MaRS Market Insights





ADVANCED ENERGY CENTRE MaRS Cleantech | Ontario, Canada

Market Information Report: Colombia

MaRS Advanced Energy Centre

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Country profile: Colombia



Country Snapshot			
Population	48.93 million		
Nominal GDP (US\$)	\$373.8 billion		
GDP per capita (US\$)	\$7,960		
Major Cities	Bogota (capital), Medellin, Cali		
Official language(s)	Spanish		
Currency	Colombian peso (COP)		
Exchange rate	1 COP = 0.0004 CAD (August 2015)		
Unemployment	9.6%		
Major exports	Oil, coal, coffee and ferrous nickel		
Export destinations	United States, China, Spain, Panama, The Netherlands		
Major imports	Intermediate, capital and consumer goods		
Import destinations	United States, China, Mexico, Brazil		





Preamble

The Going Global series provides a 360-degree view of the energy system in international priority markets for export-ready Canadian energy companies. Each report not only examines the energy and electricity landscape of a particular market, but also the business environment, the social, political and legal frameworks, and the country's macroeconomic drivers.



In short, the analysis is meant to help companies answer two key questions:

- 1 Are we a good fit for the market?
- What are the opportunities and barriers to doing business, and do the former outweigh the latter?

In preparing this report, its authors examined a set of quantitative indicators adapted from third-party sources (the World Bank, the REN21, the U.S. Energy Information Administration, and the United Nations). These indicators measure six key considerations for understanding the challenges and opportunities for energy innovation in Colombia: energy security and independence; quality and resilience of electricity supply; control over rising electricity costs; support for demand growth; environmental sustainability; and the business environment. In addition, the report identifies the scope of support for cleantech offered by national governments and utilities. At the beginning of each section, the authors' provide a high-level qualitative assessment of the market. This research is also distilled into graphs that allow for a visual comparison of Colombia's market in comparison to other priority markets, and Canada as a benchmark. The graphs are meant to provide the

reader with a snapshot of where a market stands in comparison with other key markets. Each graph is followed by an analysis of the indicators, which provides more nuanced information. Notably, this analysis is taken from third-party sources and verified by energy experts in these markets.

There are limitations to the drivers. insights this type of report can provide. The information presented is from secondary sources, and there are often details that can only be gathered from a physical presence in the market. The report is therefore intended to serve as an initial resource in understanding whether a market is suitable for your startup. The report will prompt more specific questions and should be supplemented by a mission or visit to the market in question.

It is also important to note that within the cleantech market, the report focuses mainly on energy, and does not discuss technologies related to other cleantech subsectors (e.g., waste and water management).



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Executive Summary

The Advanced Energy Centre selected Colombia as a target market for in-depth research along the specific criteria. First, in a thorough analysis of market priorities in consultation with provincial and federal partners, the Centre identified Colombia as a market that directly aligns with Canada's international market priorities. The Department of Foreign Affairs, Trade and Development (DFATD) identifies Colombia as an emerging and high potential market opportunity. *

Second, the Centre considered corporate and non-corporate partners' presence in the Colombian energy market including the presence of Canada's foreign offices and the Centre's corporate partners' global operations. The Centre also considered the momentum built in its existing international relationships including those developed in a series of exploratory trips to the Colombian market. Finally, drawing from third-party assessments of the Colombian energy market, the Centre considered market receptivity and alignment with Canadian energy innovation entrepreneurial network's interests. The key findings from this assessment are detailed in the table below. For reference DFATD defines emerging markets with the best potential for broad Canadian commercial interests as those:

- That demonstrate high potential for economic growth;
- Where Canadian capabilities have the greatest potential for success;
- Where government support can have the greatest impact;
- That are priorities for foreign direct investment, technology and/or talent; and/or
- That are part of regional trading platforms
- DFATD Free Trade Agreements
- Past and upcoming DFATD trade events
- EDC Past and Upcoming events 2015
- EDC Trade Confidence Index based on 748 responses to a telephone survey conducted from September 11 to September 26, 2014
- MEDTE Upcoming (2015) Events & Missions
- ISTP International Programs

* [Source: DFATD - Global Markets Action Plan (Priority markets)]

Opportunities In Cleantech

- Government target to double non-hydroelectric renewable energy generation by 2020 (from 3.3% to 6.5%)
- Large local utilities can act as a gateway market to other Latin American countries (e.g. Peru)
- Significant potential for energy efficiency savings in industrial, commercial and residential sectors
- New renewable energy law encourages companies to develop non-conventional renewable technologies (Law 1715; mechanisms and incentives still in development)
- Some tax exemptions are available for renewable energy projects and sales
- With some of the highest energy potential in Latin America, Colombia's climate and geography lend themselves to investment in renewable energy generation

Barriers To Cleantech

- Government incentives aren't readily available for foreign companies, due in part to procurement policies
- Regulatory framework supporting renewables and cleantech is complex and may be difficult to understand
- The surcharge for energy reliability excludes renewable energy sources
- Financial market limitations: The banking sector has little experience with cleantech and so limited financing is available
- Private sector is not attuned to the economic advantages of sustainable energy

Business Opportunities

- One of the easiest Latin American countries to do business in
- Easiest cities in which to do business:
- Manizales
- Ibague
- Bogota
- Strengths of the market:
- Ease of getting credit
- Protection of minority investment
- Registration of property
- Ease of resolving insolvency

Barriers To Cleantech

- Energy infrastructure has been damaged by guerrilla warfare in rural Colombia
- Access to electricity remains problematic
- Complex business tax structure
- Weak contract enforcement
- Transportation costs are very high due to a need for more infrastructure development
- Corruption is prevalent-bribes in the course of business are common

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This report looks at Colombia from the standpoint of six national energy considerations and measures the support for the adoption of innovation energy technologies within Colombia's government and major utilities. The purpose of this analysis is to help Canadian cleantech companies identify potential opportunities and understand barriers to energy innovation in Colombia.

The report assesses six challenges (or, "country considerations") using a total of twenty-eight metrics (see table below). To remove any subjectivity or bias in our depiction of the indicators, they are presented as raw data obtained from trusted third-party sources - including the World Bank, International Energy Agency (IEA) and U.S. Energy Information Administration (EIA) - and compared to other priority markets for reference. Each challenge is represented visually and assessed qualitatively in its respective section of the report. The analysis demonstrates areas of opportunity, as well as challenges, in deploying cleantech in Colombia. Canada is referenced in each chart as a benchmark for Canadian entrepreneurs to contextualize each comparison market.

Note:	The source	of each	metric has	been	hyperlinked	in the	table	below.
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Consideration	Metric	Description
	Total electricity generation	Electricity, billion kilowatt hours
	Electricity consumption	Gross production + imports - exports - losses
U	Proven fossil fuel reserves	Billion barrels
SECURITY OF ENERGY SUPPLY	Net electricity imports	Electricity imports - exports, in billion kilowatt-hours
	GDP growth	Annual percentage growth rate of GDP at market prices
	Access to electricity	Percentage of population with access to electricity
	Duration of interruptions	Average outage duration for each customer
	Frequency of interruptions	Average number of interruptions that customer experiences
RESILIENCE OF	Value lost due to outages	Percentage of sales lost due to power outages
ENERGY SUPPLY	World risk index rating	Measures susceptibility, coping capacities, adaptive capacities, expo- sure to national hazards and vulnerability
	Residential electricity price	Climatescope average residential electricity prices
\$	Industrial electricity price	Climatescope average industrial electricity prices
EFFICIENCY OF ENERGY SUPPLY (control over rising costs)	Electricity transmission and distribution losses	Losses in transmission between sources of supply and points of distribution and in distribution to consumers, including pilferage (percentage of output)



INFORMATION REPORT: COLOMBIA

Consideration	Metric	Description
	PM10 particulate levels	PM10 measures fine suspended particulates < 10 microns in diame- ter. Estimates represent annual exposure level of the average urban resident to outdoor particulate matter
	<u>Climate change targets</u>	Official climate change targets (such as reduction in greenhouse gas emissions)
	Renewable energy target	Percentage of total energy mix by 2020
SUSTAINABILITY	Targeted share of renewables	Targeted share of renewables in electricity generation by 2020 (excluding hydropower)
	Share of renewables	Current share of renewables in electricity generation (excluding hydropower)
	GDP growth	GDP growth, annual percentage
	<u>Urban population growth</u>	Urban population refers to people living in urban areas as defined by national statistical offices, annual percentage
SUPPORT FOR GROWING ENERGY DEMAND	Per capita usage	Measures year-on-year change in energy use (kilogram of oil equiva- lent per capita)
	Ease of doing business	The World Bank Group ranks economies on ease of doing business from 1 to 189. High scores (where 1 is the highest) mean the regula- tory environment is more conducive to starting and operating a local firm
	Corruption	Transparency International Corruption Perceptions Index ranks countries based on how corrupt a country's public sector is per- ceived to be. Scores: 0 (highly corrupt) to 100 (very clean)
QUALITY OF BUSINESS ENVIRONMENT	Foreign direct investment	Net inflows of investment to acquire a lasting management interest in an enterprise operating in an economy other than that of inves- tor. Net inflows (new investment less disinvestment) in reporting economy from foreign investors
	Political stability	Governance indicator capturing perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism
	Regulatory quality	Governance indicator capturing perceptions of the ability of the gov- ernment to formulate and implement sound policies and regulations that permit and promote private sector development
	Rule of law	Governance indicator capturing perceptions of the extent to which agents have confidence in and abide by the rules of society (quality of contract enforcement, property rights, the police and the courts) as well as the likelihood of crime and violence
	Roads paved	Infrastructure indicator, roads paved (percentage of total roads)

The report also assesses the degree of support for cleantech in Colombia, relative to other countries. To gauge support levels within the government of Colombia and among the country's largest utilities, the report looks at the factors outlined in the table below.

Group	Measuring support	Description
GOVERNMENT/ REGULATORY SUPPORT	National strategy for renew- ables	Is there a national strategy for renewables?
	Financial incentives	Capital subsidies, grants or rebates; tax incentives; energy produc- tion payments
	Public financing	Public investment through loans or public competitive bidding
	Regulatory policy	Feed-in-tariff programs, utility quota obligations, net metering, trad- able renewable energy certificates, obligations and mandates

Identifying and understanding Colombia's relative energy considerations and levels of support can help Canadian cleantech companies to identify key opportunities and recognize barriers to doing business in Colombia.



