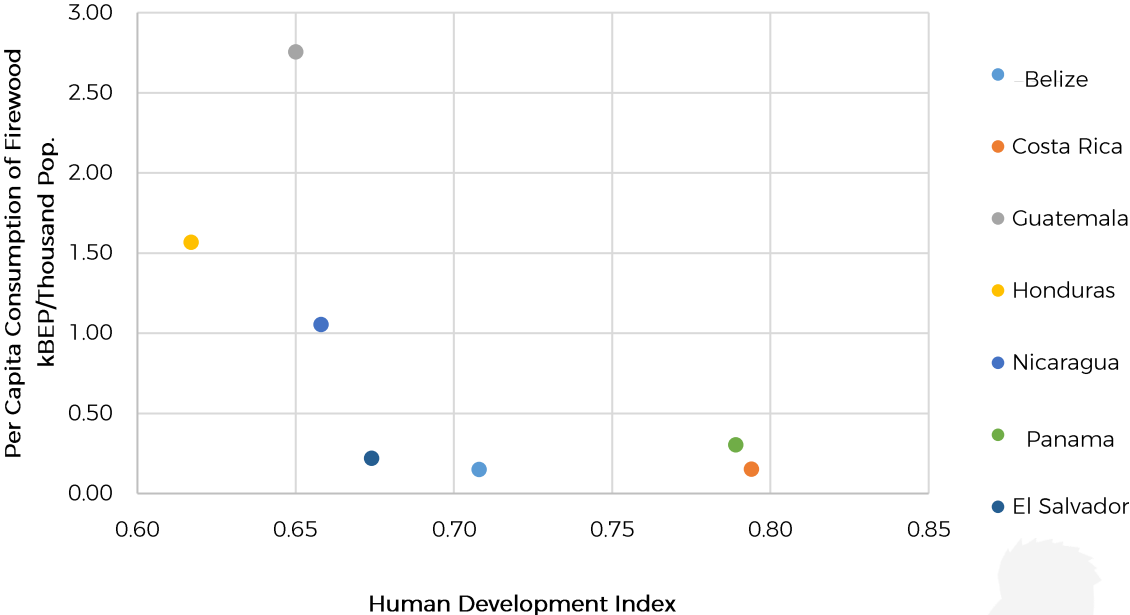
Source: Proprietary Production, Statistics of the Electric Subsector of the SICA Countries 2016.

*Guatemala: Electric coverage by 2018.

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The population that usually does not have electricity tends to use other energy sources as substitutes, both for generating heat in the home and for cooking their food. Proof of this is shown in the human development index and the estimated consumption of firewood in graph 5.

Graph 5: Per capita firewood consumption in bip/Thousand Inhabitants vs. Human Development Index for the year 2016.



Source: Proprietary Production, UNDP and Energy Balance 2016.

Countries that tend to have a lower human development index, tend to use renewable resources more inefficiently, a clear example being Guatemala, Honduras and Nicaragua, with Guatemala being the largest per capita consumer of firewood for residential use at a regional level.

This reflects the need to implement training programs that allow communities to use forest resources sustainably.

2.3.National Context

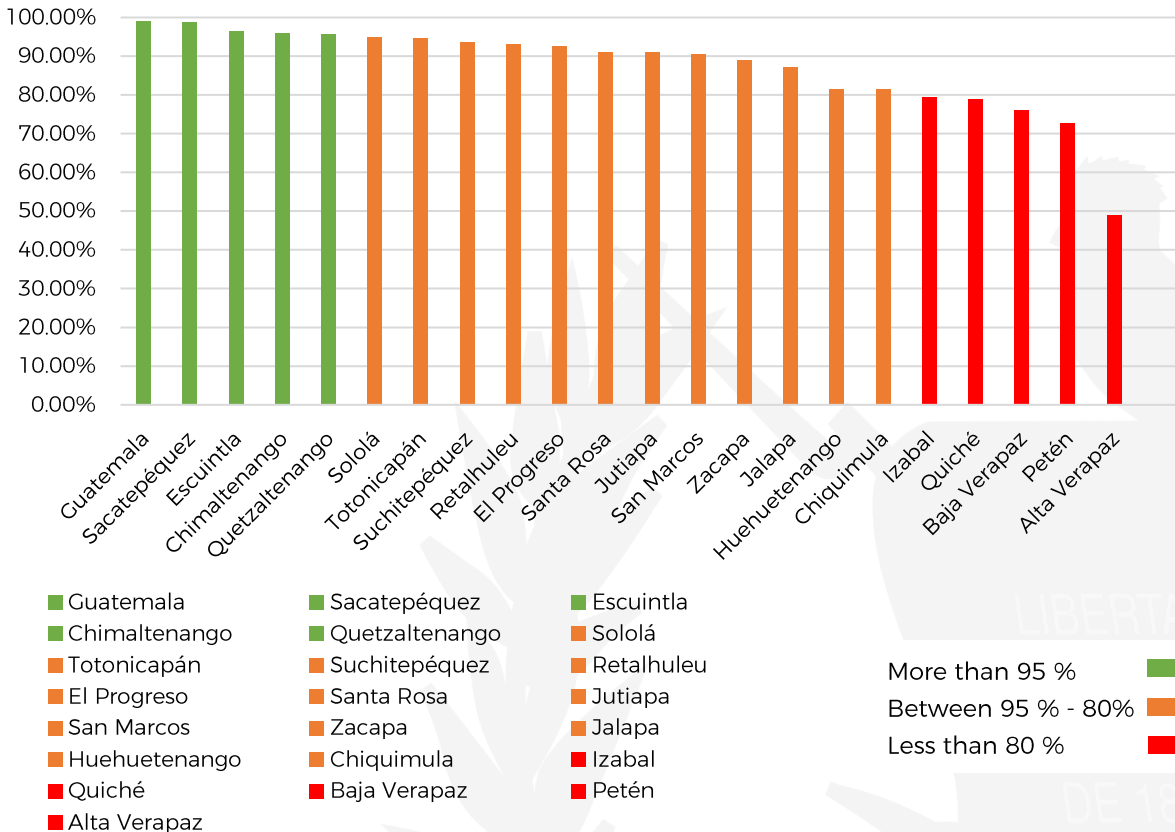
Below, a description of the current situation of the Rural Electrification Indexes is presented, as well as the portfolio of projects that are currently waiting to be financed for their execution.

2.3.1 National Electrical Coverage

Based on the information obtained through the 2018 National Census, Guatemala has reached 88.14% of electrical coverage within the national territory. Currently, there are still five departments that present electrical coverage indices below 80%, as shown in graph 6.

Graph 6 shows the electrical coverage by department, constituting the areas that need to be electrified in the country.

Graph 6: Electrical coverage by department.



Source: Proprietary Production, 2018 National Census.

Guatemala has 340 municipalities, and the following tables present the electrical coverage indexes for the year 2018 for each municipality, according to the 2018 National Census.

Table 1: Electrical coverage of municipalities in Alta Verapaz.

ALTA VERAPAZ		
No.	Municipality	Electrical coverage
1	Tactic	82.04%
2	Santa Cruz Verapaz	81.91%
3	San Cristóbal Verapaz	75.71%
4	Chisec	59.34%
5	Santa Catalina La Tinta	59.06%
6	Tamahú	58.24%
7	Cobán	57.74%
8	Raxruhá	55.72%
9	San Juan Chamelco	53.33%
10	San Miguel Tucurú	49.27%
11	Fray Bartolomé de Las Casas	44.80%
12	Panzós	40.19%
13	San Pedro Carchá	38.90%
14	Chahal	30.54%
15	Santa María Cahabón	24.04%
16	San Agustín Lanquín	23.04%
17	Senahú	22.86%

Source: Proprietary Production, National Census 2018.

Table 2: Electrical coverage of municipalities in Baja Verapaz.

BAJA VERAPAZ		
No.	Municipality	Electrical coverage
1	Santa Cruz El Chol	90.25%
2	Salamá	89.94%
3	San Jerónimo	88.19%
4	Rabinal	86.25%
5	Granados	85.65%
6	San Miguel Chicaj	83.77%
7	Cubulco	67.90%
8	Purulhá	38.52%

Source: Proprietary Production, National Census 2018.

Table 3: Electrical coverage of municipalities in Chimaltenango.

CHIMALTENANGO		
No.	Municipality	Electrical coverage
1	El Tejar	99.00%
2	Chimaltenango	98.51%
3	Zaragoza	98.06%
4	Patzicía	97.96%
5	Parramos	97.57%
6	San Andrés Itzapa	96.79%
7	Patzún	95.97%
8	Santa Apolonia	95.80%
9	San Juan Comalapa	95.59%
10	Tecpán Guatemala	95.52%
11	San Pedro Yepocapa	95.45%
12	Santa Cruz Balanyá	94.35%
13	San José Poaquil	94.22%
14	Acatenango	93.70%
15	San Martín Jilotepeque	92.52%
16	San Miguel Pochuta	81.96%

Source: Proprietary Production, National Census 2018.

Table 4: Electrical coverage of municipalities in Chiquimula.

CHIQUIMULA		
No.	Municipality	Electrical coverage
1	Ipala	95.09%
2	Concepción Las Minas	93.91%
3	Chiquimula	92.02%
4	San José La Arada	91.53%
5	Quezaltepeque	89.38%
6	San Jacinto	88.73%
7	Esquipulas	85.02%
8	Olopa	80.96%
9	San Juan Ermita	78.84%
10	Camotán	62.98%
11	Jocotán	56.02%

Source: Proprietary Production, National Census 2018.

Table 5: Electrical coverage of municipalities in El Progreso.

