The Bahamas

Energy Balances
2010 - 2012

CELAC
Comunidad de Estados Latinoamericanos y Caribeños

CAF

olade
Organización Latinoamericana de Energía
Latin American Energy Organization
Organisation Latino-americaine d'Energie
Organização Latino-Americana de Energia

The Bahamas Energy Balances (2010 - 2012)

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OLADE
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B$	Bahamian Dollar
bbl	Barrel
BEC	Bahamas Electricity Corporation
BEST	The Bahamas Environment, Science & Technology Commission
boe	Barrel Oil Equivalent
CAF	Development Bank of Latin America
CARICOM	Caribbean Community Secretariat
CARILEC	Caribbean Electric Utility Service Corporation
CDB	Caribbean Development Bank
CEIS	Caribbean Energy Information System
CELAC	Community of Latin American and Caribbean States
CIPPET	Caribbean Information Platform on Petroleum
CO_2	Carbon Dioxide
CREDP	Caribbean Renewable Energy Development Program
CSL	Cape Systems Limited
DO	Diesel Oil
ECCB	Eastern Caribbean Central Bank
ECCs	Eastern Caribbean Countries
ECCU	Eastern Caribbean Currency Union
ECERA	Eastern Caribbean Energy Regulatory Authority
EEZ	Exclusive Economic Zone
FAO	Food and Agricultural Organization of the United States
GDP	Gross Domestic Product
GDP	Gross Domestic Product
GHG	Greenhouse gas emissions
GIZ	German Agency for Technical Cooperation
GW	Gigawatt
GX	Gasoline
Ha	Hectare
JF	Jet Fuel
kboe	Kilo Barrel of Oil Equivalent
kW	Kilowatt
kWh	Kilowatt hour
LA&C	Latin American and the Caribbean
LPG	Liquefied Petroleum Gas
MW	Megawatt
NEP	National Energy Policy
NEPC	National Energy Policy Committee
OAS	Organization of American States
OECS	Organization of Eastern Caribbean States
OLADE	Latin American Energy Organization
SOL	SOL Group
tn	Tones
USD	United States Dollar

Chapter I. Country Description, Socio-Economic and Energy sector

1. Introduction

As stated in the Lima Action Plan adopted during the First Meeting of Energy Ministers of CELAC, OLADE was requested to participate as Technical Advisor. Subsequently, during the V Meeting of Energy Ministers of OLADE, the OLADE's Cooperation with CELAC was approved. The agreement included a study project for developing Energy Balances of six Caribbean Member Countries of CELAC that are Non-Member Countries of OLADE. The Development Bank of Latin America (CAF) funded the project -. (CELAC, 2013; OLADE, 2013).

Considering the need to analyze and enhance knowledge related to the regional energy integration debate and real options, the preparation of energy balances is fundamental to rise up a baseline about supply and demand on the energy sector. Energy balances will permit "the identification of surpluses or deficits, potential of exchanges of energy, prospects for energy demand and possibilities for change of the energy matrix from which it is possible to establish development plans and regional energy policies, imply the availability of up-to-date official information, homogeneous and consistent to allow an adequate knowledge of the characteristics of the energy systems of the countries, comparative analysis and consolidation of information for built-in features of the region, whereas the national energy balances as the basic element" (OLADE, 2013).

The following document represents the Energy Balance of The Bahamas. This document was elaborated after a deep research and a major gathering information process on available energy information and data collection from accurate primary sources such as surveys, interviews, Government published material, census records and reports or studies carried out by international energy and cooperation agencies. The Energy Balance was developed according to OLADE´s Methodology.

Based on the stakeholder analysis and mapping of the structure of the energy sector, several forms and surveys were applied to the most representative public and private institutions that participate in the main phases of the energy chain of the country, such as suppliers and consumers.

The document is divided into ten sections: The first, second, third and fourth sections deal with the country's general information that includes a description on geography, climate, socio-economic characteristics in every subsector, such as residential, manufacturing and industry, tourism, agriculture, transport and construction, which are all related to the overall energy sector. The fifth section provides an overview of the energy sector of The Bahamas, with a description of the institutional structure related to electricity, renewable energies and Hydrocarbons; a description of the foreign hydrocarbon suppliers is also presented. This section also presents current and past figures in terms of supply and demand of energy.

