# Collaboration and Investment Opportunities for Danish Organizations in Colombia's Green Transition: 2021 (SHORT VERSION - ENGLISH)

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# Collaboration and investment opportunities for Danish organizations in Colombia's Green Transition: 2021

PROJECT COMMISSIONED BY THE EMBASSY OF DENMARK IN COLOMBIA


Authors

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***Photo 1.*** *Jepirachi Wind Park in La Guajira, 2019.*

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EMBASSY OF DENMARK
*Bogotá*

CBS CENTRE FOR BUSINESS AND DEVELOPMENT STUDIES
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# Contents

# Preface

This report presents an in-depth analysis of the Colombian energy system as of March 2021. The aim is to provide relevant information for Danish private companies and investors to enter into dialogue and collaboration with Colombian public and private organizations for a resilient energy transition, within the framework of the Colombian National Energy Plan toward 2050 (E2050).

The E2050 plan, which was presented in June 2015, is an integral part of Colombia's Green Growth Policy. This Colombian initiative aims to transform the Colombian energy matrix by encouraging investment in *nonconventional renewable energy*. Nonconventional renewable energy is a term used by the Colombian Government [1], and is equivalent to the European and North American understanding of renewable or green energy (large- and small-scale) from the following sources: wind (onshore and offshore), solar, biomass and waste, and geothermal. The E2050 plan integrates climate change mitigation into Colombian public policy, in accordance with Colombia's commitment to the Paris Agreement [1–3], and aims to diversify the Colombian energy matrix with nonconventional renewables to ensure a more competitive, sustainable, resilient, and diversified energy system [a].

There is a growing agreement from the private and public sectors and civil society in Colombia for the need to mitigate climate change. There is a tendency to favor nonconventional renewable energy over traditional fossil fuel-based energy, but at the same time, there is resistance from end-users for this transition. However, in the midst of the COVID-19 pandemic, the Colombian government continues to revise and upgrade its legal framework to transform its energy system and promote foreign direct investment (FDI) in nonconventional renewable energy.

Colombian public policy is clear in the need to increase the share of nonconventional renewables in the energy matrix from less than 1 percent to more than 12 percent by 2022 [a]. Colombia's greenhouse gas (GHG) emission mitigation target has increased from 20 percent to 51 percent by 2030, with the aim of using "sustainable reactivation" as a driving force for economic growth following the downturn caused by COVID-19 [2].

The objectives of this report are to help private companies and investors map investment opportunities and challenges in nonconventional renewable energy in Colombia, aimed at building a resilient energy system.

## Scope of the Report

This report provides a compass for Danish companies interested in the Colombian energy market. In addition to illustrating the state of Colombia's energy system to help foster dialogue and cooperation between Colombia and Denmark in sustainable energy systems, it presents an overview of the legal framework for Colombia's energy transition with the aim of elucidating current and future investment opportunities in nonconventional renewable energy in Colombia, particularly in wind, solar, biomass, and geothermal energy.

This report was prepared based on interviews with public officials, governmental representatives, representatives of multinational enterprises (MNEs) and small and medium enterprises (SMEs) in the energy sector in Colombia and Denmark, representatives of financial institutions, representatives of nongovernmental organizations, consultants, academics, and members of civil society. The interviews were conducted between September 2020 and April 2021 and took place online due to COVID-19 restrictions. Face-to-face interviews with members of the Wayúu people in La Guajira were carried out during fieldwork in Colombia in February 2020. The statements and responses by interviewees are anonymized in this report and indicated by [a]. The report also draws from publicly available documents on the energy system in Colombia, private sector reports, and government documents such as the Colombian normative and legal energy frameworks. An important source of information is the internet platform maintained by the Mining and Energy Planning Unit (UPME—Unidad de Planeación Minero Energética) at the Ministry of Mines and Energy (MME) (available at https://www1.upme.gov.co/Paginas/default.aspx). This portal forms the national reference for state-of-the-art technology and best practices within the energy system in Colombia.

## Structure of the Report

This report begins with an executive summary for policy makers and investors in the private and public sectors to motivate dialogue, collaboration, and investment in the Colombian energy sector. This is followed by the potential, risks, and implications of Denmark-Colombia cooperation.