Colombia's electricity market snapshot

OVERVIEW OF ELECTRICITY MARKET

Colombia has a wholesale energy market with an independent system operator, XM S.A. E.S.P. (a subsidiary of the state-run energy company, ISA). Within it, power generation companies and public, private and mixed traders buy and sell energy within a regulatory framework established by the Energy and Gas Regulatory Commission (CREG). There are two markets:

- **1** Bolsa de Energia: A market for short-term deals where players offer prices and the availability of energy through daily auctions
- **2** The market for long-term contracts, which provides agents with coverage against the volatility of energy prices in the short-term market

KEY BODIES WITHIN THE ELECTRICITY MARKET INCLUDE:

- Ministry of Mines and Energy
- Mining and Energy Planning Unit (UPME)
- Energy and Gas Regulatory Commission (CREG)
- Superintendence of Public Services (SSPD)



Figure 2. Structure of Colombia's electricity industry. Source: Adapted from Hammons et al.,(1999). Competitive Generation Agreements in Latin American Systems with Significant Hydro Generation. Powered Engineering Review, IEEE (Volume 19, Issue: 9)[†]

A complete description of the tasks and responsibilities of these actors is outlined in the Appendix included at the end of this report.

1 http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=785784&url=http%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F39%2F17037%2F00785784.pdf%3Farnumber%3D785784?



The current structure of the market was established in 1994 by two national laws: 142 (Public Services Law) and 143 (Electricity Law). These laws divide the electricity market into generation, transmission, distribution and commercialization.

ENERGY GENERATION

Generation is open to competition and the market determines prices. Generation agents, including generators, minor plants, self-generators and co-generators, conduct transactions on the energy stock market. Energy is sold through bilateral contracts to the regulated and unregulated markets, energy exchange, secondary frequency regulation service and reliability charges.²

ENERGY TRANSMISSION

The National Transmission Network (STN) is operated by Empresa de Energia de Bogota (EEB) and has a voltage of 220 kV. Transmission network planning and expansion is coordinated by the UPME. The state-owned energy company, ISA, and its subsidiary, Transelca, control approximately 80% of the transmission network. Other key transmission companies include Empresa de Energia de Bogota (EEB), Empresas Publicas de Medellin (EEPPM), and Empresa de Energia del Pacifico (EPSA), among others.

ENERGY DISTRIBUTION

Distribution of electric energy is fully regulated under a voltage of 220 kV. CREG establishes and revises the distribution price component every five years. Different voltage levels are defined by different methodologies: the distribution price of Level 1 (1 kV), Level 2 (1 kV to 30 kV) and Level 3 (30 kV to 57.7 kV) voltage levels corresponds to a maximum price methodology, while the distribution price of Level 4 voltage (57.5 kV to 220 kV) corresponds to regulated revenue.

COMMERCIALIZATION

This activity involves the purchase of electricity in the wholesale market and its sale to end-users, whether regulated or not.

Table 1. Electricity market overview			
Installed generation capacity	14.4 GW		
Electricity generation	53 TWh		
Coverage	National Interconnected Sys- tem (SIN): 1/3 of the country, serving 96% of the popula- tion Non-Interconnected Zones (ZNI): 2/3 of the country, serv- ing 4% of the population		
Electricity exports	57.8 GWh		
Main export markets	85% of electricity exports to Venezuela, 15% to Ecuador		
Per capita usage	1,123 kWh (up from 1,009 in 2010)		

2 http://www.securities.com/emis/sites/default/files/EMIS%20Insight%20-%20 Colombia%20Power%20Sector%20Report.pdf



MARKET REGULATION

The deregulation of Colombia's energy supply industry began in 1994 with the Electricity Law, following a period of major national blackouts in 1992 and 1993. Adapted from the United Kingdom (UK) model, Colombia has the only price-based electricity market in Latin America (other markets such as Chile and Brazil feature a cost-based scheme). This means pool prices are settled in a bidding process. Market prices have remained low over time; however, regulated (domestic) tariffs and subsidies have created problems for small distribution companies. Customers are unable to pay for electricity, subsidies are insufficient, and in many affected areas, distribution companies still experience high losses.³

Since 1994, with the passing of Laws 142 and 143 (the Public Service and Electricity Laws), the state through CREG has strengthened its regulatory role over the electricity and gas sectors.⁴

Private investment in public services became possible following the deregulation of the electricity market. Privatization increased most significantly in distribution and commercialization activities.⁵ Since the adoption of reforms, Colombia has avoided service blackouts despite severe droughts during 1997-1998 and 2009-2010. Colombia has also become an electricity exporter to Ecuador and Venezuela.⁶

Following reforms in 1994, customers in the electricity market were divided into two groups: regulated and non-regulated users. Non-regulated users are able to negotiate electricity prices with retailing companies, whereas regulated users must abide by tariffs defined by CREG (CREG Resolution 131, 1998).

Electricity pool begins	1995	Regulator creates one-day-ahead pool, adapted from the UK model
El Niño	1997	No blackouts occur during the century's worst El Niño
Capacity payment adjustments	1999	Adjustments are made to capacity payments and to the minimum operation level of hydroelectricity plants
Privatization announcement	2000	Grid utility company announces it will go private. It attracts over 60,000 new owners
Attacks on transmission infrastruc- ture	2001	Attacks occur at isolated, key generators and cost the government an estimated US\$500 million. These attacks affected power generation capacity. Prices rose dramatically
CREG Resolution 034, 2001	2001	Resolution sets a bidding floor for plants with trapped power and a bidding ceiling for out-of-merit generating plants (units dispatched to provide reactive power to support transmission grids).
Electricity Resolution	2005	Creation of new standardized electricity-contracts market

Table 2. Development of Colombian electricity sector following deregulation⁷

3 http://www.sciencedirect.com/science/article/pii/B9780080450308500199

4 http://ieeexplore.ieee.org/xpl/login.isp?tp=&arnumber=785784&url=http

%3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F39%2F17037%2F00785784. pdf%3Farnumber%3D785784?

- 5 http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6083204
- 6 http://www.eprg.group.cam.ac.uk/wp-content/uploads/2014/02/1403-PDF.pdf
- 7 http://www.sciencedirect.com/science/article/pii/B9780080450308500199 (adapted from Table 17.5)



SUMMARY OF KEY FINDINGS

Security of energy supply is the "resilience of the energy system to unique and unforeseeable events that threaten the physical integrity of energy flows or that lead to discontinuous energy price rises, independent of economic fundamentals" (OECD).

Relative to Canada and China, Colombia's energy supply is somewhat insecure as it relies heavily on fossil fuel and hydropower for generation. However, it is more secure than Chile due largely to its regional electric network connectedness, which allows for imports and exports of electricity. It is a net exporter of more than 700GWh of electricity due to its connectedness with Ecuador, Peru and Venezuela (and a planned expansion of transmission lines to Panama). More than 60% of its installed generation capacity is from hydropower. This, combined with its fossil fuel reserves, has put Colombia in a fairly secure position in recent years. It is also a net exporter of oil, and has begun exporting natural gas. However, with only 2.445 billion barrels of proven crude oil reserves remaining, Colombia is expected to run out of oil in about seven years. As economic growth and energy demand are expected to continue to expand, Colombia will likely need to invest in other sources of energy to ensure a secure supply. Recognizing this, the government has launched several initiatives to promote the deployment of non-hydroelectric renewables, such as biofuels and solar.

TOTAL ELECTRICITY GENERATION AND CONSUMPTION (BILLION KILOWATT-HOURS, 2014)



Figure 3. Total electricity generation and consumption, billion kilowatthours, 2014. Source: EIA and IEA. Note: China numbers only available for 2012, not included above.



Table 3. Electricity imports and exports, billion kilowatt-hours, 2012. Source: EIA (billion kwh, 2012)						
Country	Electricity imports	Electricity exports	Electricity net imports			
Canada	11.39	57.97	-46.58			
Chile	0.00	0.00	0.00			
China	China 6.87 17.7 -10.78					
Colombia	0.01	0.72	-0.71			

PROVEN FOSSIL FUEL RESERVES (BILLION BARRELS)



GENERATION AND CONSUMPTION

According to the U.S. Energy Information Administration, in October 2013, Colombia had 14.4 GW of installed electricity generation capacity, of which over 60% was derived from hydropower. Colombia generated 5.3 terawatt hours (TWh) of electricity in October 2013, of which 68% was provided by hydroelectric plants, 18% by gas, 8% by coal and less than 1% by oil.



Figure 5. Share of energy demand by sector.

The total installed generation capacity in Colombia is equivalent to 53 TWh. The Colombian power system consists of a single interconnected network (NIS) that supplies almost 99% of the total demand. The remaining demand is covered with local generation.

Currently, half of the generation capacity in Colombia is privately owned, with three main companies, together, representing around 63% of the total electricity market share (in 2012)⁸. Endesa SA, Gas Natural Fenosa and Empresas Publicas de Medellin (EPM) are the three main actors in terms of electricity generation in Colombia.

Market consumption volume increased with a compound annual growth rate (CAGR) of 3.4% between 2008 and 2012, reaching a total of 48.8 TWh in 2012. The market's volume is expected to rise to 59.0 TWh by the end of 2017, representing a CAGR of 3.9% for the 2012-2017 period.

The residential segment was the market's most lucrative in 2012, with total revenues of \$2.7 billion, equivalent to 41.7% of the market's overall value. The industrial segment contributed revenues of \$2 billion in 2012, equating to 29.8% of the market's aggregate value. The performance of the market is forecasted to follow a similar pattern with an anticipated CAGR of 6.8% for the five-year period of 2012 to 2017. This is expected to drive the market to a value of \$9.1 billion by the end of 2017. Comparatively, the markets of the United States (US) and Mexico are expected to grow with CAGRs of 3.7% and 1.1% respectively, over the same period, to reach respective values of \$435.7 billion and \$24.7 billion in 2017.⁹

8 MarketLine, "Electricity Industry Profile: Colombia" http://store.marketline.com/ Product/colombia_electricity?productid=MLIP1209-0009

9 MarketLine, p. 12.

SHARE OF ENERGY DEMAND

ENERGY IMPORTS AND EXPORTS

OIL

In 2012, Colombia's oil exports amounted to 777,900 bbl/day, of which 432,000 bbl/day went to the US, its top oil export destination, followed by Panama, China and Spain. Crude petroleum is Colombia's main export product.