EL PROGRESO		
No.	Municipality	Electrical coverage
1	Cuastatoya	97.50%
2	Sanarate	96.04%
3	Sansare	93.84%
4	El Jícaro	93.51%
5	San Antonio La Paz	92.53%
6	Morazán	92.28%
7	San Cristóbal Acasaguastlán	90.63%
8	San Agustín Acasaguastlán	85.90%

Source: Proprietary Production, National Census 2018.

Table 6: Electrical coverage of municipalities in Escuintla.

ESCUINTLA		
No.	Municipality	Electrical coverage
1	Palín	98.89%
2	Escuintla	97.73%
3	San José	97.64%
4	Tiquisate	97.52%
5	Santa Lucía Cotzumalguapa	96.88%
6	Iztapa	96.32%
7	Nueva Concepción	96.20%
8	Siquinalá	95.82%
9	La Democracia	95.52%
10	La Gomera	95.28%
11	Masagua	94.30%
12	Sipacate	94.07%
13	San Vicente Pacaya	93.03%
14	Guanagazapa	81.98%

Source: Proprietary Production, National Census 2018.

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Table 7: Electrical coverage of municipalities in Guatemala.

GUATEMALA		
No.	Municipality	Electrical coverage
1	San Miguel Petapa	99.57%
2	Villa Nueva	99.45%
3	Guatemala	99.45%
4	Mixco	99.42%
5	Santa Catarina Pinula	99.18%
6	Amatitlán	98.80%
7	San Pedro Sacatepéquez	98.80%
8	San José Pinula	98.72%
9	Chinautla	98.47%
10	San Juan Sacatepéquez	98.28%
11	Fraijanes	98.21%
12	San Raymundo	98.04%
13	San Pedro Ayampuc	97.74%
14	Villa Canales	97.07%
15	San José del Golfo	96.96%
16	Palencia	95.75%
17	Churranchito	95.54%

Source: Proprietary Production, Electrical coverage.

Table 8: Electrical coverage of municipalities in Huehuetenango.

HUEHUETENANGO		
No.	Municipality	Electrical coverage
1	Huehuetenango	98.71%
2	Jacaltenango	92.80%
3	Unión Cantinil	92.36%
4	Santa Ana Huista	91.38%
5	Santiago Chimaltenango	88.77%
6	San Pedro Soloma	88.61%
7	San Rafael La Independencia	87.79%
8	Petatán	87.14%
9	La Democracia	86.88%
10	Malacatancito	86.15%
11	San Antonio Huista	86.04%
12	Todos Santos Cuchumatán	85.53%
13	Concepción Huista	85.35%

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14	San Sebastián Coatlán	84.61%
15	Aguacatlán	83.53%
16	San Juan Atitán	82.82%
17	Tectitán	82.23%
18	La Libertad	81.98%
19	San Pedro Necta	81.89%
20	Chiantla	81.09%
21	Cuilco	81.00%
22	San Rafael Petzal	76.95%
23	Colotenango	75.72%
24	San Sebastián Huehuetenango	75.49%
25	San Miguel Acatán	74.71%
26	San Mateo Ixtatán	74.05%
27	Santa Eulalia	72.29%
28	San Ildefonso Ixtahuacán	70.57%
29	San Juan Ixcoy	70.41%
30	Santa Bárbara	69.76%
31	Nentón	68.94%
32	Santa Cruz Barillas	63.62%
33	San Gaspar Ixchil	44.31%

Source: Proprietary Production, National Census 2018.

Table 9: Electrical coverage of municipalities in Izabal.

IZABAL		
No.	Municipality	Electrical coverage
1	Puerto Barrios	95.98%
2	Morales	85.96%
3	Los Amates	83.93%
4	Livingston	63.93%
5	El Estor	49.73%

Source: Proprietary Production, National Census 2018.

Table 10: Electrical coverage of municipalities in Jalapa.

JALAPA		
No.	Municipality	Electrical coverage
1	San Luis Jilotepeque	92.07%
2	Monjas	91.23%
3	Jalapa	90.18%

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4	San Manuel Chaparrón	89.25%
5	Mataquescuintla	89.18%
6	San Carlos Alzatate	84.54%
7	San Pedro Pinula	72.12%

Source: Proprietary Production, National Census 2018.

Table 11: Electrical coverage of municipalities in Jutiapa.

JUTIAPA		
No.	Municipality	Electrical coverage
1	El Progreso	97.36%
2	Asunción Mita	96.45%
3	Agua Blanca	96.23%
4	Santa Catarina Mita	96.00%
5	Atescatempa	94.98%
6	San José Acatempa	94.94%
7	Quesada	94.14%
8	Jutiapa	92.64%
9	Jerez	92.02%
10	Jalpatagua	90.93%
11	Yupiltepeque	89.42%
12	El Adelanto	87.65%
13	Zapotitlán	84.23%
14	Moyuta	83.54%
15	Comapa	83.26%
16	Pasaco	80.49%
17	Conguaco	66.75%

Source: Proprietary Production, National Census 2018.

Table 12: Electrical coverage of municipalities in Petén.

PETÉN		
No.	Municipality	Electrical coverage
1	San Benito	90.80%
2	Flores	89.06%
3	La Libertad	80.00%
4	Melchor de Mencos	76.67%
5	Las Cruces	75.78%

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6	Santa Ana	74.04%
7	San José	73.45%
8	San Francisco	73.21%
9	Sayaxché	68.54%
10	Poptún	67.40%
11	San Luis	64.67%
12	El Chal	62.96%
13	Dolores	61.67%
14	San Andrés	44.99%

Source: Proprietary Production, National Census 2018.

Table 13: Electrical coverage of municipalities in Quetzaltenango.

QUETZALTENANGO		
No.	Municipality	Electrical coverage
1	San Mateo	99.06%
2	Almolonga	98.94%
3	Zunil	98.86%
4	La Esperanza	98.82%
5	Quetzaltenango	98.62%
6	Concepción Chiquirichapa	98.42%
7	Salcajá	98.36%
8	San Juan Olintepeque	97.54%
9	Sibilia	97.48%
10	Cantel	95.86%
11	San Juan Ostuncalco	95.58%
12	Cajolá	95.43%
13	San Carlos Sija	95.28%
14	El Palmar	94.93%
15	San Martín Sacatepéquez	94.89%
16	Coatepeque	94.59%
17	San Francisco La Unión	94.4926%
18	San Miguel Siguilá	94.16%
19	Palestina de Los Altos	94.01%
20	Flores Costa Cuca	93.21%
21	Colomba Costa Cuca	92.96%
22	Cabricán	90.37%

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23	Génova	88.09%
24	Huitán	83.40%

Source: Proprietary Production, National Census 2018.

Table 14: Electrical coverage of municipalities in Quiché.

QUICHÉ		
No.	Municipality	Electrical coverage
1	Patzité	96.15%
2	Santo Tomás Chichicastenango	95.54%
3	San Antonio Ilotenango	95.24%
4	Pachalum	93.25%
5	Santa Cruz del Quiché	90.29%
6	Cunén	87.06%
7	San Pedro Jocopilas	86.58%
8	Chiché	85.91%
9	Joyabaj	85.06%
10	Chinique	83.84%
11	Zacualpa	82.75%
12	Sacapulas	82.46%
13	Playa Grande Ixcán	80.67%
14	Santa María Nebaj	77.86%
15	San Juan Cotzal	71.63%
16	San Andrés Sajcabajá	71.16%
17	Canillá	69.62%
18	San Bartolomé Jocotenango	59.54%
19	Chajul	56.10%
20	Chicamán	50.70%
21	San Miguel Uspantán	45.30%

Source: Proprietary Production, National Census 2018.

Table 15: Electrical coverage of municipalities in Retalhuleu.

RETALHULEU		
No.	Municipality	Electrical coverage
1	San Felipe	96.94%
2	San Sebastián	96.66%
3	San Martín Zapotitlán	95.20%
4	Retalhuleu	94.20%

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5	San Andrés Villa Seca	92.41%
6	Santa Cruz Muluá	92.28%
7	Champerico	91.92%
8	El Asintal	91.06%
9	Nuevo San Carlos	88.7881%

Source: Proprietary Production, National Census 2018.

Table 16: Electrical coverage of municipalities in Sacatepéquez.

SACATEPÉQUEZ		
No.	Municipality	Electrical coverage
1	Santa Lucía Milpas Altas	99.48%
2	San Lucas Sacatepéquez	99.37%
3	Ciudad Vieja	99.26%
4	Jocotenango	99.17%
5	Antigua Guatemala	99.11%
6	Santiago Sacatepéquez	99.04%
7	San Bartolomé Milpas Altas	98.96%
8	Magdalena Milpas Altas	98.92%
9	Pastores	98.82%
10	Santo Domingo Xenacoj	98.66%
11	Santa María de Jesús	98.63%
12	Sumpango	98.47%
13	San Antonio Aguas Calientes	98.46%
14	San Miguel Dueñas	98.44%
15	Santa Catarina Barahona	98.17%
16	San Juan Alotenango	96.97%

Source: Proprietary Production, Ministry of Energy and Mines

Table 17: Electrical coverage of municipalities in San Marcos.

SAN MARCOS		
No.	Municipality	Electrical coverage
1	Ocós	98.28%
2	Ayutla	98.01%
3	San Marcos	97.42%
4	San Pedro Sacatepéquez	97.37%
5	San Rafael Pie de la Cuesta	96.35%

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6	Esquipulas Palo Gordo	96.27%
7	San José el Rodeo	95.91%
8	Catarina	95.08%
9	San Pablo	94.75%
10	Malacatán	94.63%
11	Río Blanco	94.39%
12	San Cristóbal Cucho	94.30%
13	Pajapita	93.75%
14	San Antonio Sacatepéquez	93.39%
15	San José Ojetenam	93.11%
16	El Quetzal	92.74%
17	El Tumbador	91.41%
18	Tacaná	91.22%
19	San Lorenzo	91.10%
20	Nuevo Progreso	90.97%
21	La Blanca	90.75%
22	Tejutla	90.60%
23	Ixchiguán	90.29%
24	La Reforma	89.34%
25	Tajumulco	85.02%
26	San Miguel Ixtahuacán	84.31%
27	Sibinal	78.36%
28	Comitancillo	75.81%
29	Concepción Tutuapa	71.63%
30	Sipacapa	68.36%

Source: Proprietary Production, National Census 2018.