# Acknowledgments

The research undertaken to write this report was conducted by Jacobo Ramirez, Diego Abraham Angelino Velázquez, and Claudia Vélez-Zapata. We are thankful to the Embassy of Denmark in Colombia for their assistance in providing access to Colombian governmental officials with whom to conduct interviews.

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In addition, the following public and private organizations, consultants, and nongovernmental organizations provided valuable input and comments. *From Colombia*: INDEPAZ (The Institute for Development and Peace Studies), IPD Latin America, Renewable Energy Association (SER Colombia), Universidad de La Guajira, Universidad Pontificia Bolivariana, Medellín, ECOPETROL, and COTECMAR; and *from Denmark*: DanChurchAid, Danish Institute for Human Rights, ROSS DK, Haldor Topsoe, Gehl, EKF (Denmark's Export Credit Agency), IFU (The Investment Fund for Developing Countries), NIRAS, Ringkøbing-Skjern Municipality, Vestas, and Ørsted.

Access to Wayúu people was granted through the help and assistance of INDEPAZ (The Institute for Development and Peace Studies), Colombia. Jacobo Ramirez undertook fieldwork in the La Guajira region in Colombia—the territory of the Wayúu people—with the assistance of the Heinrich Böll Foundation, Germany, and IWGIA (The International Work Group for Indigenous Affairs), Denmark.

This report benefited greatly from the analysis and comments of a range of external experts, including: Alvaro Cuervo-Cazurra, Professor of International Business and Strategy at D'Amore-McKim School of Business, Northeastern University, USA; and Michael Wendelboe Hansen, Associate Professor at Copenhagen Business School (CBS).

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## Role of the Funding Source

The funding was used to collect and analyze open-source data and to conduct and analyze interviews.

## Declaration of Competing Interests

The authors have no conflicts of interest to declare.

## Data Availability Statement

The data consulted in relation to Colombian laws and regulations can be found on the Ministry of Mines and Energy webpage at https://www1.upme.gov.co/Paginas/default.aspx. The data of the interviews collected are confidential.

# ABOUT THE AUTHORS

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# Executive Summary[1]

## *Country Context*

a. Colombia is an equatorial country located in northwestern South America. Colombia has over 48 million inhabitants and is organized into departments (32), municipalities (1123), districts (5), and other special divisions including provinces (141) and indigenous territorial entities (83) [2].
b. Colombia is the 25th largest country in the world, with a total terrestrial area of 1,139,951 $km^2$, maritime area of approximately 928,660 $km^2$, and coastline extension of 2,900 kilometers [2].
c. Colombia is still in a transition process after the signing of a peace agreement between the national government and the Revolutionary Armed Forces of Colombia (FARC) in 2016. The peace agreement legally represents the end of more than 60 years of civil conflict in major regions of Colombia. The conflict distorted public policies and the economic development of the affected regions. The FARC controlled 242 municipalities, equivalent to 22 percent of Colombian territory. The peace agreement has enabled the affected regions to be reintegrated into the national economy and energy system [4].
d. Colombia is an important oil producer and a leader in extractive minerals. Exports vary year on year. According to the Office of Economic Studies of the Ministry of Commerce, in 2020, Colombia's main exports were oil and derivatives (23%), coal (16%), other mining (9%), coffee (8%), industrial goods (24%), agricultural goods (13%), iron-nickel (1%), and basic chemicals (6%) [5].
e. Colombia has 14 million homes, of which 96.7 percent have access to electricity, 66.8 percent have connections to pipeline gas, and 43.4 percent have internet access (broadband or mobile) [6].
f. The COVID-19 pandemic has damaged economies around the world. Colombia registered an 8.25 percent fall in GDP in 2020. The World Bank projects a 3.5 percent rise in the Colombian economy in 2021 and a 3.75 percent rise in 2022, which are similar to the figures released prior to the pandemic [7].
g. COVID-19 caused Colombian energy demand to decrease by 21 percent in the large industry sector and by 7.5 percent in the residential and small industry sectors.

[1] The full report is available on https://www.cbds.center/publications-1.