In 2011, Colombia imported the equivalent of 10 bbl/day. Refined petroleum represents 9.3% of products imported into the country.¹⁰

NATURAL GAS



In 2007, natural gas production began to exceed consumption, allowing for exports. Through the Trans-Caribbean Gas Pipeline, Colombia began exporting to Venezuela and has plans to expand to Panama

and Ecuador. In 2011, Colombia produced 387 billion cubic feet (Bcf) of dry ELECTRICITY

Colombia is a net exporter of electricity. According to the UPME, in October 2013, Colombia exported a total of 57.8 GWh of electricity, of a total 57.9 GWh traded. Of total exports, 89% is exported to Venezuela and the remainder to Ecuador.

Colombia imported 0.1 GWh from Ecuador in 2013.¹¹

- 10 http://www.eia.gov/countries/analysisbriefs/Colombia/colombia.pdf
- http://www.eia.gov/countries/analysisbriefs/Colombia/colombia.pdf

PROVEN RESERVES

natural gas and consumed 312 Bcf.

According to the Oil and Gas Journal (OGJ), Colombia had approximately 2.4 billion barrels of proven crude oil reserves as of January 1, 2014. Although exploration is ongoing and discoveries continue to be announced, Colombian officials estimate that, at current reserve levels, its oil reserves will last about seven years.¹²

Colombia produced 969,000 barrels per day (bbl/d) of oil in 2012, up 61% from the 604,000 bbl/d produced in 2008. The Ministry of Mines and Energy reported that Colombian production is expected to reach 1.3 million bbl/d by 2020. In 2012, Colombia consumed 287,000 bbl/d, allowing it to export most of its oil production.

12 http://www.eia.gov/countries/analysisbriefs/Colombia/colombia.pdf



GDP GROWTH

Colombia's 2014 nominal GDP was \$377.8 billion, while GDP per capita stood at \$7,720, following a trend of steady growth.¹³ Analysts at The Economist project the country's GDP growth to slow in 2015 to around 3.5% (from 4.8% year-on-year in 2014), but to increase thereafter, bolstered by improvements to the business environment, sound macroeconomic management, investment growth and the expansion of the US economy. Nevertheless, weak global oil prices present a risk to the economy. In 2015, domestic consumption will be among the key drivers of economic activity, although a recent spike in unemployment (from 7.7% in November 2014 to 10.8% in January 2015) is cause for concern.¹⁴

13 http://data.worldbank.org/country/colombia

14 http://www.gbm.scotiabank.com/English/bns_econ/latin.pdf

ORIGIN OF GDP (% REAL CHANGE)



Figure 7. Projected origin of GDP: Colombia 2015-2016. Source: The Economist Intelligence Unit

estimated **3.5% growth** in Colombia's GDP in 2015



Figure 6. Annual GDP growth: Colombia and Latin America and the Caribbean. Source: Global Economic Prospects. World Bank

GDP % GROWTH, ANNUAL

NETWORK CONNECTEDNESS

Colombia's network is connected to its neighbours in a limited fashion. Some transactions take place with Ecuador, Peru and Venezuela. The governments of Colombia and Panama have announced plans to build 614 km of transmission lines to connect the two countries' power grids, with an estimated transmission capacity of 300 MW and the option to expand this to 600 MW.¹⁵ While operations have been delayed, it is estimated that the system will launch in 2018.





Figure 10: Planned interconnection lines between Bolivia, Peru and Chile. Source: Meeting the electricity supply/demand balance in Latin America and the Caribbean, The World Bank, 2010.



Quality and resilience of electricity supply

	Indic	ators	
Average fi of interrup subsci	requency tions (per riber)	Average de interruptions customer	uration of s (hours per per year)
18	.6	17	.7
Value lost due to electrical outages (% of sales)	Expos severe	sure to weather	Access to electricity (% of population)
1.8%	Mec	lium	96.8%

SUMMARY OF KEY FINDINGS

Although nearly 97% of Colombians have access to electricity, they experience frequent, long interruptions. Value lost as a result of these interruptions, at 1.8% of sales, are relatively high compared to other developing countries, as well as China, Canada, and Chile. However, they are low compared to many countries in Latin America and the Caribbean, where the average loss is 3.3% of sales. Regulations set in 2008 have led to an improvement in distribution efficiency, despite increasing consumer demand. Marked improvement has occurred in average frequency of interruptions per subscriber, which decreased from 42.4 per year in 2008, to 18.6 per year in 2013. The cost of these improvements has largely been borne by the consumer, particularly those in rural and remote areas. Colombians in remote and rural areas that are not interconnected often have electricity less than eight hours per day. Cleantech facilitates access, builds resilience, and reduces costs may provide solutions for Colombian consumers, utilities, government, and other actors in the electricity system.

AVERAGE DURATION OF ELECTRICITY INTERRUPTIONS PER CONNECTION (HOURS)



Figure 8. Average duration of electricity interruptions per subscriber (hours per customer). Note: information for Chile is out of date (2005) as recent data is not readily available. Source: World Bank Group Benchmarking Analysis of Electricity Distribution in Latin America and the Caribbean, and the University of Waterloo (2014).

AVERAGE FREQUENCY OF INTERRUPTIONS PER CONNECTION (NUMBER OF OCCURRENCES PER YEAR)



Figure 9. Average frequency of electricity interruptions per subscriber (number of occurrences per year). Note: information for Chile is out of date (2005) as recent data is not readily available. Source: World Bank Group Benchmarking Analysis of Electricity Distribution in Latin America and the Caribbean, and the University of Waterloo (2014).

VALUE LOST DUE TO ELECTRICAL OUTAGES (% OF SALES)



Figure 10. Value lost due to electrical outages (as a percent of sales). Source: World Bank, 2013.

Table 4. World Risk Index Rankings, measuring exposure to severe weather (where 1 is greatest exposure). Source: United Nations University, Institute for Environment and Human Security.

Country	Rank
Canada	143
Chile	26
China	78
Colombia	79

per day.



RELIABILITY/QUALITY

Electricity market losses in Colombia are moderately high compared to other developing countries. Although losses have fallen since deregulation, terrorist attacks aimed at the electricity system remain a challenge for the country. Over time, the system operator has adapted and is able to keep the system on line.

Power interruptions occur in Colombia. In 2001, the country had an average of 60 interruptions per year, resulting in a total of 58 hours of interrupted service.¹⁶ The length of electricity interruptions has improved as a result of new regulations set by CREG in 2008. A 2014 study found that electricity distribution efficiency in Colombia has improved since 2008, and that energy losses and the length of service interruptions have decreased, despite significant annual demand growth rates (which reflects new customers).¹⁷ However, this improvement in service quality has come at a price: the tariff per kWh has also increased over during this time and the proportion received from distribution costs has also increased relative to other components of the tariff.¹⁸

With approximately 46 people per square kilometre, Colombia should have a system average interruption duration index (SAIDI) of approximately 120 minutes. However, in certain urban areas, the SAIDI is over 600 minutes. According to Colombia Inteligente, roughly 2 million Colombians do not have access to electricity. Moreover, non-interconnected zones of the country have very limited service-generally less than eight hours per day. In these remote, non-interconnected zones, producing a kilowatthour of electricity could cost as much as US \$0.50. Although reliability is improving in urban cores due to regulatory incentives, it still lags behind international standards.

VALUE LOST

According to a survey carried out by the World Bank, Colombia experiences an average of 1.2 power outages in a typical month. The value lost due to these power outages is estimated to be around 1.8% in terms of sales (compared to 3.3% of sales in the region of Latin America and the Caribbean). Often the government blames power outages on rebel attacks, given the vulnerability of electricity towers.

- 16 http://ac.els-cdn.com/B9780080450308500199/3-s2.0-B9780080450308500199main.pdf?_tid=9ffc70d8-cd93-11e4-a1b6-00000aacb361&acdnat=1426699645_113df 4818de08dedfe5076c5074726d8
- 17 http://www.eprg.group.cam.ac.uk/wp-content/uploads/2014/02/1403-PDF.pdf
- 18 http://ac.els-cdn.com/B9780080450308500199/3-s2.0-B9780080450308500199main.pdf?_tid=9ffc70d8-cd93-11e4-a1b6-00000aacb361&acdnat=1426699645_113df 4818de08dedfe5076c5074726d8



Figure 11. Colombia SAIDI and SAIFI 2008-2013. Source: EPSA 2014 (http://siper.cecacier.org/assets/es/docs/presentaciones/12-smart-grid-colombia.pdf)

EXPOSURE TO SEVERE WEATHER

The World Risk Index measures a country's vulnerability and exposure to severe weather, disaster risk and environmental degradation. According to the World Risk Report (2012), relative to other countries Colombia has a medium level of exposure to natural hazards including earthquakes, storms, floods, droughts and sea level rise. Colombia ranked 81st out of 173 countries. The main natural hazards to which Colombia is exposed are volcanic eruptions in the highlands (the last one occurring in 2010), occasional earthquakes, and periodic droughts and floods.

Due to El Niño and La Niña events and the country's high reliance on hydropower, Colombia has historically experienced energy shortages every three to five years.¹⁹ Through reduced reliance on hydro resources over time, the government has become increasingly adept at managing the impacts of El Niño on energy supply and the country has become less vulnerable.

Value lost to electrical outages was 1.8% of total sales compared to a regional average of 3.3% Colombia has a relatively high adaptive capacity, which is related to its ability to adapt to future natural events and climate change. However, it also has a relatively high lack of coping capacity due to weak governance and material security. The following are the details of Colombia's scores per the 2012 World Risk Report:²⁰

19 http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=785784&url=http %3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F39%2F17037%2F00785784. pdf%3Farnumber%3D785784?