Table 18: Electrical coverage of municipalities in Santa Rosa.

SANTA ROSA		
No.	Municipality	Electrical coverage
1	Barberena	95.64%
2	Nueva Santa Rosa	94.20%
3	Cuilapa	94.17%
4	Santa Rosa de Lima	93.99%
5	Santa Cruz Naranjo	93.46%

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6	Casillas	92.26%
7	Guazacapán	91.58%
8	Chiquimulilla	89.34%
9	Santa María Ixhuatán	88.19%
10	Taxisco	87.82%
11	San Rafael Las Flores	86.69%
12	Oratorio	85.93%
13	Pueblo Nuevo Viñas	85.44%
14	San Juan Tecuaco	80.68%

Source: Proprietary Production, National Census 2018.

Table 19: Electrical coverage of municipalities in Sololá.

SOLOLÁ		
No.	Municipality	Electrical coverage
1	Panajachel	99.02%
2	San Pedro La Laguna	98.59%
3	Santa María Visitación	97.99%
4	San Marcos La Laguna	97.98%
5	Santiago Atitlán	97.59%
6	San Andrés Semetabaj	97.54%
7	Santa Lucía Utatlán	97.44%
8	Concepción	97.14%
9	Sololá	97.06%
10	Santa Clara La Laguna	96.68%
11	San Juan La Laguna	96.39%
12	San Lucas Tolimán	96.20%
13	San José Chacayá	95.97%
14	San Pablo La Laguna	95.72%
15	San Antonio Palopó	95.31%
16	Santa Cruz La Laguna	93.55%
17	Santa Catarina Palopó	93.11%
18	Santa Catarina Ixtahuacán	90.31%
19	Nahualá	90.02%

Source: Proprietary Production, National Census 2018.

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Table 20: Electrical coverage of municipalities in Suchitepéquez.

SUCHITEPÉQUEZ		
No.	Municipality	Electrical coverage
1	Zunilito	97.89%
2	Mazatenango	97.50%
3	Samayac	96.45%
4	Pueblo Nuevo	96.44%
5	San Francisco Zapotitlán	96.14%
6	Santo Tomas La Unión	95.56%
7	San Gabriel	95.56%
8	San Pablo Jocopilas	95.39%
9	San José El Ídolo	94.49%
10	Cuyotenango	94.42%
11	San Antonio Suchitepéquez	93.45%
12	San José La Máquina	93.30%
13	Patulul	92.95%
14	San Bernardino	92.53%
15	Santo Domingo Suchitepéquez	92.00%
16	San Miguel Panán	91.85%
17	Río Bravo	90.94%
18	Santa Bárbara	90.44%
19	Chicacao	89.34%
20	San Lorenzo	88.38%
21	San Juan Bautista	87.55%

Source: Proprietary Production, National Census 2018.

Table 21: Electrical coverage of municipalities in Totonicapán.

TOTONICAPÁN		
No.	Municipality	Electrical coverage
1	Totonicapán	97.98%
2	San Andrés Xecul	97.35%
3	San Francisco El Alto	96.60%
4	San Cristóbal Totonicapán	96.18%
5	Momostenango	94.01%

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6	San Bartolo Aguas Calientes	90.43%
7	Santa Lucía La Reforma	86.61%
8	Santa María Chiquimula	85.35%

Source: Proprietary Production, National Census 2018.

Table 22: Electrical coverage of municipalities in Totonicapán.

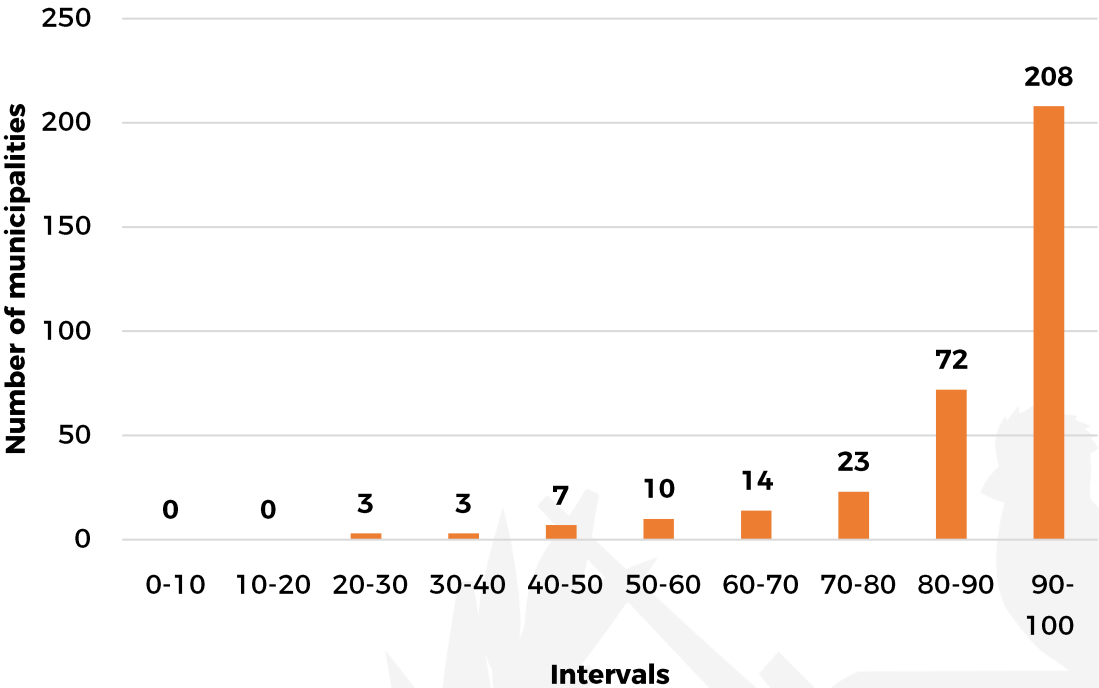
ZACAPA		
No.	Municipality	Electrical coverage
1	Estanzuela	98.41%
2	Teculután	96.52%
3	Río Hondo	95.41%
4	San Jorge	93.70%
5	Usumatlán	92.50%
6	Cabañas	91.25%
7	Zacapa	90.99%
8	San Diego	90.21%
9	Huité	87.65%
10	Gualán	86.25%
11	La Unión	70.04%

Source: Proprietary Production, National Census 2018.



Based on the frequency distribution shown in graph 7, it is detailed that there are no municipalities with a coverage index below 20%. Between the intervals of 20-30%, 30-40%, and 40-50%, there are 13 municipalities grouped together, while within the 50-60% interval, there are 10 municipalities. Between the 60-70%, 70-80%, and 80-90% intervals, there are 14, 23, and 72 municipalities, respectively. The interval of 90-100% contains the highest number, with 208 municipalities.

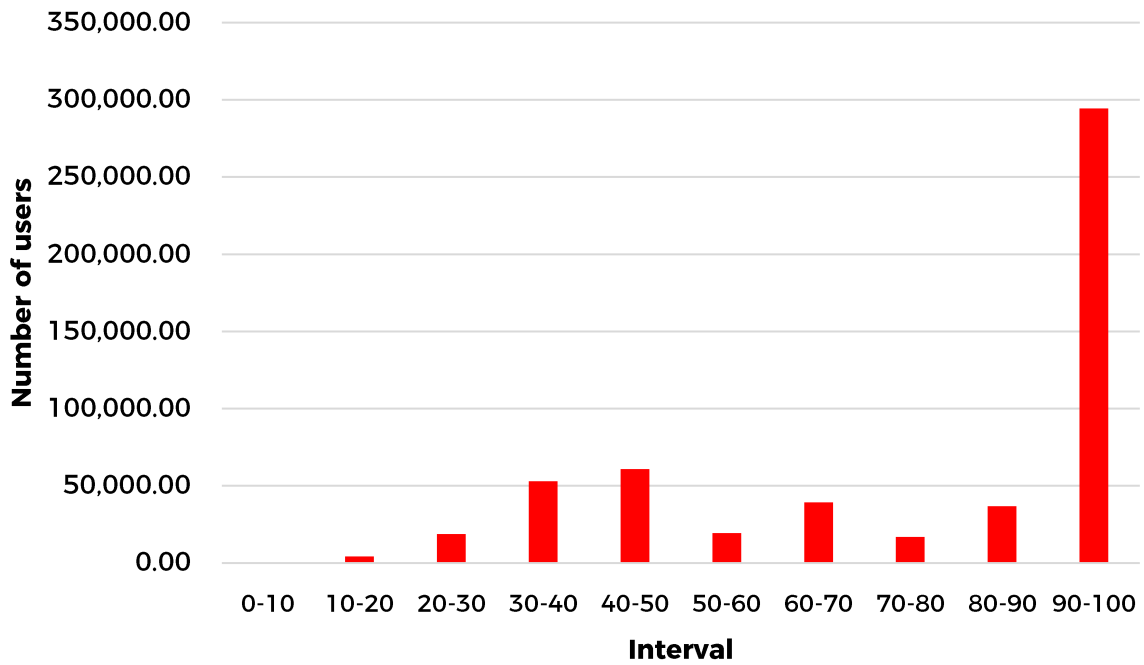
Graph 7: Distribution of municipalities over coverage index intervals.



Source: Proprietary Production, National Census 2018.