# *Energy Sector*

a. The Colombian energy matrix is based on coal, oil, gas, hydropower, biofuel, and *nonconventional renewable energy*. Almost 70 percent of the electricity capacity in Colombia is produced from hydroelectric plants. Thermal energy (gas, coal, and steam) represents 30.7 percent of supply [8].

b. The largest consumers of energy are the residential (42%), industrial (33%), and tertiary (25%) sectors [average figures from 1998 to 2018 [6]]. The energy matrix differs by sector: the residential sector is largely powered by hydropower and gas; industry is powered by coal, natural gas, bagasse (a type of biofuel) and hydroelectricity; and the tertiary sector uses coal, oil, hydropower, and (to a lesser extent) nonconventional renewable energy such as solar power [6, 8].

c. The energy sector in Colombia is relatively decentralized but is controlled by large Colombian utility firms [a].
    - Three utilities have a 63 percent share in the energy production market: Grupo EPM (22.0%), ISAGEN (19.0%), and EMGESA (22.0%).
    - Three utilities dominate the energy transmission market: ISA InterColombia (80%); Gupo Energía Bogotá (GEB) (10%), and Grupo EPM (7%).
    - Three utilities control 64.7 percent of the energy commercialization market: Grupo EPM (25.3%), Electrificadora del Caribe (20.2%), and Grupo ENEL (19.2%).
    - Medium-size firms control 8 percent of the energy production market and 17.2 percent of the energy commercialization market.

d. Grupo ECOPETROL (Colombian Petroleum Company), a private-public company (88 percent government and 12 percent private investors), is the main oil company in Colombia and one of the four largest oil firms in Latin America. Recently (January 27, 2021), Grupo ECOPETROL announced to the national government the acquisition of 51.4 percent shares of Interconexión Eléctrica S.A. E.S.P. (ISA), a mixed utility company (Ministerio de Hacienda y Crédito Público: 51.4%; Grupo EPM: 8.82%; Fondo de Pensiones Obligatorias Porvenir: 8.32%; Fondo de Pensiones Obligatorias Protección: 5.75%; Fondo Bursatil Ishares Colcap: 2.97%; and others: 22.73%). This transaction will position Grupo ECOPETROL as one of the main energy conglomerates in Latin America and the Caribbean.

a. In 2015, Colombia presented the National Energy Plan toward 2050 (E2050). This is a key Colombian initiative for investment in small- and large-scale nonconventional renewable energy projects such as wind, solar, biomass and waste, and geothermal energy [9].
b. The Green Growth Policy, launched in 2018, aims to improve Colombian productivity and economic competitiveness by 2030, while simultaneously ensuring social inclusion and the efficient use of natural capital in a climate-friendly manner [10].
c. The E2050 plan and Green Growth Policy show political understanding of the advantages of energy matrix diversification through nonconventional renewable energy. The Colombian government seems to accept that the energy transition can no longer be reversed [a].
d. The Colombian government is limited to establishing the legal framework and regulations for the management and coordination of different stakeholder priorities in the operation of utilities.
e. A major milestone is Law 1955 of 2019, published in March 2021, which establishes that energy utilities that operate in Colombia will be required from 2023 to source at least 10 percent of their annual energy from nonconventional sources [11].
f. Another major milestone in advancing the legal framework was the approval of Law 1715 in 2014, which is the main legal instrument for the energy sector in Colombia [12].
g. Law 1715 stipulates the key aspects of the functioning and development of the renewable energy sector, such as providing fiscal incentives for investment, defining responsibilities among ministries, and establishing financial and operative instruments for different types of nonconventional renewable energy.
h. The four main incentives in Law 1715 are as follows [12]:
    - Deduction of 50 percent of investment profits for tax purposes on energy generation projects for 15 years;
    - Waiver of value-added tax (VAT) on the purchase of equipment, elements, and machinery or the acquisition of necessary services for the project;
    - Tax exemption on imports of machinery and other necessary supplies for the project; and
    - Accelerated depreciation of applicable assets, equipment, machinery, and civil projects needed for the project.
i. Law 1715 also emphasizes a cultural change in Colombia in terms of the use of nonconventional renewable energy. Different stakeholders (including private- and public-sector representatives and indigenous people) emphasized the importance of improving the consultation process with indigenous people.