20 https://www.ehs.unu.edu/file/get/10487.pdf

- Exposure = 13.84% (medium): Related to exposure of population to natural hazards, earthquakes, storms, floods, droughts and sea level rise
- Vulnerability = 49.8% (medium): Sum of susceptibility, lack of coping capacities and lack of adaptive capacity
- Susceptibility = 29.73% (medium): Measures public infrastructure, nutrition, income and economic framework
- Lack of coping capacity = 76.89% (high): Measures governance, medical care and material security
- Lack of adaptive capacity = 42.75% (low): Related to future natural events and climate change





Efficiency of electricity supply (Control over rising electricity costs)

Indicators

Residential prices (US\$/MWh)

\$192.25

Industrial prices (US\$/MWh)

\$126.62

Power transmission and distribution losses (2011)

12%

SUMMARY OF KEY FINDINGS

Colombia's residential energy prices are among the most expensive in Latin America, higher than Chile, Brazil and Peru. This is due in large part to its residential energy tariff which is the most expensive in Latin America at US\$192.25 per MWh as compared to US\$188.19 per MWh in Chile, US\$141.52/MWh in Peru, and US\$132.4/MWh in Brazil. Industrial prices are similarly high, though they are lower than in Chile. Both residential and industrial prices are significantly higher than in Canada. Power losses also contribute to high prices, and are overwhelmingly concentrated in distribution. Though they have decreased significantly in the past few years and are now below the average for Latin America and the Caribbean, they are still higher than countries such as Canada. These high prices combined with challenges to quality and resilience of the supply may lead consumers to seek alternative energy sources and home energy management systems to reduce their costs. Although these technologies are not yet popular in Colombia, increasing market presence and initiatives undertaken by the government and other organizations are leading to raised awareness and interest. Canadian cleantech companies will have much to offer this growing market as opportunities arise.



ELECTRIC POWER TRANSMISSION AND DISTRBUTION LOSSES (% OF OUTPUT)



WHOLESALE MARKET PRICES

In 2014, average energy stock prices were 4.71 COP/KWh higher than in 2012.

In 2008 and 2009, there was a rapid increase in wholesale electricity prices in Colombia. In 2009, Frank Wolak of Stanford University identified four issues with the existing electricity market design that may have contributed to periods of high short-term prices:

- The limited flexibility in the offer curves that suppliers submit to the wholesale market enhances the ability of suppliers to exercise unilateral market power
- 2 The immediate public release of information on market behaviour enhances the ability of suppliers to raise wholesale prices
- 3 The use of the same offer price in the supply curve as the one a generation unit owner submits to the Bolsa and to the pay-as-bid auction for automatic generation control services
- 4 The challenge of how to allow co-generation units owned by large industrial and commercial customers to participate in the short-term wholesale market²¹

HOUSEHOLD PRICES

In 2013, Colombia's residential energy tariff totaled US\$0.19/ kWh, making it among the most expensive in Latin America.

In 2014, Colombia's average residential electricity price was US\$192.25/MWh-higher than Chile, Peru and Brazil. In 2014, costs in Chile were US\$188.192/MWh. In Peru household prices were US\$141.522/MWh, and in Brazil, average residential prices were US\$132.404/MWh.



AVERAGE RESIDENTIAL ELECTRICITY PRICE (USD/MWH)



AVERAGE INDUSTRIAL ELECTRICITY PRICE (USD/MWH)



Figure 14. Average industrial electricity price, 2014. Source: Climatescope.



Figure 15. Wholesale market prices 2014. Source: EMIS 2014





Figure 16. Levelized cost of renewable energies versus 2011 wholesale energy prices. Source: REGSA Project 2012, www.regsa-project.eu/downloads/Public%20 documents/regsa_summary.pdf

INDUSTRY PRICES

The average industrial electricity price in Colombia in 2014 was \$126.62, coming in significantly higher than the average price in Peru (US\$76.11 per MWh), slightly higher than Brazil (US\$125.22) and markedly lower than in Chile (US\$150.67).

Figure 16 shows data from the REGSA Project that compares 2011 wholesale energy prices in Colombia and other Latin American countries to the levelized cost of energy for different renewable energies.

POWER TRANSMISSION AND DISTRIBUTION LOSSES

Total losses in Colombia decreased between 2010 and 2011, leaving total losses in 2011 at 7,430,000,000 kWh. These losses are considerably higher than in Chile, which also showed decreased losses between 2010 and 2011, with a total of 4,687,000,000 kWh lost in 2011. However, losses were considerably lower than in Brazil, which saw losses of 87,524,000,000 kWh in 2011 (a growth of just under 2,000,000,000 kWh over 2010). According to the IADB, Colombia's electricity losses ratio in 2012 was 20%, slightly above the Latin American country average of 17%.²² Colombia's ratio has increased by about one percentage point since 2010.²³ Colombia's electricity losses ratio is greater than that of Brazil, Argentina and Chile. Similar to other countries in Latin America, losses are overwhelmingly concentrated in energy distribution (only 1.9% of losses occur in transmission). The cost of electricity losses in Colombia is estimated at between 0.22% and 0.32% of GDP.

Colombia's pricing scheme promotes a reduction in transmission and distribution losses through rewarding over-performance and penalizing underperformance. The regulator has established a cap on losses that can be passed on to consumers through tariffs, meaning utilities have to cover additional losses.²⁴

- 22 http://www10.iadb.org/intal/intalcdi/PE/2014/14933.pdf
- 23 http://www10.iadb.org/intal/intalcdi/PE/2014/14933.pdf
- 24 http://www10.iadb.org/intal/intalcdi/PE/2014/14933.pdf

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Indicators

Urban population growth

1.7%

GDP growth (annual)

4.7%

Per capita usage (year-on-year change)

44 ktoe (7%)

SUMMARY OF KEY FINDINGS

Energy demand in Colombia is steadily growing, particularly in urban centres such as Bogota, Cali, Medellin and Barranquilla. This is due in large part to the growing urbanization of Colombia's population, as well as strong economic growth. Coverage rates are significantly higher in large cities compared to smaller ones, where it can be as low as 40%. While national per capita energy use has only increased 7% from 2007-2012, demand is much higher in the country's biggest cities. To satisfy growing demand, the government has developed a strategy to increase hydroelectric, gas-fired and coal power generation. In addition, a law passed in 2014 seeks to advance the integration of non-conventional renewable energy sources into the national energy system. As it has only recently come into effect, specific incentives and mechanisms to promote investment, research, and deployment of cleantech in the energy system are still being developed. However, this shift in regulation as well as unmet demand should lead to new market opportunities for cleantech deployment.

Table 5.

Support for electricity demand growth. This table considers six indicators that offer insights into projected changes in demand for electricity. Source: World Bank Group.

					Per capita energy
	Urban population	Economic growth	Per capita energy	Per capita energy	use: difference 2007-
Country	growth (2013)	(GDP, 2013)	use 2007 (kg of oil)	use 2012 (kg of oil)	2012
Canada	1.4%	2.0%	8262	7270	-12%
Chile	1.1%	4.1%	1834	1874	2%
China	2.9%	7.7%	1551	2029	31%
Colombia	1.7%	4.7%	627	671	7%



URBAN POPULATION GROWTH

Colombia is a highly urbanized country: 75% of the population lives in cities, with 30% of the population concentrated in Bogota, Cali, Medellin and Barranquilla.²⁵ There are also a growing number of small and mid-sized cities in the country. In 2006, the number of cities with more than 100,000 inhabitants grew to 33.

Figure 18 shows how access to basic services, including electricity, has evolved in cities of different sizes. It shows that coverage rates for smaller cities in Colombia are lower, at approximately 40%.

25 http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-9522-6

URBAN POPULATION TRENDS (AS A PERCENTAGE OF TOTAL POPULATION)



Figure 17. Urban population trends, measured as a percentage of total population. Source: United Nations



Figure 18. Evolution of access to services based on city size. Source: World Bank 2012

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CHANGE IN ENERGY USAGE

Electricity growth (year-on-year) was 4% in 2013, down from 4.7% in 2005. This growth was fuelled by rising consumption from both private and household users. The strong growth of the Colombian economy also contributed to growth rates for the power generation sector, due to increasing electricity consumption by public companies.²⁶

UPME's 2013-2027 electricity strategy is to enhance power sector capacity and encourage investment in the energy sector to satisfy growing electricity demand. The government plans to increase Colombia's power generation during the period by an annual average of 3.4% to 76.0 TWh. This includes an average annual increase of:

- Hydroelectric power generation by 3.6%
- Coal generation by 2.9%
- Gas-fired generation by 2.7%

Tables 3 and 4 are adapted from UPME. They provide low, medium and high forecast scenarios for Colombia's national electricity demand and national maximum capacity through 2027.

Table O	: National electr	icity demand (G	wii) iorecasi			
National	National electricity demand (GWh) forecast					
Medium						
Year	Low scenario	scenario	High scenario			
2015	63,983	65,526	67,070			
2017	68,572	70,172	71,7733			
2019	74,276	75,944	77,613			
2021	78,040	79,786	81,531			
2023	82,995	82,825	84,654			
2025	84,610	86,529	88,448			
2027	88,250	90,265	92,279			

Table 7: Forecast of national maximum capacity						
Forecas	Forecast of national maximum capacity (MW)					
	Medium					
Year	Low scenario	scenario	High scenario			
2015	10,272	10,524	10,776			
2017	10,662	10,923	11,184			
2019	11,124	11,396	11,668			
2021	11,641	11,926	12,120			
2023	12,202	12,500	12,798			
2025	12,800	13,113	13,426			
2027	13,434	13,673	14,091			





²⁶ http://www.securities.com/emis/sites/default/files/EMIS%20Insight%20-%20 Colombia%20Power%20Sector%20Report.pdf



SUMMARY OF KEY FINDINGS

The majority of Colombia's renewable generation is large hydro, with only 3.3% coming from non-hydroelectric sources. This is similar to Canada's 3.5% share, as both countries have significant hydroelectric resources and fewer other sources of renewable generation in the mix. The Colombian government seeks to nearly double that number by 2020, as well as increase the amount of renewable energy in the total energy mix. This similarity may create opportunities for Canadian companies with expertise and technology suited for hydroelectric generation. Furthermore, Colombia has some of the highest energy potential in Latin America due to its climate and geography which are well suited for investment in renewable energy generation. Colombia's climate and renewable energy targets are less ambitious than other markets in Latin America, such as Chile. Though Colombia is party to the Kyoto Protocol, as an Annex II country they are not required to make carbon emissions reduction commitments. Without such a commitment there is less pressure to invest in renewable energy for environmental sustainability. However, to reach existing targets as well as meet unmet demand and secure the energy supply, increases in smart grid and other cleantech deployment will be required.