However, the distribution of users without electrical service is illustrated in graph 8. Users without electrical coverage are distributed according to the coverage index. Between the intervals of 20-30%, 30-40%, and 40-50%, 24.39% of the users are grouped, while within the 50-60% interval, only 3.59% are found. Between the 60-70%, 70-80%, and 80-90% intervals, 7.24%, 3.12%, and 6.75% of the users without electrical coverage are located, respectively. The interval of 90-100% contains the largest share, comprising 54.10% of the users. 46% of the users without electrical service are in municipalities with a coverage index below 90%, while the remaining users are in municipalities with an index above 90%.

Graph 8: Distribution of users without coverage over coverage index intervals.



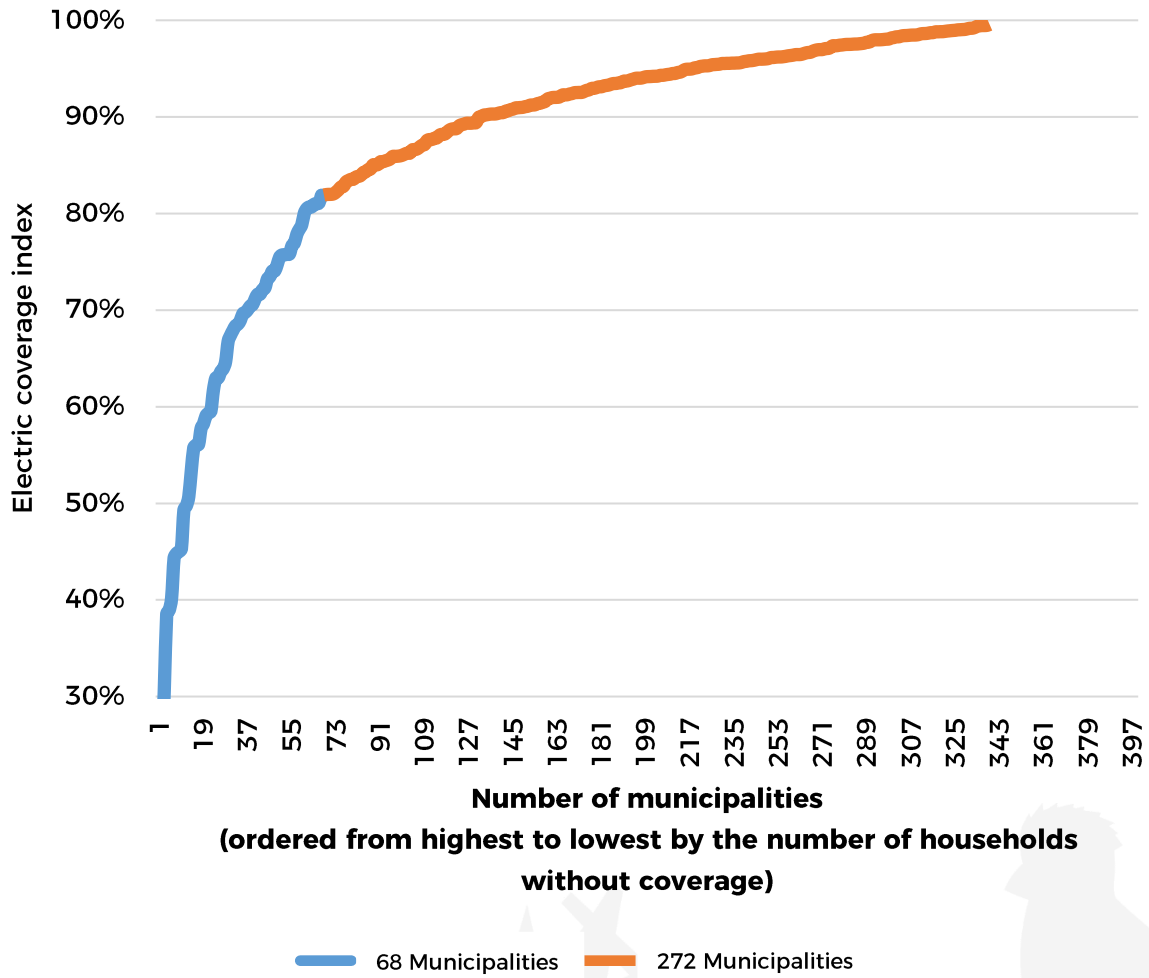
Source: Proprietary Production, Ministry of Energy and Mines.

This has an important implication, given that by electrifying 20% of the municipalities, prioritized by density of users without electricity supply, the electricity coverage index can be increased by approximately 7%. Graph 9 gives a visual representation of the above.

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Graph 9: Variation of the electrical coverage index.



Source: Proprietary Production, National Census 2018.

2.3.2 Project portfolio

The National Institute of Electrification and the Ministry of Energy and Mines have identified approximately 4,300 electrification projects that are still pending to be addressed. These projects make up the investment portfolio of the INDE. These projects directly benefit approximately 229,000 households across the Republic of Guatemala, which represents an estimated 1.3 million Guatemalans.

Table 23: Distribution of currently identified projects.

DEPARTMENT	Pending Households to be Electrified	Average Households per Project	Number of Projects
Alta Verapaz	47,448	64	748
Baja Verapaz	10,956	56	198
Chimaltenango	1,899	39	50
Chiquimula	11,856	47	253
El progreso	1,625	49	34
Escuintla	4,060	53	76
Guatemala	1,391	58	24
Huehuetenango	35,675	51	698
Izabal	13,542	50	272
Jalapa	3,482	37	97
Jutiapa	5,264	47	112
Peten	25,072	59	426
Quetzaltenango	2,465	43	58
Quiche	32,411	47	690
Retalhuleu	3,464	61	57
Sacatepéquez	204	34	6
San marcos	13,244	54	249
Santa rosa	3,616	40	90
Sololá	856	33	26
Suchitepéquez	2,164	37	58
Totonicapán	2,575	143	18
Zacapa	6,330	52	121
Total	229,599		4,361

Source: Proprietary Production, National Electrification Institute.



These projects belong to 251 municipalities. The 20 municipalities with the largest number of identified projects are shown below.

Table 24: Twenty municipalities with the highest number of identified households.

MUNICIPALITY	Estimated Households	Households Average per Project	Number of Projects
San Pedro Carcha	11,124	72	155
Uspantan	9,558	64	149
Cobán	7,410	54	137
Senahu	6,553	80	82
Barillas	6,490	49	133
Purulha	5,242	55	95
Ixcán	5,233	49	108
Sayaxché	4,906	55	89
La libertad	4,487	68	66
Cahabón	4,202	48	88
Joyabaj	4,019	71	57
San Mateo Ixtatán	3,870	72	55
Esquipulas	3,828	39	99
El estor	3,778	48	78
Cubulco	3,629	70	52
Poptun	3,437	58	59
Chisec	3,231	65	50
Fray Bartolomé de las Casas	3,161	96	33
Gualan	2,982	58	51
Dolores	2,948	47	63

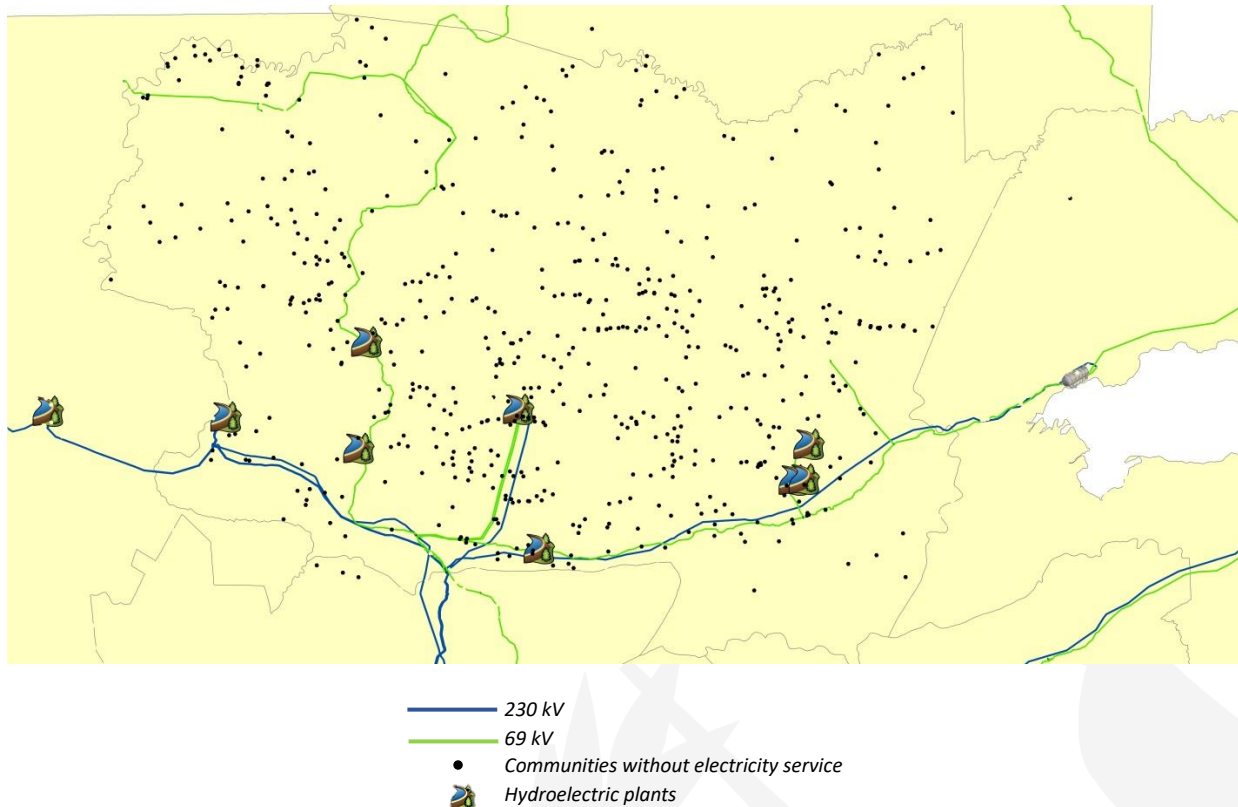
Source: Proprietary Production, National Electrification Institute.