## *Key Findings*

a. The Colombian government is committed to the E2050 plan through further development of the Colombian legal framework and new public tenders (e.g., financial support such as tax incentives for importing equipment and material).
b. The infrastructure required to build large-scale nonconventional renewable energy projects and transmit power to end-users needs to be expanded. This provides a further business opportunity for Danish investment.
c. The Colombian energy sector is an oligopolistic industry, controlled by utilities with a mix of ownership (government and private investors).
d. Large-scale nonconventional renewable energy investment in Colombia focuses on climate change mitigation (e.g., reducing $CO_2$). However, there is little incentive or investment for climate change adaptation. The El Niño-Southern Oscillation (ENSO) warm and cold phases affect Colombian industries such agriculture. There is potential for collaboration and investment in projects that will enable Colombia to adapt to the impacts of climate change.
e. Colombia's rich biodiversity and multiracial population must be considered in the energy transition. Biodiversity should be considered in the planning and development of nonconventional renewable energy projects and adapted according to Colombia's biodiversity and sociodemographics.

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## *Areas for collaboration*

This study has identified the following five areas that can be the basis for a broad collaboration between Denmark and Colombia: 1) biodiversity and natural ecosystems; 2) governance in energy democracy; 3) energy culture; 4) energy efficiency; and 5) supporting infrastructure.

### 1. Biodiversity and Natural Ecosystems

a. **Balance of land use: energy versus food:** The use of adapted modern technology to produce biofuels (e.g., ethanol) raises a controversial discussion about sustainability, both in Colombia and worldwide. There is a business opportunity to develop biofuels from waste and not crops, with new prospects for the

production of green hydrogen, green ammonia, and green fertilizers.

b. **Protection and National Parks:** A commitment between government and firms creates an opening to respect and protect biodiversity refuge areas (e.g., Amazonas Department) and ecosystems (e.g., water treatment in sanitation, rivers, and seas).

## 2. Governance in Energy Democracy

a. **Ensuring compliance with laws and regulations**: The multicultural sociodemographics of Colombia provide an opportunity for firms to promote energy democracy. The Colombian government has invested in human capital through the Directorate of the National Prior Consultation Authority (DANCP) to improve the efficiency of public consultations with indigenous people. Colombia is the first country in Latin America and the Caribbean that has conducted an online public consultation with indigenous people for solar investment. These advances could help to revise the disputed consultations in La Guajira, according to the particularities and needs of the Wayúu people [a].

b. **Fostering accountable and transparent governments**: Public policies at the federal, state, and municipal levels should facilitate the sustained dissemination of information on national renewable energy developments to help local communities build trust in the government and make informed choices [a].

c. **Access to finance**: There are financial incentives and organizations that provide a platform for firms to access credit when investing in nonconventional renewable energy projects (e.g., *Danish*: EKF, IFU, P4F; *UN's Climate Finance*: GCF, SCCF, AF). These incentives provide an opportunity for Colombian firms to access finance and for Danish firms to protect their investments [a].

d. **Renewable ownership:** Exploring local communities and small and medium enterprises' (SMEs') access to existing finance funds could lead to stakeholder partnerships in nonconventional renewable energy investments among financial institutions, multinational enterprises (MNEs), local governments, and local communities [a].

## 3. Energy Culture

a. **Expansion of education, training, and development programs in nonconventional renewable energy:** Communities in the La Guajira region and other regions in Colombia are not familiar with the benefits of nonconventional renewable energy. It is necessary to help educate them and to discuss the benefits of energy efficiency practices to foster their participation in nonconventional renewable energy projects. Technical and

engineering higher education programs and nonconventional renewable energy training are required to create local skilled workforces. There is an opportunity for the private sector to work with local education institutions and policy makers to develop suitable education programs.

b. **Promote employment through nonconventional renewable energy**: Developers can promote local employment in nonconventional renewable energy by implementing training and internship programs that target local communities and connect students with the local labor market.