The sixth section presents the concepts defined by the OLADE's Energy Balances Methodology and a brief summary of the Methodology itself. The seventh and eight sections contains the description of the data gathering process as well as a description of the activities that were held during the OLADE´s technical visit to the country.

The ninth section provides the results on the Energy Balances that were elaborated for the periods of 2010, 2011 and 2012. The tenth section presents the country's Greenhouse Gases Emission Inventories (2010-2012) by following the technology approach. And finally the last two sections present energy and economic indicators and describe the final conclusions and recommendations on The Bahamas Report.

2. Background

The First Meeting of Energy Ministers of CELAC was held in Lima, Peru, on November 16, 2012, where the Lima Action Plan was adopted and OLADE was requested to participate as Technical Advisor. Subsequently, the V Meeting of Ministers of the Latin American Energy Organization (OLADE) was held in Quito, Ecuador, on May 17, 2013, approving the participation of OLADE as a Technical Advisor of the Meeting of Ministers of CELAC. This meeting of Ministers also accepted the working program (OLADE's cooperation to CELAC), which was presented previously at the V Meeting of Coordinators of CELAC on May 9-10, in La Habana, Cuba.

The working program approved by the 5th extraordinary meeting of Ministers of OLADE included the Reduction of asymmetries in the CELAC energy sector information. Since there isn't a source of consistent information that could be used to analyze the supply and demand situations of some CELAC's Member States and to develop projects to diversify their energy matrix, OLADE presented the action plan for the elaboration of the Energy balance of Saint Lucia, Antigua & Barbuda, Bahamas, Dominica, Saint Kitts and Nevis, Saint Vincent and the Grenadines. This project has the financial support of the non-refundable technical cooperation with the Development Bank of Latin America – CAF" (OLADE, 2013).

The Bahamas is an archipelago formed by 700 island and cays, which is totally dependent on imports of fossil fuels to meet its domestic demand. Several studies have been made to explore the potential of the renewable energy in the country and important foundlings have resulted in the process. However, currently the country does not officially use any renewable energy in the energy matrix. Although, several important affords have been made at the island of Eleuthera.

In response to the current energy sector challenges and the significant amount of proposals received, the Government created a National Energy Policy Committee to elaborate the National Energy Policy and also advise the Government on solutions which could be implemented to reduce the high cost of electricity and the dependence on fossil fuels, while reducing the country' s carbon footprint. Information and data from industries, residential sector, agriculture, fishing and mining, as well as the commercial and public services is needed to be collected and centralized.

Based on the country's necessity of having a sustainable energy development and a tool to aid its decision-making, and the readiness of CELAC in having a deeper understanding of the energy sector in the Eastern Caribbean Member Countries, OLADE has prepared the following report hoping to fulfill both, The Bahamas and CELAC's requirements.

3. Country description

3.1. General profile

Country	The Bahamas
Capital city	Nassau
Head of State	Queen ELIZABETH II represented by Governor General Dame Marguerite Pindling
Head of Government	Prime Minister Perry CHRISTIE (since 8 May 2012)
Government Characteristics	Constitutional parliamentary democracy and a Commonwealth realm. The country has 31 districts; Acklins Islands, Berry Islands, Bimini, Black Point, Cat Island, Central Abaco, Central Andros, Central Eleuthera, City of Freeport, Crooked Island and Long Cay, East Grand Bahama, Exuma, Grand Cay, Harbour Island, Hope Town, Inagua, Long Island, Mangrove Cay, Mayaguana, Moore's Island, North Abaco, North Andros, North Eleuthera, Ragged Island, Rum Cay, San Salvador, South Abaco, South Andros, South Eleuthera, Spanish Wells, West Grand Bahama
Languages(1)	English (official), Creole (among Haitian immigrants)
Currency(1)	Bahamian dollars (BSD)
Exchange rate (2014)[(1)]	1BSD per 1 US Dollar
Economy(1)	Tourism and Offshore Banking
Population[(1)]	321,834 inhabitants
GDP (2011 B$M) [(2)]	7.931

Source: (1); (2) National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf

The name "Bahamas" comes from the Spanish “baja mar” meaning shallow sea, and is an archipelago of over 700 islands stretching over 258,998 square km in the western Atlantic Ocean. The British colonization started in 1692 when Charles I granted the General Attorney of England several lands in Latin America, one of them The Bahamas. By 1640, The Bahamas were influenced by the religious disputes that initiated in Bermuda and Cap. William Sayle who had been governor of Bermuda, was chosen to seek for an island in which dissidents can life freely.