Table 8. Pollution levels, as measured by PM10 particulate (μg/m3). Source: World Bank Group.				
Country	Rank			
Canada	10 (Low)			
Chile	46.2 (Medium)			
China	60.24 (High)			
Colombia	19.73 (Low)			

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Table 9.

Climate change targets and commitments. Source: Climate Action Tracker and United Nations Environment Programme.

Country	Rank
Canada	Reduce emissions to 17% below 2005 levels by 2020
Chile	Reduce emissions to 20% below business as usual (projected from 2007) levels by 2020
China	40-45% CO ² per unit of GDP below 2005 levels by 2020
Colombia	None

RENEWABLE ENERGY CAPACITY

There have been few major advances in the use of renewable energy in Colombia. This is largely a result of insufficient government incentives and a lack of information on the potential of various renewable energies.

Table 10. Renewable energy net energy capacity: Colombia				
Renewable energy source	Effective capacity (MW)			
Hydropower	9,415			
Thermal	4,521			
Small hydropower	560.98			
Small thermal	88.35			
Bagasse-based cogene- ration	66.30			
Wind power	18.42			
Total effective capacity	14,665.05			
Source: EMIS 2014				

POLLUTION LEVELS

The mean annual exposure of Colombians to PM10 particulate levels is $19.73 \leftrightarrow g/m3$ (in 2009). This is relatively low compared to other countries in the region, however some regions and cities have significantly higher particulate levels. Air pollution is an issue especially in the city of Bogota, due to vehicle emissions.

Renewables in electricity generation (non-hydropower)



Figure 19. Targeted and actual share of renewables in electricity generation, excluding hydropower. Source: REN21 and IEA. Note: Information not available for China.

CLIMATE CHANGE TARGETS

Colombia is a party to the Kyoto Protocol and the United Nations Framework Convention on Climate Change (UNFCCC); however, as an Annex II country, it has no CO2 reduction commitments. As such, its climate change target sensitivity is zero given that there are no plans in place to reduce national emissions.

NATIONAL STRATEGY FOR RENEWABLES

Currently, renewable energy represents 3.3% of electricity generation in Colombia. The government has set a target of increasing renewable energy to 6.5% of total energy production by 2020.

As mentioned, there have been no major advances in the use of renewable energy in the country. Progress has likely been hindered by insufficient government incentives and a lack of general awareness of the potential of various renewable energies. Currently, the national government does not provide significant subsidies for renewables. In 2014, however, the government passed Law 1715, which is designed to advance the integration of non-conventional renewable energy sources into the national energy system. As the law recently came into effect, specific incentives and mechanisms to promote investment, research, and deployment of cleantech in the electricity market are still being developed. As a result, tangible outcomes for Canadian companies are unclear, but the law does signal a shift towards a renewable energy future that should present new market opportunities.

SMART GRID OVERVIEW

In 2010, a workshop called Technology and Implementation of Smart Grids in the Colombia Electrical Sector organized by Colombia Inteligente – a coalition of industry organizations involved in the operation of the Colombian power grid – and the U.S. Trade and Development Agency brought together over 125 participants from the private, academic and public sectors to create a roadmap for the Colombian electricity industry. The objective of the roadmap is to help orient and focus the efforts of the industry toward implementing a smart grid.

This roadmap is the first step the country has taken toward looking at a smart and efficient energy system. The next stage is anticipated to be the development phase (2012-2025), where new smart technologies become part of the Colombian electrical sector. The final phase is the consolidation phase (2026 onward), where the country orients itself to efficient and environmentally friendly systems as new technologies join the grid. The workshop participants identified ten challenges for the deployment of a smart grid in Colombia. Of these, five (in red) were designated as the most important:

- 1 Service quality
- 2 Coverage of non-interconnected zones
- **3** Reliability
- 4 Industrial and technological development
- 5 Energy efficiency
- 6 Market structure
- 7 Commercial management
- 8 Asset management
- 9 Demand side management
- 10 Energy security
- 27 http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=785784&url=http %3A%2F%2Fieeexplore.ieee.org%2Fiel5%2F39%2F17037%2F00785784. pdf%3Farnumber%3D785784?



Figure 20. A roadmap for the implementation of a smart grid in the electrical sector. Source: Adapted from Hammons et al., (1999). Competitive Generation Agreements in Latin American Systems with Significant Hydro Generation. Powered Engineering Review, IEEE (Volume 19, Issue: 9)²⁷





Indicators

Corruption index score

94/175

Ranking: "Ease of doing business" index

34/189

Political stability (scale = -2.5 to 2.5)

0.39

Regulatory quality (scale = -2.5 to 2.5)

0.39

Rule of law (scale = -2.5 to 2.5)

-0.45

SUMMARY OF KEY FINDINGS

Colombia is the top-ranked Latin American and Caribbean country for ease of doing business, a metric which considers getting credit, paying taxes, and dealing with construction permits, among other factors. Within Colombia, the top cities for doing business include Manizales, Ibague, and Bogota. Cities such as Medellin also offer benefits to foreign companies that build factories and establish offices in their jurisdiction. Although Colombia is relatively politically unstable compared to most countries in the region, there are many policies in place that enable a good business environment for foreign investors. This, combined with the Canada-Colombia free-trade agreement,²⁸ fosters an attractive investment climate for Canadian companies. However, companies should be aware of regional variances in stability, regulations, and business environment prior to entering the market.

Table 11.

Ease of doing business ranking compared to priority markets. Source: World Bank Group.

Country	Ease of Doing Business Ranking (out of 189 countries)
Canada	16
Chile	41
China	90
Colombia	34

Table 12. Summary of business environment indicators. Source: World Bank Group and United Nations.						
Country	Political Stability (Score -2.5 to 2.5)	RRegulatory Quality (Score -2.5 to 2.5)	Rule of Law (Score - 2.5 to 2.5)	Roads Paved (%)		
Canada	1.03	1.71	1.74	39%		
Chile	0.37	1.48	1.34	24%		

-0.31

0.39

28 http://www.international.gc.ca/trade-agreements-accords-commerciaux/agr-acc/ colombia-colombia-toc-tdm-can-colombia.aspx?lang=eng China

Colombia

-0.55

-1.27

-0.46

-0.45

64%

14%

CORRUPTION AND GOVERNMENT RESPONSE

Transparency International ranks Colombia 94th out of 175 countries in its Corruption Perception Index of 2014. A 2010 study by Transparenciá por Colombia and the Externado University of Colombia stated that 93% of Colombian corporate executives surveyed reported that bribes were paid in the course of their business activities.

The government of President Juan Manuel Santos implemented the new anti-corruption act in 2011 and created a new anti-corruption office overseen by the presidential administration. Colombia still faces several inherent corruption challenges: the collusion of the public and private sectors, clientelism and policy capture by organized crime, the lack of state control and weak service delivery in remote areas of the country, and an inefficient criminal justice system. The government's ability to deal with corruption depends on its capacity to enforce its legal framework and implement its strategic commitments against corruption.

TABLE 13

Transparency International Corruptions Perception index ranks (from 1 to 175 where 1 is the least corrupt), and scores (from 1-100 where 100 is the least corrupt).

Source: Transparency International.

Country	Rank/175	Score/100	
Colombia	94	37	
Canada	10	81	
CHILE	21	73	
China	100	36	
Mexico	103	35	

EASE OF DOING BUSINESS

As of June 2014, Colombia ranked 34th out of 189 countries in terms of ease of doing business. The ranking takes into account many metrics, including the ease of starting a business, dealing with construction permits, getting electricity, getting credit and paying taxes. It is the top-ranked country in which to do business in Latin America and the Caribbean. Nationally, the top three cities in which to do business are Manizales, Ibagué and Bogotá (see Table 14 for top 10).

Table 14. Top 10 cities in Colombia for doing business. Cities are ranked (out of 23) according to various indicators including ease of starting a business, dealing with construction permits, registering property, and paying taxes. Source: World Bank Group.

Francowy	Ease of Doing Busi-	Starting a Dusiness	Dealing with Con-	Desistaring Draparty	Daving Taxos
Economy	HESS RAHK	Starting a business	struction Permits	Registering Property	Paying laxes
Manizales	1	7	4	1	3
Ibagué	2	4	15	1	1
Bogotá	3	7	7	4	16
Armenia	4	1	3	14	10
Pereira	5	3	1	13	10
Santa Marta	6	2	5	9	21
Dosquebradas	7	23	2	11	2
Valledupar	8	21	19	3	8
Neiva	9	9	13	12	9
Montería	10	20	6	17	4



The most significant barriers to doing business in Colombia include:			
Framework for government procurement	Colombia has struggled with the requirements of the existing government procurement framework, which calls for open bidding in public tenders. With the current system, the process can lack transparency, fairness and competitive bidding for many tenders.		
Legal services	Only firms licensed under Colombian law may provide legal services. Foreign law firms can operate in the country by forming a joint venture with a Colombian law firm and operating under its lawyers' licences.		
Restrictions on foreign providers of professional services	Economic needs tests are required when foreign providers of professional services operate temporarily. Residency requirements restrict trans-border trade of certain professional services, including architecture, engineering and urban planning.		
Commercial presence	A commercial presence is required to bid on Colombian government contracts.		
Restrictions on foreign nationals as employees	For firms with more than ten employees, no more than 10% of the general workforce and 20% of specialists may be foreign nationals.		
Insurance	Insurance companies are restricted from offering policies to underwrite risk on government-sponsored infrastructure projects as Colombian regulations do not recognize insurance policies as equivalent to bank guarantees.		
Intellectual property protection	Colombia has been on the Special 301 Report "Watch List" since 1991, which reflects the country's ongoing challenges in the enforcement of intellectual property rights.		
	Customs duties have been consolidated into three tariff levels:		
Customs duties	 0% to 5% percent on capital goods, industrial goods and raw materials not produced in Colombia 		
	10% on manufactured goods, with some exemptions		
	• 15% to 20% on consumer and sensitive goods.		
Payment of taxes	tax (sales tax), and labour taxes are extremely high at 239 hours, compared to an OECD average of 175.		