## 4. Energy Efficiency

a. Energy efficiency implies flexibility and diversification of the energy matrix and network. Nonconventional renewable energy sources such as solar and wind, particularly on the Caribbean Coast and in the central Andes regions, can complement the hydropower sector during dry seasons of the annual climatological cycle. There is a potential for developing hybrid or complementary pilot projects based on current nonconventional renewable energy technologies.

b. Digital solutions are possible for energy efficiency such as residential and industrial metering.

## 5. Supporting Infrastructure

a. There is a need to upgrade roads and ports in Colombia to facilitate transport of equipment and components for large-scale wind and solar investments.

b. When a limitation with the current infrastructure (e.g., roads) is identified—for example, if the load is heavy or large—the associated costs must be met by private agents (e.g., the investor). Investors in nonconventional renewable energy projects should have a clear understanding of the necessity and costs for adapting existing infrastructure and of the adjustments that need to be made so that these costs are expected during project execution [a].

c. This is an opportunity for foreign firms concerning the collaborative development of transportation infrastructure in Colombia. Danish companies can participate through FDI in the design and construction of infrastructure in Colombia. This may include public-private partnerships for infrastructure development.

# Potential for Denmark-Colombia Cooperation

Colombia has implemented public policies that have laid the foundation for its energy transition to meet the E2050 and the Paris Agreement. Transitioning from conventional large-scale energy sources (e.g., hydropower, oil, and carbon) to a more sustainable energy system requires the energy industry (utilities and infrastructure) and end-users to accept, integrate, manage, and balance conventional and nonconventional renewable energy sources.

Investing in Colombia's energy transition presents a unique opportunity for Denmark at the political, business, research and development (R&D), and social development levels.

Denmark's green energy expertise places it among the top five nations in the World Economic Forum's Energy Transition Index 2020 [13]. This index assesses countries' readiness for the transition to a secure, sustainable, affordable, and reliable energy system. Denmark's high ranking in this index reflects the long tradition of Danish firms at the forefront of green energy technology, energy production, and energy efficiency solutions. The energy transition goes beyond the production, storage, and transmission of nonconventional renewable energy: it requires energy efficiency; the ability to produce sustainable energy; and the capacity to implement mechanisms to safeguard energy for industrial and commercial use.

Danish-Colombian collaboration offers a win-win relationship. Danish companies can enter a growing market with great potential for scalability in South and Central America. Moreover, there is scope to develop the market to provide a comparative advantage, because large technology providers from China, Germany, and the United States are currently focused on large-scale nonconventional renewable energy projects in Colombia. In turn, Colombia will benefit from Denmark's state-of-the-art technology and best practices for energy production and efficiency, while gaining from the introduction of proven and successful green energy models for both small- and large-scale electricity generation.

Denmark has a unique platform that combines firms with the technology and solutions for a green transition and the support of financial institutions, such as the IFU (The Investment Fund for Developing Countries) and EKF (Denmark's Export Credit Agency), which have a key focus and expertise in the Latin American and Caribbean market. IFU is open to participating in projects by injecting equity, while the EKF is part of the lending group. IFU and EKF can

participate in the same projects, and thereby increase the support of projects in the Danish interest [a]. These institutions, together with the private sector, are collaborating with the Embassy of Denmark in Colombia to promote and support the green energy transition in Colombia.

According to the EKF, Colombia has a Country Risk rating of 4, where 7 is high risk and 0 is low risk. This classification is consistent with the OECD's country risk classification [a].[2] The risk designation relates to the risk that a customer would be unable to pay because of political risks in the country; the higher the figure, the greater the risk [a]. Denmark, by various private-public organizations, offers a one-of-a-kind forum for identifying the right option for nonconventional renewable energy projects. Denmark's financial firms have local networks in Colombia, which facilitates deals with local banks as well as comprehensive business and project evaluations. To find the best financing option for the scheme, Denmark's private-public agencies collaborate closely with local and foreign networks. Furthermore, internal divisions inside Danish organizations, such as corporate social responsibility (CSR) teams, can evaluate the particularities to consider the nature of the risk under which the investment project will be developed, using international impact evaluation standards [a]. This, along with Denmark's technology and energy solutions, places Denmark as a perfect partner for cooperation and investment in Colombia.