The quest was called Company of Eleutherian Adventurers. Sayle and about 70 settlers, consisting of Bermudan religious Independents, sailed from Bermuda for the Bahamas. It is not so clear where do they landed but the settlement took place around 1648. The community did not prosperate due to the internal discord that was generated over time and also the Spanish interference.

New Providence was one of the first settlements around 1666. Four years later, Charles II gave the responsibility of the civil Government to the Duke of Albemarle and

the place became the seat of the government. This first intent of Government failed and the island soon became a pirate´s homeland. In 1671 John Wentworth was appointed as the first General Governor and also a parliamentary government was created. Piracy was still the most lucrative profession. In 1684 Charles II himself intervened and required that a law be passed against the pirates, but apparently it had little effect.

In 1717 a direct order from the Crown made Cap. Woodes Rogers the first royal governor of the island. His most important responsibility was to eliminate the pirates. He succeeded, with the redemption of around 1000 pirates that received the crown´s forgiveness; however, some of them were hanged.

Nassau was settled in 1670, and it was first called Charlestown in the honor of Charles II. A representative assembly was created in 1729 and the colony continued with a certain order until 1776 when the US Navy entered the island looking for supplies for the American Revolution; they left a few days later.

After the American Revolution many Americans emigrated from the United States to The Bahamas under the support of the Crown. Some of the voyagers took with them their slaves which led to the increase in the population of the country. The hard conditions for the slaves continued until 1834 when the United Kingdom Abolition Act came in place and led to the full emancipation in 1838.

In 1953 the Progressive Liberal Party started a political battle against the United Bahamian Party, which was formed by British descendant politicians. In 1964 the country adopted a new constitution and by 1969 the country gained a complete self-governance. In 1973 the name The Commonwealth of the Bahamas was adopted along with the country Independence (Encyclopedia Britannica, Web page visited on January 2015)[1].

3.2. International profile

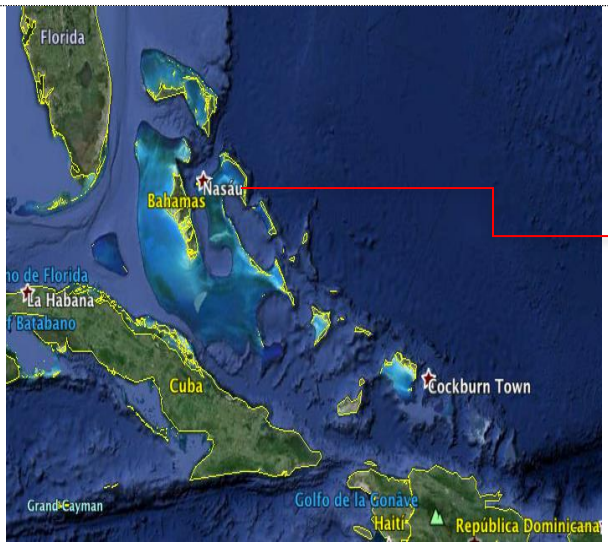
Relevant Memberships	Climate Change, Climate Change-Kyoto Protocol, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Ozone Layer Protection, Ship Pollution, Wetlands. ACP, AOSIS, Caricom, CDB, CELAC, FAO, G-77, IADB, IBRD, ICAO, ICRM, IDA, IFAD, IFC, IFRCS, ILO, IMF, IMO, IMSO, Interpol, IOC, IOM, ITSO, ITU, LAES, MIGA, NAM, OAS, OPANAL, OPCW, Petrocaribe, UN, UNCTAD, UNESCO, UNIDO, UNWTO, UPU, WCO, WHO, WIPO, WMO, WTO (observer)