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2.3.3 Geographical Location of the Project Portfolio

A clearer way to visualize the communities that still lack electricity is through georeferencing. Therefore, the following are the departments that have less than 80% electrical coverage.

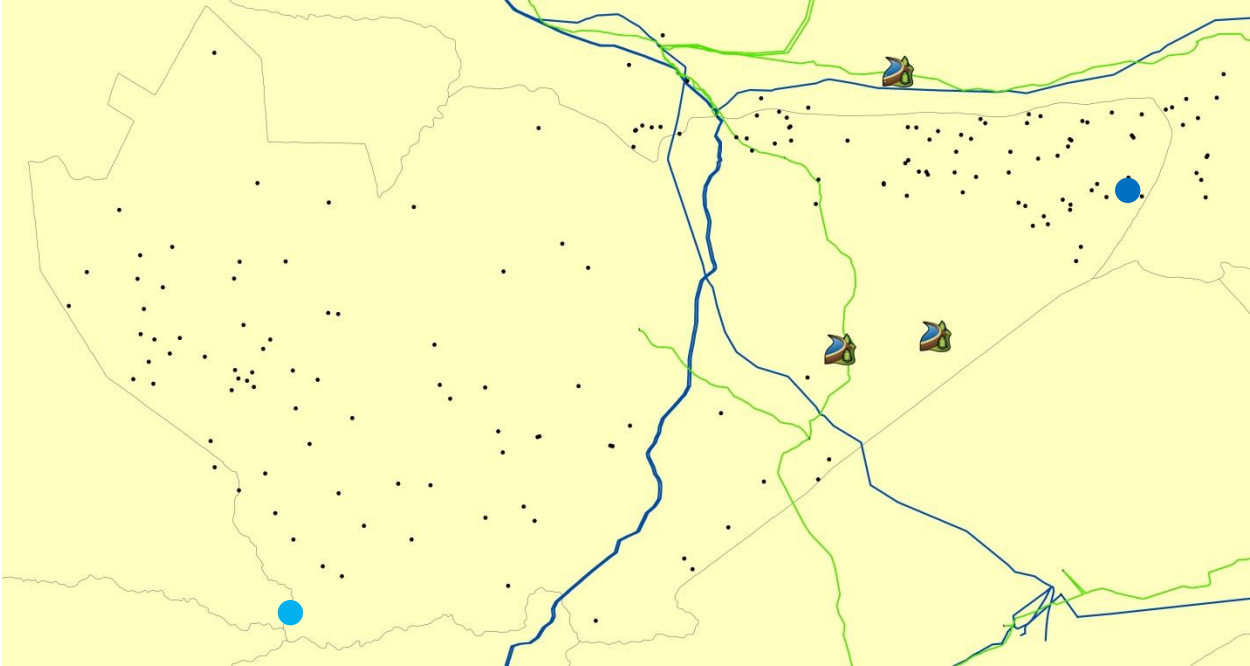
Figure 9: Communities without electric coverage, department of Alta Verapaz.



Source: Proprietary Production, CNEE and INDE.

This department has the lowest electrical coverage index, reaching 48.92%. In this department, there is the highest number of identified households, totaling 47,448, spread across 748 projects. The municipality of Senahú has the lowest electrification index, reaching 22.86%.

Figure 10: Communities without electric coverage, department of Baja Verapaz.

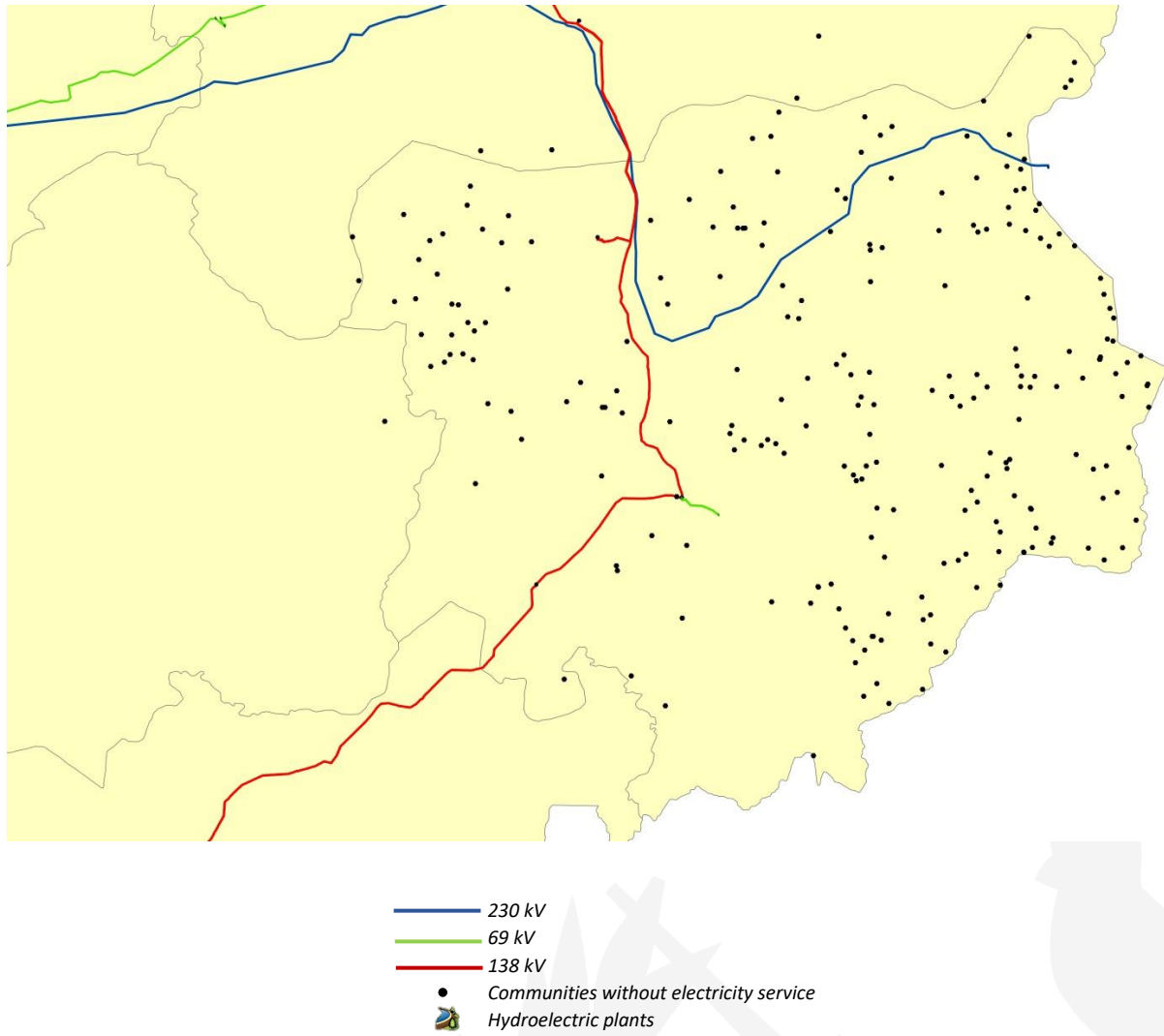


- 230 kV
- 69 kV
- Communities without electricity service
- 🏠 Hydroelectric plants
- San Luis 2 Hydroelectric Plant
- Sac-já 2 Hydroelectric Plant

Source: Proprietary Production, CNEE and INDE.

This department has an electrical coverage index reaching 82.53%. There are 10,956 households identified by INDE in this department, spread across 198 projects. The municipality of Purulhá has the lowest electrification index, reaching 38.52%.