This section presents some areas for dialogue, cooperation, and investment between Colombia and Denmark to meet the E2050 plan and the Paris Agreement, in addition to areas of potential risk that should be considered by any company considering investing in the energy transition in Colombia.

## Implications for Public and Private Organizations

Colombia and Denmark have signed instruments for cooperation, dialogue, and investment, such as the European Union–Colombia Free Trade Agreement (FTA) and the Memorandum of Understanding (MoU), providing a framework for *renewable energy and energy efficiency*. Colombia's commitment to the Paris Agreement is a clear signal to businesses and investors that Colombia is open for investment in nonconventional renewable energy. Additionally, the sustainable development goals (SDGs) are a common language between Colombia and Denmark, particularly in relation to Goal 7, which aims to ensure *access to affordable, reliable, sustainable and modern energy for all* by 2030 [14].

[2] See the OECD's risk assessment criteria at https://www.oecd.org/trade/topics/export-credits/arrangement-and-sector-understandings/financing-terms-and-conditions/country-risk-classification/.

*Source: [14].*

The public policies implemented in Colombia to meet the E2050 plan have set the groundwork for its transition to nonconventional renewable energy. Nevertheless, this transition will require a transformation of Colombia's energy system (both for businesses and end users/civil society). New regulations on consultation with local communities, infrastructure, and auctions for grid-scale energy storage systems demonstrate Colombia's political will to meet the E2050 and their commitments to the Paris Agreement.

*The message conveyed by various ministers interviewed here was unequivocal [a]:* ***Danish companies are invited to participate in all aspects of Colombia's energy system.***

Investment from Denmark is expected to have a significant benefit for energy efficiency and electrification (industry, public and private transportation, domestic use, and so on) in Colombia. This offers a unique opportunity for Denmark at the political and business levels but also for R&D, industry, and civil sensitization and education. However, Danish firms and investors should conduct in-depth risk assessments of different areas before investing in nonconventional renewable energy in Colombia. Table 1.1 offers an initial account of the Colombian advances in public policies, legal framework, energy market, sociodemographics, legacy of armed conflict, climate change, and the COVID-19 pandemic, as well as some potential risks associated with each of these areas.

*Danish-Colombian collaboration offers a win-win relationship. Danish companies can enter a* ***growing market with great potential for scalability****, while Colombia will benefit from* ***Denmark's state-of-the-art technology****, best practices for energy production and efficiency, and* ***successful green energy models*** *for both small- and large-scale electricity generation.*

**Table 1.1.** Potential Risk Areas

| Macro Level | Advances | Potential risks |
|---|---|---|
| **Public Policies** | • Signing of the International Energy Charter, 2015.<br>• Colombian Green Growth Policy.<br>• E2050 National Energy Plan.<br>• EU-Colombia Economic Partnership, 2012.<br>• Member of OECD since 2020. | • Long-term commitment to the E2050 plan beyond electoral cycles. Colombia will hold a presidential election in 2022.<br>• Timeframe in adjusting current legal framework in accordance with national and international market demand.<br>• Alignment to a common understanding of the E2050 plan among different ministries.<br>• Internal political instability and with Venezuela.<br>• Instability in migration process from Venezuela. |
| **Legal Framework for Nonconventional Renewable Energy** | • Law 1715 & ongoing new regulations.<br>• Public and private auctions. | • Legal framework to de-regulate the energy sector for IPPs and large-scale utilities.<br>• Reinforce legal protection Risk: Public auctions: Guarantees in Payment system: PPAs vs. single payment option trading (Spot market).<br>• Highly volatile spot market with price variance of up to 90% in any given week. |
| **Energy Market** | • Private and public auctions stimulate Colombian utilities' investments and international investors.<br>• Commercial operation date window of approximately three years to commercialize nonconventional renewable energy. | • Risk for energy production utilities to sign PPAs.<br>• Uncertainty to sell the energy. If there is no guarantee to secure PPAs the project is not attractive for investors and financial institutions.<br>• In 2019, 42% of energy consumption was for residential use.<br>• Uncertainty to dispatch energy due to delays in the construction of transmission lines.<br>• Unclear signal for future auction for production of nonconventional renewable energy.<br>• Idiosyncrasy of Colombian utilities is short-term. |
| **Sociodemographics & Legacy of Armed Conflict** | • Ratification of ILO Convention 169 (FPIC).<br>• Implementation of national action plan on business and human rights.<br>• Signing of Peace Agreement with left-wing FARC rebels, 2016.<br>• Establishment of the Chair of Peace. | • Little training of human talent in technologies oriented to the development of projects in unconventional energies at private and public universities.<br>• Permanence of armed conflict beyond the Peace Process.<br>• Skilled labor is expensive. Expatriate talent may be required.<br>• Delays in consultation processes with indigenous people.<br>• Social mobilizations against energy projects.<br>• Protection of Human Rights Defenders.<br>• Cybersecurity: cyber-attacks on the electric grid leading to disruption of the power system. |
| **Climate Change & Pandemic** | • Ratification of Paris Agreement, 2018.<br>• Commitment to SDGs, 2016. | • Possible social and economic instabilities caused by natural disasters and climate fluctuations (e.g., El Niño-Southern Oscillation [ENSO]).<br>• Consequences of COVID-19 Pandemic: Decreased spending and consumer confidence, Private and public investments slowed down and contracting in spending. |