Sources: CIA World Fact book, visited January, 2015

[1] http://www.britannica.com/EBchecked/topic/48951/The-Bahamas

3.3 Geography

Region [1]	Eastern Caribbean
Location [1]	Chain of islands in the North Atlantic Ocean, southeast of Florida, northeast of Cuba
Latitude [1]	24 15 N, 76 00 W
Surface area [1]	13,880 km^2



Map1. Eastern Caribbean, The Bahamas region [2]

Map2. The Bahamas [3]

Sources: (1) http://www.bahamas.com/islands/nassau; (2) Google earth (web page visited January, 25th2015) (3) Maps of the Bahamas, visited January 2015, http://www.cs.odu.edu/~wild/travels/maps.htm

3.4 Climate

The Bahamas climate is semi tropical consisting in two seasons: summer and winter. Occasionally summer also has also a rainy season. The summer usually occurs from May to September. Bahamas climate is warm and humid with temperatures ranging from 21C to 34C. Rain falls between the months of May to October and the hurricane season extends from June to November.

Winter in the Bahamas is from October through April. Temperature during this season ranges from 24C to 29C with lower temperatures from January to February. Because the Bahamas is near the Continental North America, it gets affected by the North American Cold Air, making it a bit cooler than any other Caribbean Island (The Bahamas History, Web page visited January 2015)[2].

[2] http://www.britannica.com/EBchecked/topic/48951/The-Bahamas

4. Socio-Economic Characteristics

4.1. General description

The Bahamas is one of the leading points of tourism in the Caribbean, therefore tourist sector and its related activities have been the main influence of the Bahamian economy. Almost 50% of the GDP is generated by this sector and it generates around 50,000 jobs.

Banking and financial sectors are the second pillars of the economy, they account around 15% to 20% of the GDP. Usually these institutions are off shore companies that brings foreign exchange to the country. Agriculture and fishing are mainly focused in the domestic demand. However there are some foreign investors that are working in the aquaculture projects (The Bahamas High Commission, Web page visited January 2015)[3].

Agriculture and Fishing account for less than 10% of the GDP, despite that the Government has supported with a lot of incentives these activities. The Bahamas is one of the most chosen places for doing business due to its special and unique characteristics that are very attractive to investors. For example, the country has a free tax status on income which means that capital gain, corporate earnings, personal income, sales, inheritance, are all tax exempt (National Energy Policy 2010).

The Bahamian dollar is on par with the US dollar, and has a reputation of the steady performance through time. Since the middle of the 90´s decade, The Bahamas has constantly growth in terms of the GDP at almost 4% on an annual basis. This performance is mainly caused by advances and expansion in tourism and construction and of course, a permanent tax neutral environment on income.

While this sector continuously provide the country with a strong economic profile, new investment opportunities are appearing in the scene in several areas such as e-business, manufacturing, light industry, land development and transshipment (Ministry of Finance, Government of The Bahamas, Web Page visited January 2015).

The 2011 Labor Force Report from the Department of Statistics indicated that the four most important sectors in the Bahamas were tourism (comprising hotels, restaurants, wholesale and retail), which employed 30.7% of the labor force. Financial services (consisting of financing, insurance, real-estate and other business services), employing 25.4%, construction (25.1%), community, social and personal services (9.9%), manufacturing (3.2%), transport, storage and communications (2.7%) and agriculture, hunting, forestry and fishing (1.9%) (Private sector Assessment, The Bahamas, 2014).

Current Macroeconomic results

Results from the Statistics Department in 2012 shows that the GDP had a positive growth of 0.7% in terms of the constant prices. This situation is caused mainly by the positive performance in Manufacturing, Communication, Insurance and Public Administration. However, Fisheries, Banking, Restaurants, Hotels, Shipping and Other Community Services had slowed the size of its increase.

[3] http://www.bahamashclondon.net/page.php?page=2

Compared with the two first quarters of the year 2012, the exports of goods has decreased in 12.6%. Tourism expenditure has also decreased in 3% due to the reduction of the arrivals in the same year (The Bahamas, Department of Statistic, 2012)[4].