POLITICAL STABILITY AND DOMESTIC SECURITY

GUERRILLA WARFARE AND THE PEACE PROCESS

The deep political divisions shaping Colombia's modern development have strong historical roots. The political tension between the conservative right and progressive left came to a head in La Violencia (1948-1958), a period during which an estimated 250,000 people died.

During the 1960s, several guerrilla groups emerged due to continued social, economic and political problems. Of these groups, the Revolutionary Armed Forces of Colombia– People's Army (FARC) and the smaller Ejercito Nacional de Liberacion (ELN) emerged as the major guerrilla groups. Their struggle has largely lost its ideological drive, and in the 1980s and 1990s the two groups became heavily involved in the lucrative narcotics and kidnapping industries.

Violent crime and kidnappings, while still prevalent, decreased significantly under President Uribe, who was elected in 2002. Throughout Uribe's presidency, FARC suffered some significant setbacks in its guerrilla campaign and its control of areas of the Colombian countryside diminished. Peace talks between FARC and the Colombian government commenced in Havana, Cuba, in November 2012. The government and FARC announced in May 2013 that an agreement had been reached on agrarian reform, which included a land fund to redistribute illegally held or underused land to displaced people. Negotiations continue with varying degrees of optimism.

DRUG TRAFFICKING

Colombia is a major global supplier of cocaine, marijuana and heroin. The illicit narcotics trade is estimated to be worth around 5% to 10% of the GDP. The cultivation and trafficking of drugs continues to have a negative impact on security, the formal economy and the environment. In particular, the use of fragile tropical and jungle ecosystems to grow cocaine, including the use of agricultural chemicals, has caused considerable environmental harm.

FOREIGN DIRECT INVESTMENT

The Colombian government actively encourages foreign direct investment (FDI) and received \$15 billion in FDI in 2012. The annual level of foreign direct investment–notably in the oil and gas sectors–reached a record high of \$16.8 billion in 2013, a 7% increase over 2012, and equivalent to 4.5% of the country's GDP. Of the total FDI, 46.7% of inflows were to the mining sector, 15.9% to manufacturing, 10.4% to transport and communications, and 9.4% to commerce. The Ministry of Trade, Industry and Tourism is responsible for formulating foreign investment policy along with the Ministry of Finance and Public Credit.

All foreign direct investment that involves the establishment of a commercial presence in Colombia requires registration with the Superintendent of Corporations ("Super Sociedades") and the local chamber of commerce.

Colombian law regulates the number of foreign personnel in several professional areas, such as architecture, engineering, law and construction. For firms with more than 10 employees, no more than 10% of the general workforce and 20% of specialists can be foreign nationals.

Year	Government economic policies
2010	 Streamlined the securing of construction permits by introducing regulations that categorize building projects on the basis of risk and allow electronic verification of certain documents
	 Improved access to credit information by guaranteeing borrowers' right to inspect their own data and by making it mandatory for credit providers to consult and share information with credit bureaus
	 Strengthened investor protections by making it easier to sue directors when a related-party transaction harms a company
	 Made payment of taxes easier and less costly for companies by introducing electronic filing and payments, and by reducing some payments
2011	• Eased the process of starting a business by reducing the number of days needed to register with the Social Security System
	Simplified the securing of construction permits by improving the electronic verification of pre-building certificates
	Eliminated upfront payment of the commercial licence fee
2012	• Eased the administrative burden of tax payments for firms by establishing mandatory electronic filing and payment for some of the major taxes
2013	• Eliminated the requirement to purchase and register accounting books at the time of incorporation
2014	• Simplified the process of getting electricity by opening a one-stop shop for electricity connection and improving the efficiency of the utilities' internal processes
	Simplified and sped up the proceedings for commercial disputes, making it easier to enforce contracts
	•••
	Streamlined the process of transferring property by eliminating the need for a provisional registration
	• Improved access to credit by adopting a new secured transaction law that establishes a functional secured transactions system and a centralized, notice-based collateral registry. The law offers several benefits, including:
	Broadening the range of assets that can be used as collateral
2015	Allowing a general description of assets granted as collateral
	Establishing clear priority rules inside bankruptcy for secured creditors
	 Setting out grounds for relief from stay of enforcement actions for secured creditors during reorganization procedures
	Allowing out-of-court enforcement of collateral
	 Made the payment of taxes more complicated for companies by introducing a new profit tax (CREE), though it also reduced the corporate income tax rate and payroll taxes



FINANCIAL SYSTEM OVERVIEW

Colombia's financial system operates under the supervision of the Financial Superintendent, a financial institution created in 2005 from the merger of the Banking Superintendent and the Stock Exchange Superintendent. The financial system is relatively large in comparison with the nation's gross domestic product. It has many highly sophisticated institutions with stateof-the-art technology. However, financial services are still very costly and intermediation remains the most important financial activity.

REFORMS

In 2009, a new law reforming the financial sector was passed. The reforms increased protection for financial customers, including requirements that financial institutions properly disclose the costs associated with their operations. They also forbade agreements in which consumers waived their rights and provisions, which has shifted the burden of proof to consumers. The reforms created specific roles for "Advocates for financial consumers," and every financial institution must have such an advocate–i.e., someone who is responsible for ensuring that financial institutions do not violate consumers' rights.

The new law also introduced greater flexibility to the pension fund system by creating a multi-fund structure to allow for various risk investment profiles. It allows foreign banks and foreign insurance companies to operate locally without having to incorporate a Colombian entity, although they do have to set up a branch in Colombia, subject to all relevant legal requirements.

Lastly, the law establishes mechanisms to promote microfinance, securitization and the development of capital markets.

FOREIGN EXCHANGE

Colombia imposes no foreign exchange controls on trade. However, exchange regulations require that the following transactions be channelled through intermediaries (i.e., banks or other recognized financial institutions) that are authorized for such purposes, and that they be declared to the Central Bank:

- · Imports and exports of goods
- External loans and related financing costs
- Investment of capital from abroad and remittances of profits thereon
- Investment of Colombian capital abroad, as well as remittances of yields
- Investment in foreign securities and assets and their associated profits
- Endorsements and guarantees in foreign currency
- Derivative or secondary financial operations, (e.g., forwards, swaps, caps, floors or collars)

SECURING CREDIT

The government and the Central Bank are important sources of funding for the financial system. The Central Bank, in addition to providing the usual discount facilities to support system liquidity, manages several special government funds that promote lending to sectors that have been deemed economically essential or key to national development. The funding comes from government capital and bonds, as well as fiscal appropriations, if needed to cover deficits. Access to the funds tends to require considerable paperwork: applicants must qualify and margins are limited. The importance of funds as a financing resource has diminished in recent years.

Leasing as well as domestic and international (both operating and capital) financing are becoming popular, mainly because of the tax benefits. Factoring and international credit insurance is available. Transactional financing tends to be associated with trade in consumer goods, while equity-based financing is more commonly used for project financing.

Colombian exporters have access to credit offered by the Colombian Foreign Trade Bank (Bancoldex). This credit is also extended to Colombian importers for industrial imports. Foreign investors have full access to local credit. While the Colombian government directs credit to some sectors (notably agriculture), the private financial market is the predominant source of credit allocation. Loans of foreign origin and the foreign financing of imports are permitted.



CANADA-COLOMBIA RELATIONS

After many years of being focused on domestic developments, Colombia is promoting itself as being open for business and as a global partner for co-operation, including trade, investment, security, technology, education and energy. The Santos administration has significantly expanded Colombia's international engagement, both bilaterally and multilaterally.

Colombia is Canada's fourth-largest export market in South America. Canada's merchandise exports to Colombia totalled \$716.8 million in 2013 and included machinery, cereals, motor vehicles, vegetables, paper and paperboard. Imports from Colombia reached \$691.3 million in 2013 and included coal, crude petroleum, coffee, cut flowers, fruit and sugar. Bilateral merchandise trade between Canada and Colombia reached \$1.4 billion in 2013.

Colombia is Canada's fifth-largest trading partner in Latin America and the Caribbean (excluding Mexico). Canadian direct investment in Colombia reached nearly \$1.8 billion at the end of 2012, making Colombia the fifth-largest investment destination in South and Central America.

The Canada-Colombia Free Trade Agreement, as well as parallel agreements on labour co-operation and the environment, came into force on August 15, 2011. In May 2010, Canada and Colombia also signed an agreement regarding annual reports on human rights and free trade between the two countries.

US-COLOMBIA RELATIONS

The United States is Colombia's most important trading partner. The US-Colombia free trade agreement came into effect in May 2012. It is an additional boost to Colombia's most significant trading relationship, which in 2012, accounted for 36.9% of Colombia's merchandise exports and 24.3% of its merchandise imports. US-Colombia engagement is growing following the co-operation and achievements of Plan Colombia, a US military and diplomatic aid initiative to combat the drug trade as well as insurgent groups - the US aid package created in 2000 which has provided Colombia with over US\$5 billion to combat drugs and contribute to peace.

INFRASTRUCTURE

The country is implementing an aggressive infrastructure investment program, which is expected to drive growth in 2015 and 2016. Specifically, investments in large-scale public works programs are being used to offset declining oil prices and rising US interest rates.

Transportation poses challenges in Colombia. Colombia has 164,000 km of roads, of which approximately 14% are paved. The rail system is small and out-dated, with only 3,313 km of railways in the country. Transportation costs are relatively high: the country has the second-highest cost of transportation in South America. In November 2011, the government announced a plan for ambitious reforms and created the Colombian National Infrastructure Agency (ANI). The agency introduced an ambitious plan of private public partnerships (PPPs) to attract \$20 billion to \$50 billion in funding from 2011 to 2021. Its goals include increasing:

- Four-lane highways by 100%
- The length of its operating railways by 50%
- The loading capacity of seaports by 50%
- The capacity to transport passengers at airports by 35%

Some of the infrastructure in Colombia, including oil and gas pipelines, rail lines, and electricity transmission lines and towers, are vulnerable to insurgent attacks. They have in the past been the target of bombings since they are seen as easy targets.