*Source: [a] and bibliography.*

*Note: FPIC = free, prior, and informed consent; IPPs = independent power producers; PPAs = power purchase agreements; SDGs = sustainable development goals.*

Table 1.2 presents some of the most salient areas for collaboration and investment in Colombia. This is not an exhaustive list. The "Areas with Existing Opportunities" column presents current "urgent" themes that need better integration into the E2050 plan. The "Potential Opportunities for Danish Firms" column presents the competencies of Danish firms that have potential to be transferred to Colombia. This column also presents some concrete actions and examples for contact points in Denmark.

**Table 1.2.** Potential Areas for Collaboration

| Energy System | Areas with Existing Opportunities | Potential Opportunities for Danish Firms |
|---|---|---|
| **Biodiversity and Natural Ecosystems** | • Balance of land use: energy versus food<br>• Sea and land | • Development of national parks and protection areas (e.g., Amazonas Department)<br>• Best practices to protect ecosystems (e.g., water treatment in sanitation, rivers and seas)/State of Green (Denmark) |
| **Governance in Energy Democracy** | • Partnerships (public-private)<br>• Engagement with local communities | • Support for regulations and schemes for partnerships<br>• Best practices for *Civic Energy Cycle*, (e.g., Ringkøbing-Skjern Kommune) |
| **Energy Culture** | • Development of human capital at technical and higher education levels<br>• Technical expertise<br>• End users<br>• Awareness of nonconventional renewable energy and its use. | • Wind-energy program (e.g., DTU)<br>• Joint academic programs<br>• Industrial training (e.g., internships)<br>• Training of trainers (e.g., Chamber of Commerce, Industrial associations and NGOs) |
| **Energy Efficiency** | • Flexibility of the energy network (electricity grids—transmission and distribution)<br>• Energy storage (technology, equipment, and machinery)<br>• Design of public places and mobility | • Digital solutions (operation of nonconventional renewable energy investments)<br>• Energy efficiency (technological solutions)<br>• Batteries<br>• Cybersecurity<br>• Intelligent cities |
| **Supporting Infrastructure** | • Building/upgrading transportation infrastructure, e.g., roads and bridges | • Public-private partnerships for the planning, design, and construction of infrastructure |

*Source: Original table for this publication*

# Conclusions

The objective of this report is to guide for Danish businesses in entering the Colombian energy sector. Colombia is in a unique position to develop a sustainable and flexible energy system with a combination of different energy sources. The E2050 plan aims to provide a *roadmap for the future: efficient, reliable and sustainable energy for the service of all Colombians* [6]. Colombia has a capable and committed public sector that has made major efforts to develop a legal framework to meet the E2050 plan. This is very aligned with Danish objectives. In December 2020, Denmark's Climate and Energy Minister Dan Jorgensen announced that Danish oil and gas production in the North Sea would end by 2050. Minister Jorgensen said, "*We hope this can inspire others*" [15]. Colombia has a commitment to the SDGs. However, the transformation of Colombia's energy system requires political decisions to be made, particularly regarding the future of coal, oil, and gas. Lessons can be learned from Denmark regarding the extent to which Colombia will transform its energy matrix with nonconventional renewable energy sources.