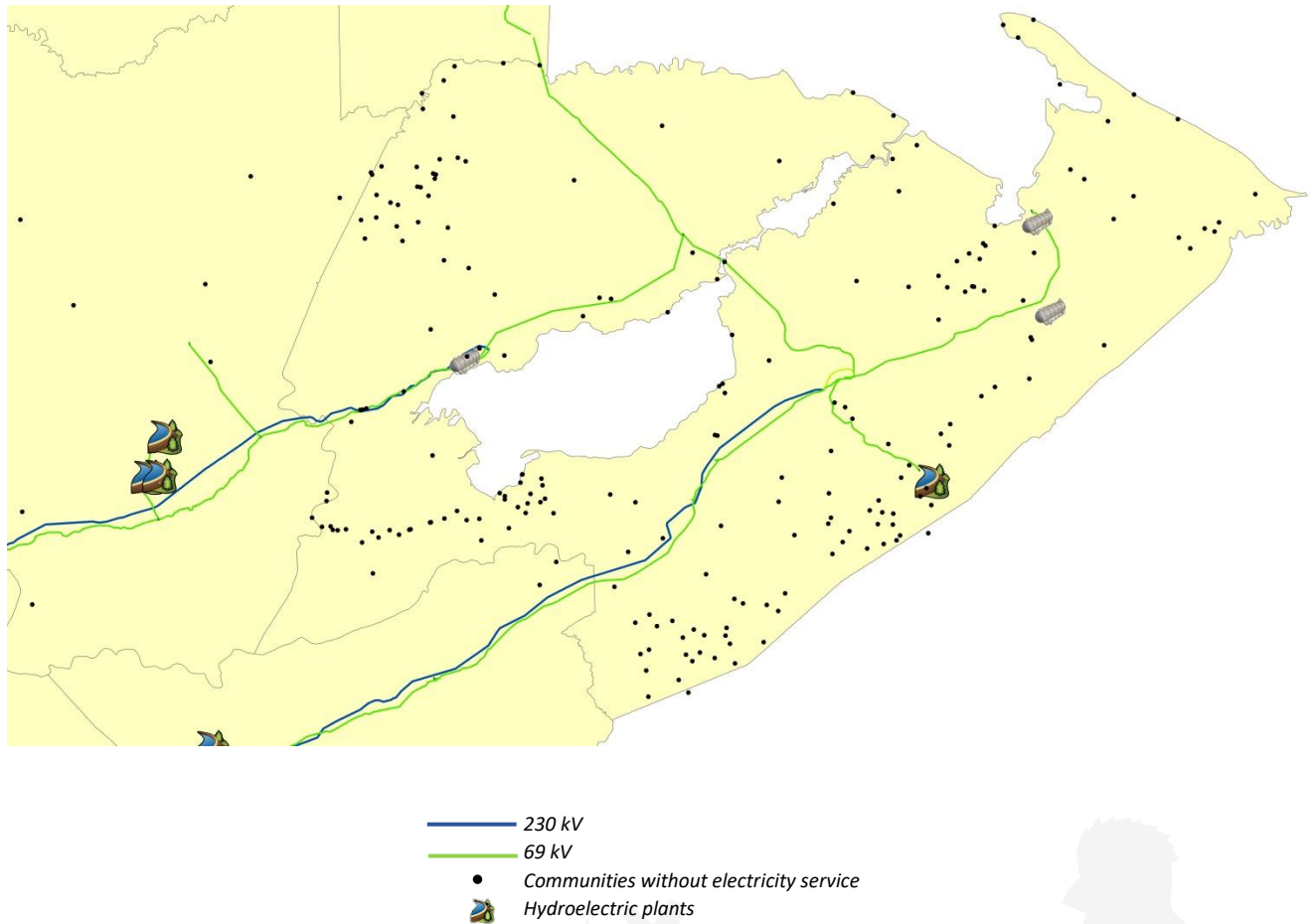
Figure 11: Communities without electric coverage, department of Chiquimula.



Source: Proprietary Production, CNEE and INDE.

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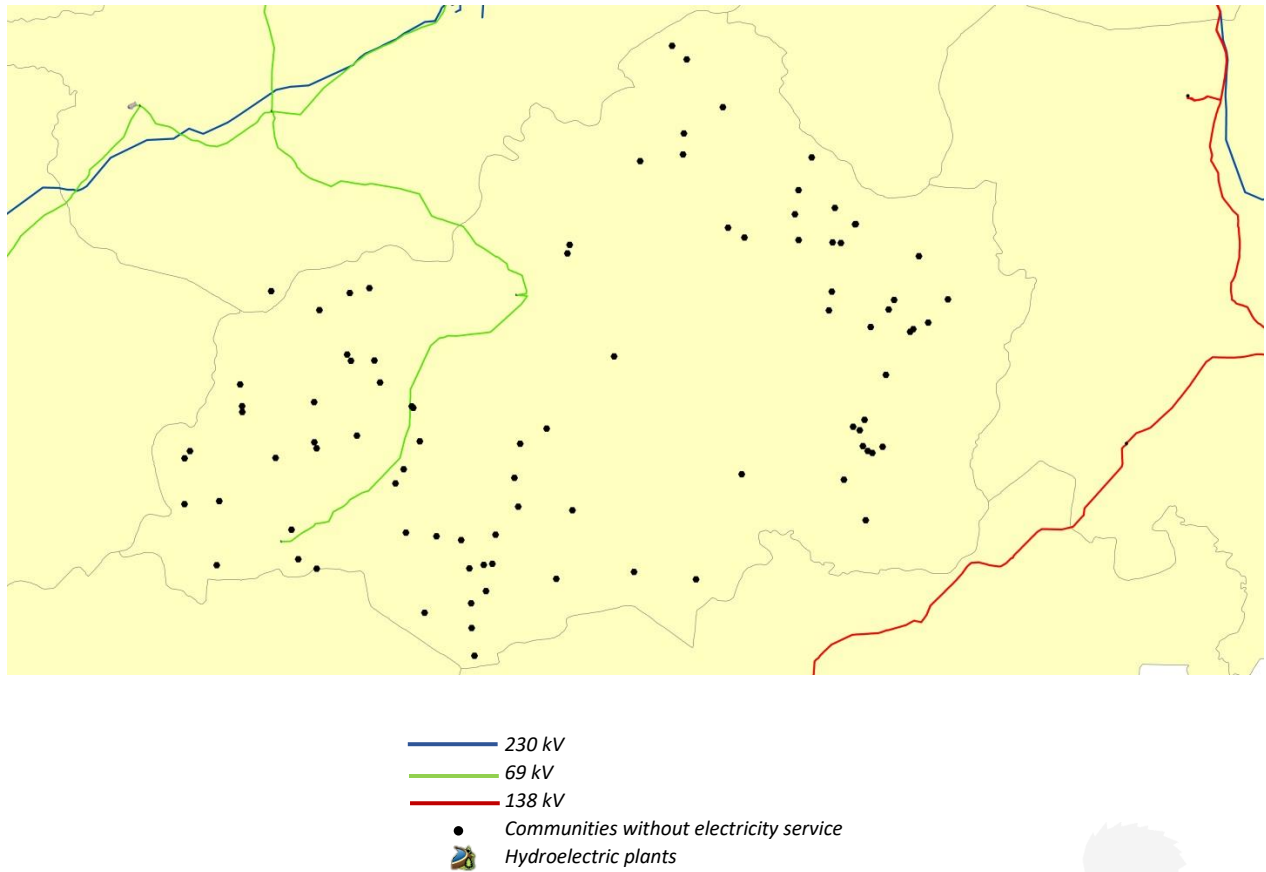
Figure 12: Communities without electric coverage, department of Izabal.



Source: Proprietary Production, CNEE and INDE.

This department has an electrical coverage index of 79.48%. The lowest coverage index in the department is highlighted in the municipality of El Estor with 49.74%. According to INDE, there are 13,542 households pending electrification.

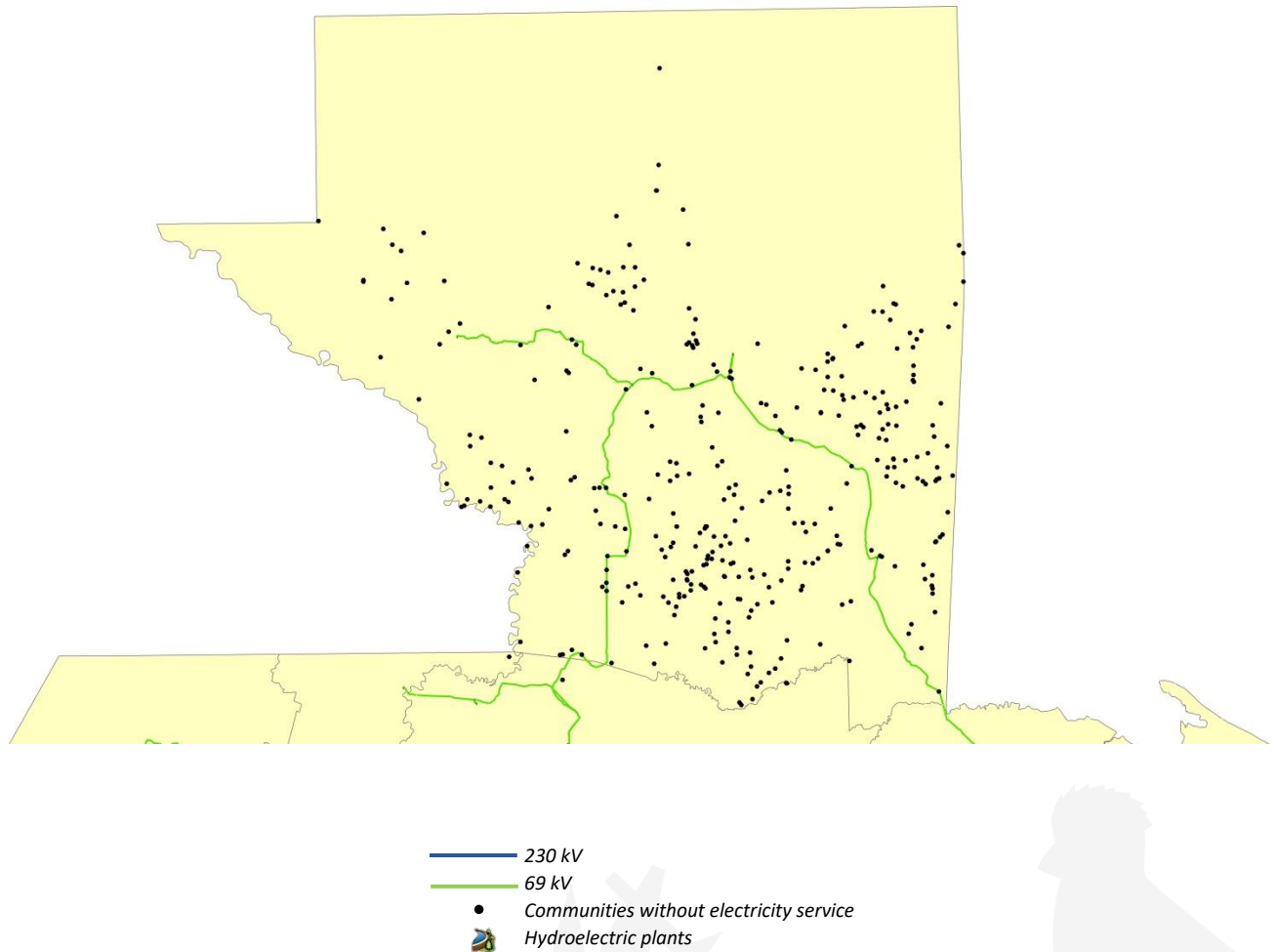
Figure 13: Communities without electric coverage, department of Jalapa.