The National Transmission System (STN) connects electricity generators to traders, and is regulated by the CREG. The government-controlled Interconexion Electrica S.A. (ISA) is the only energy transporter in Colombia with national coverage. It has one of the largest transmission networks in Latin America, including direct connections that link Colombia to Venezuela, Ecuador and Panama.



INTERNATIONAL ORGANIZATION MEMBERSHIP AND ENGAGEMENT

Colombia is a founding member (along with Chile, Mexico and Peru) of the outward-looking and trade-liberalizing trading bloc, the Pacific Alliance. Colombia served as a non-permanent member of the UN Security Council for 2011-12, and commenced accession to the OECD in June 2013. Colombia is an active member of the Forum for East Asia-Latin America Cooperation (FEALAC). It is seeking membership in Asia-Pacific Economic Cooperation (APEC) and has expressed interest in participating in the Trans-Pacific Partnership Agreement (TPP) negotiations.

Constructive relations within Latin America and the Caribbean are also a priority for Colombia. Following a dispute in 2008, which led to interruptions in diplomatic ties, relations with neighbours Venezuela and Ecuador have been stable. Colombia is an active member of the Association of Caribbean States, and the Organization of American States (OAS). A territorial and maritime dispute with Nicaragua, on which the International Court of Justice (ICJ) ruled in 2012 that Colombia would cede maritime territory, is a source of tension with its northern neighbour. Colombia completed negotiations for a free-trade agreement (FTA) with the Republic of Korea in June 2012. The FTA is Colombia's first in the Asia-Pacific region and is seen as a further bridge toward greater integration. In May 2012, during a visit to China by President Santos, Colombia and China signed nine agreements, and agreed to commence an FTA feasibility study.

MULTILATERAL FUNDING AGENCY ENGAGEMENT

Multilateral agencies, such as the World Bank through the International Finance Corporation (IFC), the Inter-American Development Bank (IDB), the Andean Development Corporation (CAF), the Export Import Bank of Japan, and USAID (and development agencies of Japan and Canada), are active in providing financing for projects in Latin America and the Caribbean.

The Andean Development Corporation (Corporacion Andina de Fomento) is the only organization to provide major direct financing for greenfield projects in Colombia. The CAF has provided direct financing to the private sector for the development of greenfield projects in various infrastructure sectors.

INTER-AMERICAN DEVELOPMENT CORPORATION

The Inter-American Development Corporation (IADC) provides development capital to agricultural export businesses through Colombia's development capital fund, "Corfisura Fondo de Desarrollo de Empresas".

WORLD BANK

In 1994, with Law 149, Colombia signed onto the Multilateral Investment Guarantee Agency (MIGA), created in 1985 by the World Bank to stimulate the flow of investment for between member countries and, in particular, toward developing countries, with the overall aim to boost prosperity.



Government and regulatory environment

Indicators

Financial incentives

Public financing

Regulatory policies

Medium Medium

SUMMARY OF KEY FINDINGS

The Colombian government has fewer policies that are directly supportive of cleantech deployment and energy innovation than other Latin American countries such as Chile. On the other hand, it actively encourages and seeks foreign direct investment from countries such as Canada. Due to the lack of financial incentives and private financing available within Colombia. Canadian companies need to be well-funded to enter the market. Despite the lack of finance available, the market opportunities for cleantech are growing as a result of consumer demand and government initiatives. Furthermore, due to all of the considerations analyzed in previous sections, such as decreasing fossil fuel reserves and increasing consumer demand for an efficient and secure energy supply, it is clear that Colombia's energy system could greatly benefit from integration of advanced energy technologies.



LEVEL OF GOVERNMENT SUPPORT FOR CLEANTECH

1 point awarded for every supportive policy out of 10

Figure 21. Comparative levels of government support for cleantech in priority markets. Scores were compiled based on whether or not a government had implemented financial incentives, public financing and regulatory policies in support of cleantech deployment (see Table 15 for more detail).



TABLE 15.

Measuring government support for cleantech across markets. Includes: financial incentives (FI), public financing (PF), and regulatory policy (RP).

Measuring Government Support for Cleantech					
Indicator	Colombia	Chile	China	Canada	
National strategy for renewables?	Yes	Yes	Yes	Yes	
FI: Capital subsidy, grant or rebate	No	Yes	Yes	Yes	
FI: Tax incentives	Yes	Yes	Yes	Yes	
FI: Energy production payment	No	Yes	Yes	No	
PF: Public investment, loans	Yes	Yes	Yes	Yes	
PF: Public competitive bidding	No	Yes	Yes	Yes	
RP: FIT	No	No	Yes	Yes	
RP: Utility quota obligation	0.0%	5%	15.0%	Sub-national (varies)	
RP: Net metering	No	Yes	No	Yes	
RP: Obligation and mandate	Yes	Yes	Yes	Yes	
RP: Tradable renewable energy certs	No	No	No	No	

FINANCIAL INCENTIVES FOR RENEWABLES

Currently, the national government does not offer financial subsidies for renewable energy.

TAX EXEMPTIONS

Tax exemptions are available for the following:

- Small hydroelectric projects (< 20 MW)
- Equipment and machinery for cleantech programs, projects and activities when used as part of program or plan run by the Ministry of Environment and Energy
- Sales made by generation companies (wind, biomass or agricultural waste), which are exempt from income tax for 15 years
- Bioenergy producers, who can import machinery duty-free, are exempt from consumption tax and have a flat income-tax rate of 15%



⁶¹ http://transasialawyers.com/publicfiles/N2-Grasty-E.pdf

⁶² http://www.oas.org/dsd/SpecialMeetings/ChileMeeting/Garcia_OEA-CORF0%20 080711.pdf

LEGISLATION

Legislation	Description
Decree 2501 (2007)	 Ordered the issuance of technical regulations on energy efficiency to be applied across the board, including the products used in the transformation of energy, end-use products, government buildings, government-subsidized housing, public lighting and traffic lights. Notably, the decree established that, starting in 2010, developers of public housing had to incorporate energy efficient designs into housing construction in order to receive government subsidies
	Created PROORE (more information under government programs section)
Law 1715 (2014)	 Advanced the integration of non-conventional renewable energy sources into the national energy system. One of its key benefits is the integration of self-generated electricity, regardless of the resource, into the national grid
2010-2014 National	Set out new policies and the institutional architecture to address climate change
Development Plan (PND)	Strategies include the implementation of:
	 i) A national plan to adapt to climate change ii) A national plan to financially protect against climate-related disasters. Within this, the Colombian Strategy for Low Carbon Development (ECDBC) contains nationally appropriate mitigation actions (NAMAs) and a Low-Emission Development Strategy (LEDS). This outlines the economic, energy and emissions trajectory and helps identify leverage points for policy interventions.
Law 788 of 2002	 Created tax exemptions for 15 years on sales of electrical energy obtained from biomass, wind and agricultural wastes-provided they meet with the certified emission reductions requirements set by the Kyoto Protocol, and that the half of the income is invested in social benefit projects, such as Jepirachi Wind Park

PUBLIC FINANCING

CLEAN TECHNOLOGY FUND

The Clean Technology Fund has US\$150 million in financing for a range of urban transport and energy efficiency projects. It operates in co-ordination with the Inter-American Development Bank (IDB), the International Bank for Reconstruction and Development (IBRD), the International Finance Corporation (IFC) and key Colombian stakeholders.

he fund is expected to mobilize an additional US\$2.34 billion in public and private co-financing over the next ten years.

FUND FOR THE ELECTRIFICATION OF NON-INTERCONNECTED ZONES (FAZNI)

Administered by the Mining and Energy Planning Unit (UPME) of the Ministry of Mines and Energy, the Fund for the Electrification of Non-Interconnected Zones (FAZNI) focuses on energy expansion. Its objectives are to finance the plans, programs and projects of energy infrastructure investments in non-interconnected zones. One of three state funds within FAZNI, the National Royalties Fund (FNR), contributes to the National Development Plan by funding government projects. The FNR uses royalties from the exploitation of mining and energy resources. In July 2002, the Colombian Office for Climate Change Mitigation allocated resources from the FNR to be used to finance energy projects in the non-interconnected zones (ZNI) for 15 years. Notably, ZNIs comprise 66% of the country and require off-grid solutions. Using funds from the FNR, Articles 63 and 64 of Law 812 (2003) created a program to reduce non-technical barriers to energy supply in under-serviced neighbourhoods.

COLOMBIA'S NATIONAL RENEWABLE ENERGY TARGETS

CONNECTION STATUS	RE TARGET 2015*	RE TARGET 2020*
Sistema Interconectado Nacional (SIN) On Grid	3.5%	6.5%
Zonas No Interconectadas (ZNI) Off Grid	20%**	30%

* Figures do not include large hydro power

** 20% is made up of 8% presnet capacity adn 12% from wind, biomass, SHP, and solar energy

Figure 22. Colombia's national renewable energy targets. Source: Berkeley Rural Energy Group & Alliance for Rural Electrification. (2006). Colombia Off-Grid Market. The ARE Market Briefs Series, p.5.

RURAL ELECTRIFICATION FUND

The Rural Electrification Fund (FAER) allows local authorities, with support from local electricity providers, to develop priority investment plans, programs and projects to construct and install new electrical infrastructure.

The fund is administered by the Mining and Energy Planning Unit (UPME) of the Ministry of Mines and Energy.