# References


**[a]** **Based on interviews conducted.**

[1] Unidad de Planeación Minero Energética. Integración de las energías renovables no convencionales en Colombia. CONVENIO ATN/FM-12825-CO. Bogota, Colombia: UPME; 2015.

[2] Departamento Administrativo Nacional de Estadística. Geoportal del DANE - Geovisor CNPV 2018, https://geoportal.dane.gov.co/geovisores/sociedad/cnpv-2018/?lt=5.1566554617025755&lg=-72.5091171552499&z=6; 2021 [accessed 19 January 2021].

[3] Ministerio de Minas y Energía. Transición energética: un legado para el presente y el futuro de Colombia, https://www.minenergia.gov.co/libro-transicion-energetica?fbclid=IwAR3xByT01YkQdLYmqKZEI-yVgj78hxJd15qSKO3wam2XkZeFMmChI4FrXZY; 2021. [accessed 13 March 2020].

[4] LeGrand CC, van Isschot L, Riaño-Alcalá P. Land, justice, and memory: challenges for peace in Colombia. Can J Lat Am Caribb Stud 2017;42:259–76.

[5] Oficina de Estudios Económicos del ministerios de Comercio. Perfil de Colombia MINCIT, https://www.mincit.gov.co/getattachment/1c8db89b-efed-46ec-b2a1-56513399bd09/Colombia.aspx; 2020. [accessed 20 October 2020].

[6] UPME. Proyección de la demanda de energía eléctrica y potencial máxima en Colombia, http://www.siel.gov.co/siel/documentos/documentacion/Demanda/Proyeccion_Demanda_Energia_Jul_2019.pdf; 2019 [accessed 17 January 2021].

[7] Comisión Económica Para América Latina. Perfil económico Colombia, https://estadisticas.cepal.org/cepalstat/Perfil_Nacional_Economico.html?pais=COL&idioma=spanish; 2020 [accessed 19 January 2021].

[8] Ata Insights. Materiales del webinar: análisis del mercado eléctrico colombiano, https://atainsights.com/materiales-del-webinar-analisis-del-mercado-electrico-colombiano/; 2020 [accessed 29 January 2021].

[9] Ministerio de Minas y Energía. ABC propuestas de la misión de la transformación energética, https://www.minenergia.gov.co/documents/10192/24169616/ABC+Misión+Transformación+Energética.pdf; 2020 [accessed 15 January 2021].

[10] Departamento Nacional de Planeación. Documento CONPES 3934, https://colaboracion.dnp.gov.co/CDT/Conpes/Econ%C3%B3micos/3934.pdf; 2018. [accessed 12 December 2020].

[11] Ministerio de Minas y Energía. Resolución 40060, https://www.minenergia.gov.co/documents/10180//23517//48858-40060-2021.pdf; 2021. [accessed 12 December 2020].

[12] Unidad de Planeación Minero Energética. Ley 1715, https://www.upme.gov.co/Normatividad/Nacional/2014/LEY_1715_2014.pdf; 2014. [accessed 11 November 2020].

[13] World Economic Forum. Energy Transition Index 2020: from crisis to rebound. https://www.weforum.org/reports/fostering-effective-energy-transition-2020; 2021 [accessed 26 april, 2021]

[14] United Nations. Goal 7: ensure access to affordable, reliable, sustainable and modern energy for all, https://unstats.un.org/sdgs/report/2016/goal-07/; 2016 [accessed 19 June 2018].

[15] Buttler, M. Denmark to End North Sea Oil Production in Milestone Deal. Bloomberg. Retrieved from https://www.bloomberg.com/news/articles/2020-12-03/denmark-ends-north-sea-oil-exploration-drops-production-in-2050; 2020, December 3 [accessed 10 January 2021].

***Photo 1.2.*** *Solar Panel in a Lounge [Typical House Construction] in La Guajira.*

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