Source: Proprietary Production, CNEE and INDE.

Jalapa has an electrical coverage index of 87.03%, however, the municipality of San Pedro Pinula has a coverage index of 72.13%. INDE has identified 3,482 users pending electrification.

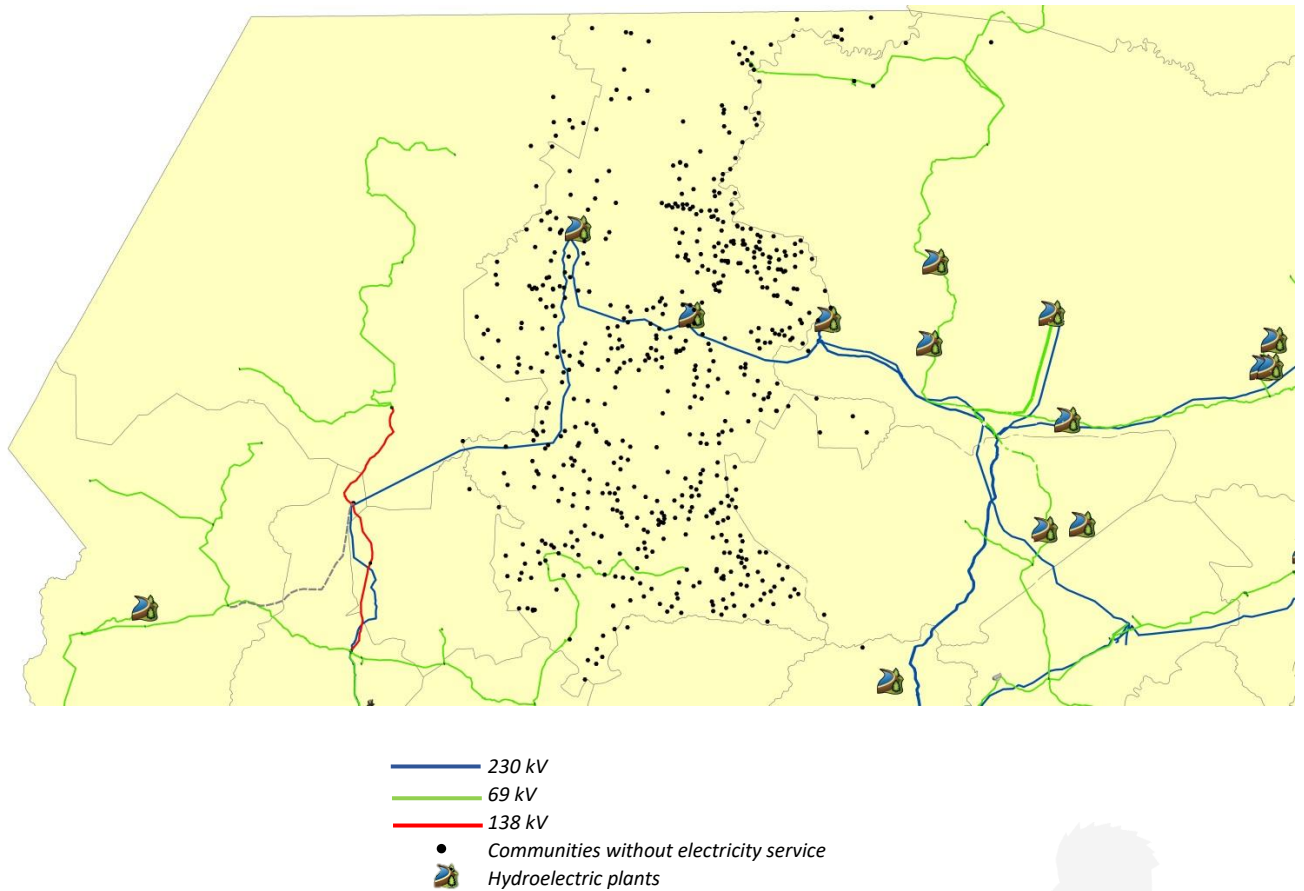
Figure 14: Communities without electric coverage, department of Petén.



Source: Proprietary Production, CNEE and INDE.

This is one of the departments with coverage rates below 80%, being the second lowest with 72.59% for the year 2018. At least 6 out of 14 municipalities have an electrical coverage index of 70% or lower. Currently, INDE has identified 25,072 households pending electrification in this department.

Figure 15: Communities without electric coverage, department of Quiché.



Source: Proprietary Production, CNEE and INDE.

The department of Quiché has an electrical coverage index of 78.98%, however, the municipalities of San Miguel Uspantán, Chicamán, Chajul, and San Bartolomé Jocotenango have coverage indexes lower than 60%. In this department, the density of households without coverage is key to the feasibility of projects. There are 32,411 households pending electrification according to INDE.

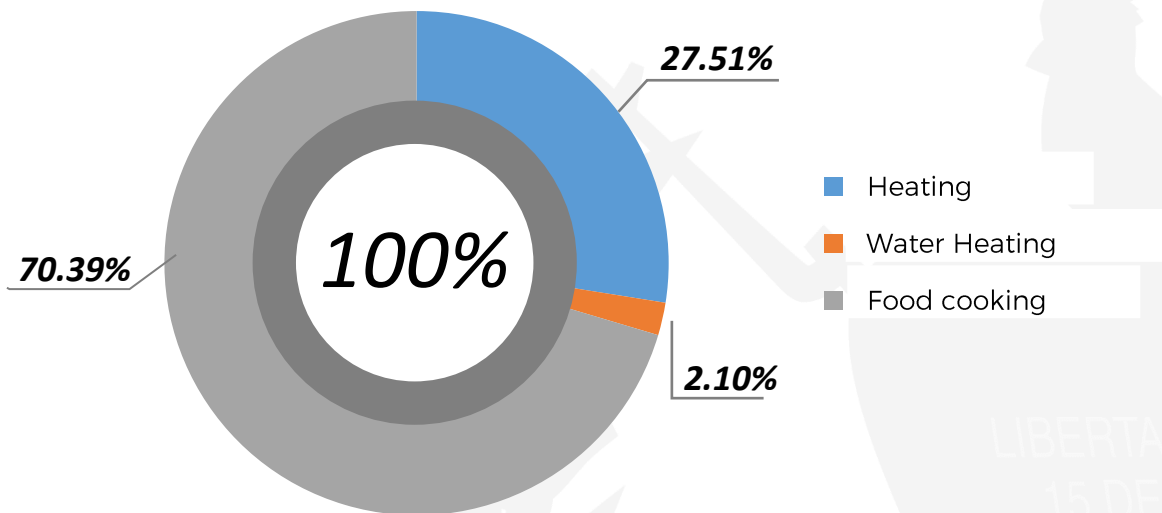
2.3.4 Firewood consumption by non-electrified users.

Communities that still lack electricity services within the national territory meet basic household needs through firewood as their primary source of energy. Lighting needs are met through candles and kerosene.

Among the 388,675 non-electrified households, firewood is consumed for the following purposes:

- ✓ Approximately 27.51% of non-electrified users require heating systems in their homes, which is mostly fulfilled through the burning of firewood in open stoves.
- ✓ 2.10% of the total energy derived from burning firewood in non-electrified communities is used for water heating purposes unrelated to food cooking.
- ✓ 70.39% of the firewood used in non-electrified households is employed for cooking purposes.

Graph 10: Firewood consumption by non-electrified communities.



Source: Unit of Mining Energy Planning, MEM.

Annually, non-electrified communities consume an average energy of 8,298 MWh obtained from firewood, which is equivalent to an estimated 2,617 metric tons of firewood per year.

Oak and pine are the most preferred types of firewood among the general population (IARNA, 2012).

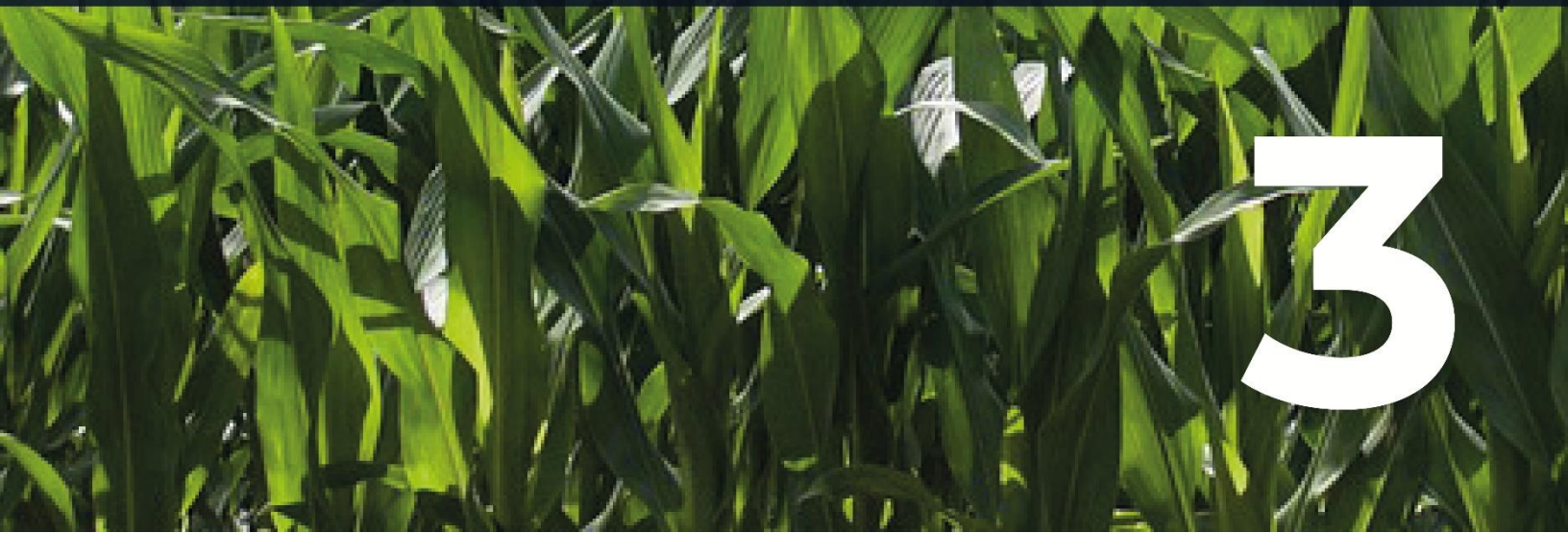
The dependence on firewood as the primary energy source in the residential sector has collateral effects on individuals who use it, such as health repercussions due to the smoke generated during the burning process, the lack of conservation and protection of the environment and national ecological reserves, and the low efficiencies of the technologies employed for firewood use.