RENEWABLE ENERGY PROGRAMS

Programs	Key stakeholders	Key objectives	Technology focus
Program of Rational and Efficient Use of Energy and Non-Conventional Sources in Colombia (PROURE)	Ministry of Mines and Energy	To promote the rational and efficient use of energy and non-conventional sources of energy in order to help ensure a full energy supply, grow the Colombian economy, protect consumers, and to advance the use of non-conventional sources of energy in an environmentally sustainable manner	Solar energy, geothermal energy, tidal energy, wind energy
Colombia Clean Energy Program (CCEP)	USAID, Ministry of Mines and Energy, Institute for Planning and Promotion of Energy Solutions in the Non-Interconnected Zones (IPSE), Mining and Energy Planning Unit (UPME), Power and Gas Regulatory Commission (CREG), municipal governments, private sector	To increase access to renewable energy sources and improve energy- efficient practices in Colombia through a combination of project development support, technical assistance, and the development of a financing environment that promotes investment in renewable energy and energy efficiency	Renewable energy, cleantech
Enhancing Capacity - Low Emissions Development Strategy (EC-LEDS) / Estrategia Colombiana de Desarrollo Bajo en Carbono (ECDBC)	Ministry of Environment and Sustainable Development, Colombia Department of National Planning (DNP), USAID	To identify and assess ways to prevent the rapid growth of greenhouse gas emissions as sectors grow-involves developing mitigation plans for each of the country's key sectors and promoting implementation tools, including a monitoring and reporting system	Clean energy



SMART GRID PILOT PROJECTS

Project	Characteristics
Universidad Industrial de Santander	This project designed two micro-grids to connect to the grid to reduce consumption, and installed micro-grids composed of a PV system on the main university campus.
Technology Smart Grid Implemen- tation in the Colombian Electricity Sector	This workshop studied transmission, generation, distribution, consumption and support areas and structured a proposal for a roadmap for the development of a Colombian smart grid.
Universidad Nacional, Universidad de los Andes, Pontificia Universidad Javeriana, Universidad Industrial de Santander, and CIDET, in association with CODENSA and COLCIENCIAS	This project aims to design a smart grid pilot either through CODENSA or on the campus of Universidad Nacional. The scope of this project includes distributed generation applications, storage, energy efficiency, advanced metering, demand response and EV technology support tools.
Interamerican Development Bank (IDB) "Analysis, assessment and recommendations for the successful implementation of a Smart Grid in Colombia" Project Number: CO-T1337 Operation Number: ATN/ KK-14254-CO	The IDB has provided financing of US\$760,000 to Colombia's Ministry of Mines and Energy and the Ministry of Information Technologies, of which a portion has been applied to a project called 'Analysis, evaluation and recommendations for the successful implementation of an intelligent network'. In mid-2014, the IDB issued a request for expressions of interest from eligible consultants specifically for services to identify feasible smart grid and information and communication technology solutions to be implemented in Colombia. Consultancy services will be based on technical and economic feasibility analyses, best practices for smart grid architecture design, and cost-benefit assessments. The Government of Colombia has provided US\$260,000 in counter-part financing to the project. According to the IDB project status, the project was March 31, 2015, however no findings from the feasibility studies have been published to date and can be expected in the coming months.
Celsia Flores IV	In 2011, Zone Franca Celsia (formerly Termoflores S.A E.S.P.) - a thermal plant consisting of two generating units located in Barranquilla - initiated a plant expansion project. The project resulted in the plant increasing its capacity by 169 MW, reaching a total output of 610 MW. Through converting two of the generation units - Flores II and III - to combined cycle, both units improved their efficiencies by 43%. The plant is now ranked among the most efficient plants in the Caribbean area. The project has resulted in an annual reduction of 500 kt of CO2 emissions. The project was financed with resources from Zone Franca Celsia, as well as a US\$150million loan from the International Finance Corporation (IFC), the Andean Development Corporation (CAF), and Deutsche Investitions-Und-Entwicklungsgesellschaft MBH (DEG). The project will be supported on the revenue obtained as a Special Plant, under the Reliability Charge granted for ten years.
U.S. Trade and Development Agency Feasibility Study Grant to	This grant was awarded in February 2014 to support the implementation of a one-megawatt demand-side management pilot project for EMCALI's distri- bution system, which can support over 25 MW of load management. EMCALI is a multi-sector utility owned by the Municipality of Cali. It has
EMCALI	selected the US firm Innovari Inc. to carry out the study and demonstrate that the utility can use an intelligent, dynamic load management system to manage peak demand and use resources more efficiently.

Appendix

ADMINISTRATIVE STRUCTURE: COLOMBIA

POLITICAL SYSTEM:

Colombia is a representative democratic republic with a central government and a separation of powers into three branches, the Executive, Legislative, and Judiciary.

Political Branch	Members	Term
Executive	President elected by direct vote	Renewable four-year term
Legislative (bicameral Congress)	Senate of 102 members	Four-year term
	House of Representatives of 165 members	Four-year term
Judiciary	 Supreme Court Prosecutor General Office Supreme Court Prosecutor General Office Superior Council of the Judiciary Constitutional Court Council for Administrative Law Jurisdiction 	Eight-year term

ADMINISTRATIVE STRUCTURE:



MINISTERIAL STRUCTURE:





INSTITUTIONS IN THE ELECTRICITY SECTOR

Institution	Description
Energy Regulatory Gas Commission (CREG)	This utilities regulator was established in 1994 through Laws 142 and 143. It establishes tariffs for regulated users (those with power demands under 0.1 MW and a monthly consumption below 55 MWh).
Interconexion Electrica S.A. (ISA)	Headquartered in Medellin, Colombia, this state-owned transmission company was formed under Ministry of Mines and Energy in 1967. Prior to 1999, ISA was responsible for the entire expansion of the national transmission system (STN).
	ISA operates and maintains:
	 40,805 km of transmission in Colombia, Peru, Bolivia and Brazil
	 International interconnections with Venezuela, Ecuador and Peru
	It is responsible for:
	 Operation planning, coordination, supervision and control of the national intercon- nected system (SIN)
	 The administration of the Commercial Settlement System in the wholesale energy market
	 The settlement and clearance of charges for the use of SIN's grids
	 Customized solutions for energy transmission lines and substations and the assembly of fibre-optic networks
ISAGEN S.A.	This mixed public utility company was created in 1995 when ISA was split into two entities.
Ecopetrol	Ecopetrol is a national oil company. Prior to the reforms of 2003, it controlled the development of all hydrocarbon resources.
ANH	Agencia Nacional de Hidrocarburos is a government agency that is responsible for regulating and managing Colombia's oil and gas resources, with the aim to generate power and state revenues from these resources. It was given the role of administrator and regulator of national hydrocarbon resources in 2003, following the restructuring of the Colombia hydrocarbon sector. These roles were previously held by the state oil company, Ecopetrol.



GOVERNMENT INSTITUTIONS IN THE ENERGY SECTOR

Ministry	About	Responsibilities	Programs
Ministry of Mines and Energy Industry sector: Energy-includes mining, electrical energy, hydrocarbons and nuclear	The Ministry formulates and adopts policies for the sustainable use of mining and energy resources in order to contribute to the economic and social development of the country	 Administering non-renewable natural resources in Colombia to ensure their best and greatest use Directing this use and related regulations Guaranteeing the supply of natural resources and safeguarding their preser- vation, their restoration and the country's sustainable development-in accordance with the evaluation, follow-up and environ- mental management criteria that have been indicated by the relevant environmental authority 	 Program of Rational and Efficient Use of Energy and Non-Conventional Sources in Colombia (PROURE) Program of Normal- ization of Electrical Networks (PRONE) Regulatory Commission for Gas and Energy (CREG)
Mining and Energy Planning Unit (UPME)	Attached to the Ministry of Mines and Energy, the UPME administers and co-ordinates planning between public and private entities in the energy sector	 Planning the development and use of mining and energy resources Researching and providing the information required for policy formulation and decision- making by the Ministry of Mines and Energy 	 -Program of Rational and Efficient Use of Energy and Non-Conventional Sources in Colombia (PROURE)
Ministry of Environment and Sustainable Development Industry sectors: Integrated water management resources, marine affairs and aquatic resources, climate change	The Ministry is the lead manager of the environment and renewable natural resources	-Defining the national environmental policy -Promoting the recovery, conservation, protection, planning, management, use and exploitation of renewable natural resources to ensure sustainable development and to ensure the right of all citizens to enjoy and inherit a healthy environment	-National Environmental Policy -National Policy for Integrated Water Resource Management -National Plan for Training on Integrated Water Management Resources



Organization	Description
Colombia Inteligente	Colombia Inteligente is an initiative to help develop smart grids in Colombia. It was set up by XM (Power System and Market Operator), CIDET (Electrical Sector Research Center), COCIER (Colombian branch of CIER), CNO (National Operation Council), CAC (Commercialization Advisor Committee) and CINTEL (Communications Research Center).
	It brings together companies and entities (including utilities) to establish a framework as well as policies and strategies for the development of the electrical sector. Where applicable, it favours strategies and solutions oriented toward the smart grid.
	Colombia Inteligente has the objective to promote the smart grid in the national agenda of public policy inside and outside Colombia.
ХМ	XM is an ISA subsidiary that specializes in "real-time systems" management, which includes the planning, design, optimization, commissioning, operation, and adminis- tration or management of transactional systems or technology platforms that involve the exchange of value-added information and markets for goods and related services. XM currently applies its expertise primarily in the electricity sector, but also works in the transportation and financial sectors.
Colombian Council for Efficient Energy (CCEE)	This non-profit organization was created with the purpose of fostering activities related to energy efficiency and to build relevant awareness and knowledge within the country in order to promote more efficient and rational use of energy in all sectors.
Colombia Energy Institute	The Colombia Energy Institute is dedicated to providing specialized services in consulting and technical training in the energy sector.

KEY SMART GRID ORGANIZATIONS



ADDITIONAL RESOURCES

Resources	Website
Annual Reports on Human Rights and Free Trade between Canada and the Republic of Colombia	http://www.treaty-accord.gc.ca/text-texte.aspx?id=105278
Canada-Colombia Free Trade Agreement	http://www.international.gc.ca/trade-agreements-accords-commerciaux/ agr-acc/colombia-colombie/can-colombia-toc-tdm-can-colombie. aspx?lang=eng
Canadian Trade Commissioner Service	www.tradecommissioner.gc.ca/co
Colombian Banking Association	http://www.asobancaria.com
Colombian Customs and Income Tax Offices	http://www.dian.gov.co
Colombian Ministry of Foreign Affairs	http://www.cancilleria.gov.co/en
Doing Business Guide, 2015	http://www.doingbusiness.org/Reports/Subnational-Reports/~/media/giawb/ doing business/documents/profiles/country/COL.pdf
Transparency International, Colombia	http://www.transparency.org/country#COL
U.S. Commercial Service in Colombia	http://www.export.gov/colombia/index.asp
Moody's	https://www.moodys.com/credit-ratings/Colombia-Government-of-credit- rating-186200
Canada Colombia Chamber of Commerce	http://www.canadacolombiachamber.org/





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