4.2. Residential

According to the 2010 Census Report, by that year there were 351,461 resident inhabitants. From this total 348,844 persons lived in private dwellings. The population of The Bahamas has increased in 15.8% during the last decade, which is the lowest increase in a decade since 1950. During the 1990.2000 decade the population growth 19%.

Some of the islands in the country experimented a decline in their population as well. For example Cat Island (7.6%), Inagua (5.8%), Crooked Island (5.7%), San Salvador (3.1%) and Andros (2.6%). On the contrary, Islands that showed substantial growth were Exuma (94.0%), Abaco (30.8%), Acklins (32.0%) and Rum Cay (23.8%). Ragged island experienced no growth.

As its seen on the chart the three most populated Islands are New Providence, Grand Bahama and Abaco. Together they accounted for the 90% of the population. For the case of New Providence de amounts in the population are due to the intern immigration process that has been consistent through several decades.

In terms of the density of the population, The Bahamas has a density of 65.3 persons per km^2 in 2010. For the case of New Providence, the density in the same year was 3,079 people per km^2. It is important to notice the case of the Andros Island, which is the biggest island but has a density of 3.3 persons per Km^2.

The household population is important to consider in terms of the energy consumption of a country. For the case of The Bahamas, in 2010 there were 126,493 dwellings. In the last decade the number of dwellings increased in 26.2%, which represents an increase of 26,276 dwellings. New Providence (79,311) and Grand Bahama (15,140) are the island with more dwellings.

The number of households in the entire country for 2010 is 102,862. The islands that holds most of the household population are New Providence with 70,222 households and also the island of Grand Bahama with 15,140 households (The Bahamas Census Report 2010)[5].

Consumption

In the year 2000 almost every dwelling (95%) in The Bahamas has access to electricity. Only 2.4% of the dwelling used oil for electricity generation and a very small amount of dwellings (less than 1%) used LGP for the same purposes. In the islands where there is a small population the use of oil for lightning is recurrent. For example, in the year 2000, 20.9% of the dwelling in Acklins, 17.7% in Mayaguana, 17.4% in Cat Island, and 16.7% of those in Crooked Island used oil.

In terms of the cooking, most of the households (95%) use LPG. However it is important to notice that in the island of Grand Bahama the most used fuel for cooking is

[4] http://statistics.bahamas.gov.bs/download/074094200.pdf
[5] http://statistics.bahamas.gov.bs/download/024494100.pdf

electricity. On the other hand the use of charcoal and Wood is used in less than 3% of the households.

Finally 53,67% of the household use air conditioning systems and 69.33% of the households uses electrical water heaters. The computer use is recorded in 27.86% of the households despite that the Internet connection is very small, almost 15% of the households (2000 Round of Population and Housing Census Sub-Project, National Census Report, The Bahamas, 2009)[6]

Island	Population	Number of Dwellings	Number of households
All Bahamas	351,461	126,493	102,862
New Providence	246,329	79,311	70,222
Grand Bahama	51,368	20,337	15,14
Abaco	17,224	8,113	5,197
Eleuthera	8,202	4,267	2,718
Exuma and Cays	6928	2,875	2028
Long Island	3,094	1,769	1,119

Table 1: Population/Number of Households/Number of Dwellings
Source: The Bahamas 2010 Census Report

The household consumption is about 7,500 kWh per year, with important differences between the characteristics and the income of each house. For example, on a 12-house sample, the luxury houses consumed an average of 34,528kWh and the normal houses an average of 7,416 kWh.

In the normal houses according to Fichtner, the standby mode electronics are the one that consumed most of the electricity, almost 19%, followed by Electronics 18%, Refrigerator and freezer 16% and hot water systems 16%. In the luxury houses, cooling systems consumed 37%, followed by lightning with 21% (Promoting Sustainable Energy in The Bahamas, Fichtner, 2010).