Additionally, it is necessary to mention that the energy obtained from burning firewood results in an estimated annual emission of 3.63 million metric tons of carbon dioxide equivalent (CO₂e). This has a direct impact on the atmosphere, contributing to the acceleration of climate variability. Moreover, it produces carbon monoxide (CO) and particulate matter, which are harmful to respiratory health for those in proximity.





PROSPECTS



3

3. Prospects

The proposed action axes arise from the need to design specific actions that allow achieving objectives in the shortest possible time. It is important to observe that the formulation of these actions primarily aims to optimize resource use and maximize benefits in order to achieve development for highly vulnerable social groups.

The action axes aim to improve the living and productive conditions of Guatemalan communities that currently do not have access to electricity. The lack of electricity service is correlated with low socio-economic development. Therefore, the communities' ability to pay for electricity service should consider the implementation of productive development programs and utilization of electricity.

3.1. Consumption and Management Sectors

The following sectors represent the areas of influence that this policy seeks to impact through different mechanisms. These sectors were selected because they represent the areas to which the actions will be focused.

3.1.1 Community Sector

This sector aims to address the needs that directly arise from the lack of electricity service. These needs will be addressed from a technical perspective, so information is crucial in this sector.

It is important to understand that families without access to electricity service often rely on other products or raw materials to meet their lighting, heating, and cooking needs. The introduction of electricity service will help avoid the depletion of non-renewable resources through actions that educate families on habits and skills for sustainable development while respecting their surrounding environment.

Electricity also has a significant influence on human development, as it allows for the implementation of systems that improve productivity. Therefore, it is necessary to strengthen communities so that they can use electricity for commercial purposes. This integration into economic development enhances process technification, extends productive hours, improves facilities, and ultimately increases income. The development of the commercial sector brings social benefits such as job opportunities, higher wages, access to better goods, among others.

3.1.2 Institutional Sector

Institutional management is a fundamental pillar for the success of any policy. It is important for institutions to have the capacity to adapt to different situations and propose consensus-based solutions regarding the best technical solutions that can be implemented to fulfill the energy policy. This axis will develop the necessary actions and objectives to address technical and social issues.

3.2.Action Lines

The proposed axes address the situation from two different fronts: the technical front with the "Rural Electrification" axis, which aims to identify technical and legal issues that hinder the proper development of rural electrification policy, and the social front with the "Productive Development" axis, which seeks to address and manage the needs of each community by articulating the efforts of different institutions to ensure the availability of resources for newly covered service users.

3.2.1 Electrificación Rural

This axis will propose the principles and guidelines to create plans, strategies, and actions that ensure the supply conditions for approximately 1.8 million Guatemalans who do not have access to electricity service. This will be an inter-institutional effort led by the Ministry of Energy and Mines, which will analyze and propose the necessary actions for the proper implementation of the Rural Electrification Policy.

3.2.2 Productive Development

The lack of basic services, lack of access to efficient technologies, low human capital, and low productivity are some of the factors that contribute to the underdevelopment of communities without electricity service. This lack systematically accelerates the depletion of natural resources, which negatively impacts the well-being of younger generations in the medium term.

Therefore, this axis will articulate objectives and actions that improve both productive and social development capacities through inter-institutional coordination between different ministries, local authorities, and community representatives.

3.3. Objectives and Operational Actions

The following are the proposed actions and objectives for the operationalization of the Rural Electrification Policy:

3.3.1 Rural Electrification

Sector	No.	Objective	Actions	Actors
Community	1	Create and promote technical committees for rural electrification.	<ul style="list-style-type: none"> ✓ The Ministry will establish technical committees as deemed necessary, with the aim of fulfilling the objectives set out in the Rural Electrification Policy. 	MEM INDE DISTRIBUTORS
	2	Centralize information related to unelectrified communities.	<ul style="list-style-type: none"> ✓ Public and private institutions will create a database with information on the socio-economic situation of communities without electricity service. 	DGE INDE DISTRIBUTORS



			<ul style="list-style-type: none"> ✓ <i>Generate social indicators for communities lacking electricity.</i> 	
	3	<p><i>Establish a system for project monitoring and follow-up in rural electrification.</i></p>	<ul style="list-style-type: none"> ✓ <i>Develop mechanisms for project management and progress verification in rural electrification projects.</i> 	<p>DGE UPEM</p>
Institutional	1	<p><i>Increase the electricity coverage index.</i></p>	<ul style="list-style-type: none"> ✓ <i>Achieve 99% national electricity coverage by 2032.</i> 	<p>UPEM INDE</p>
	2	<p><i>Identify and diversify sources of financing.</i></p>	<ul style="list-style-type: none"> ✓ <i>The Ministry of Energy and Mines should coordinate with relevant institutions to develop a financing plan for electrification projects and plans.</i> 	<p>DGE UPEM INDE</p>
	3	<p><i>Develop the Indicative Plan for Rural Electrification.</i></p>	<ul style="list-style-type: none"> ✓ <i>The Ministry of Energy and Mines should publish the Indicative Plan</i> 	<p>UPEM</p>



			<p><i>for Rural Electrification, with updates every two years, based on the premises outlined in this policy.</i></p> <p>✓ <i>Establish the methodology for determining the electrification priority indicator.</i></p>	
4	Study alternatives for electrification projects.		<p>✓ <i>Elaborate technical and economic studies for the evaluation of alternatives for the development of electrification projects.</i></p>	<p>UPEM CNEE</p>
5	National Innovation and Development Plan -PLANID- (for its acronym in Spanish).		<p>✓ <i>Achieve 90% rural electrification by 2023.</i></p>	<p>MEM DISTRIBUTORS</p>

3.3.2 Productive Development

Sector	No.	Objective	Actions	Actors
Institutional	1	Support the management of social development programs for the utilization of rural electrification projects.	✓ Institutionalize procedures that allow ministries to coordinate the implementation of social development programs for monitoring, evaluation, and follow-up of rural electrification projects.	MEM INDE





CONCLUSIONS



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4. Premises for the Development of the Indicative Rural Electrification Plan

To establish and prioritize the main communities and municipalities in which efforts should be focused on access to electricity, it is necessary to establish the measurement parameters that will determine the premises for the development of the Indicative Rural Electrification Plan.

The identification of the importance of each variable will determine the approach to optimizing technical resources, considering the social and developmental needs of the inhabitants.

Therefore, the methodology proposed for the development of the Indicative Rural Electrification Plan should consider the following technical premises:

1) Quality of service to end users

Improve the quality of service to end users by complying with the NTSD (for its acronym in Spanish) in force.

2) Feasibility and compliance with current regulations

Simulate a current 13.8 kV MV circuit in the rural area considering the capacity to transmit 25% of its capacity for 7 km, complying with the NTSD indices; and in the urban area for 5 km. Simulate a 34.5 kV MV circuit considering the capacity to transmit 25% of its capacity for 25 km, complying with the NTSD quality indexes.

3) Economic and commercial considerations

The availability of distribution trunk network conductors in rural and urban areas is usually in sizes 1/0 and 4/0.

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In addition, the following socio-economic premises need to be included in the development of the Indicative Rural Electrification Plan:

1) Human Development Index

Prioritize municipalities and departments with higher poverty and extreme poverty rates, considering chronic malnutrition rates as well.

2) Electricity coverage

Also consider prioritizing municipalities and departments with lower electricity coverage rates.

3) Electricity coverage by 2024

Electrify 61,066 households, equivalent to approximately one million users, in the period from 2020 to 2023.

4) Reduction of firewood consumption

Considering the values shown in the energy balance reports of the Ministry of Energy and Mines (MEM), departmental and per capita firewood consumption rates are considered as premises for the rural electrification plan.

5) Cleaner cooking solutions

In relation to the reduction of firewood consumption, the use of electric induction stoves within electrified communities is considered as a mitigation measure for the health and climate change impacts caused by firewood.

6) Electricity for food cooking

Considering the growing demand for electricity and the improvement of the quality of life of the Guatemalan population, the use of electric appliances for cooking processes is considered.

7) Electric mobility

Anticipating the future growth in demand for electricity, the use of electric mobility is contemplated and promoted in rural communities, contributing simultaneously to the mitigation of greenhouse gas emissions.

In addition to these premises, the Indicative Rural Electrification Plan should consider the actions described in the "Strategic-Energetic Planning" section of this document, including:

- i. Actions developed by the Distributors.
- ii. Plans and actions of the National Institute of Electrification (INDE for its acronym in Spanish) to achieve rural electrification and electricity coverage objectives.
- iii. Plans and actions of the National Institute of Electrification (INDE for its acronym in Spanish) to achieve rural electrification and electricity coverage objectives.
- iv. Multilateral credits.
- v. Adaptation of the Economic Value Added (VAD) for electrification projects.



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