Number of Households (2010) (1)	102,862
Number of persons per Households (2010) (1)	3.4
Electricity consumption (kWh) (2011) (2)	7,500

Table 2. Residential Summary – 2010 - 2011
Source: (1) 2010 CENSUS REPORT The Bahamas. (2) Promoting Sustainable Energy in The Bahamas, Fichtner, 2010

[6] http://www.caricomstats.org/Files/Publications/NCR%20Reports/The%20Bahamas.pdf

4.3. Industry and Manufacturing

The Bahamas has a small scale industry. In 2013, Industry contributed 6.5% of gross added value from which 3.9% accounts for manufacturing. The main industries at the Bahamas, in terms of size are related to oil refinery, cement, transshipment, rum manufacturing, Pharmaceuticals and welding equipment.

Industry and manufacturing activities are relatively small. Recently, the country has started to diversify its economy towards the mining and manufacturing sector, which has recorded a notable dynamism in the past decade. For example, the average growth rate in Mining and Quarrying between the years 2000 to 2011 was 7.5%. These sectors are considered small but fast growing.

At The Bahamas there are a significant amount of large and small-scale enterprises. According to the Bahamas Department of Statistics, in the year 2011 there were an estimated of 4,732 registered small and medium-sized firms on the island of New Providence (Private Assessment Report, The Bahamas, 2014).

The wholesale and retail trade industry accounted for the largest number of these firms, at 2,031.Then, the next by size is accommodation and food service with 493 and mining, quarrying, manufacturing, water supply, waste management and remediation, electricity activities and air conditioning supply with 326 in total.

Information and communications technology industry accounted with 43 firms and the arts, entertainment and recreation industry together hold 51. On the other side, in 2009 Grand Bahama, which is the second more crowded, accounted for 356 firms registered in the manufacturing sector.

Small firms have an estimated of 10 employees, and the large ones an average of 38 employees. There are also some medium scale firms related to agro processing, fish, fruit and vegetables which have an average of 21 employees (Private Assessment Report, The Bahamas, 2014).

Manufacturing Added Value (B$ thousands) Constant (2011)[1]	302,380
Added Value as % of GDP [1]	3.8
Number of electricity consumers (2012) [2]	
Electricity consumption (GWh) (2012)[3]	

Table 3. Industrial Summary – 2012

Source: (1) National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf

4.4. Tourism

The main pillar of the Bahamian Economy is the tourist sector, which along with construction and industry related accounts for 60% of the GDP. Tourist arrivals came mainly from the United States due to the closeness of the island. In 2010, 4.5 million people visited the country 85% were from the United Sates. Tourism generates around

half of the labor force of the Bahamas. Therefore the economy of Bahamas is relatively close and influenced whit the United States.

The country has a tourism dependent economy, which means that depends strictly in tourists' arrivals. According to the World Travel and Tourism Council this sector has a prospectus to growth in 2.6% on an annual basis until 2022. The growth by this influence that is expected for employment is 23% in the same period (Private Sector Assessment Report, The Bahamas, 2014).

The construction sector will continued to be positively influenced by large-scale tourism projects such as the Baha Mar tourist complex and some others. The infrastructure needed in the tourism sector will boost the economy generating employment and investment in The Bahamas.

In terms of the consumption, hotels consumed almost 40% of the total generated electricity. It is important to notice that the major hotels and resort as well as future projects are located at the islands of New Providence and Grand Bahama. For the rest of the islands that are called "family islands", 6 of them account for the 80% of the consumption in terms of electricity: Bimini, Abaco, Andros, Eleuthera, Exuma and Long Island (Promoting Sustainable Energy in The Bahamas, Fichtner, 2010)[7].

According to the Fichtner Preliminary Report, the consumption from the hotel sector varies depending on the size of each hotel. The report recorded an average consumption of 19.11 GWh in the large scale hotels (more than 350 rooms). On the medium scale hotels (50 to 350 rooms) the consumption recorded was 2.50 GWh. Finally in the small scale hotels (less that 50 rooms), the consumption recorded was 0.52GWh.

In 2008, a total of 4,394,000 tourists visited the country, from them, 1,392 arrived by air and 3,001 arrived by sea. (National Energy Policy, 2010)[8]

Added Value Hotels+Restaurants (B$ Thousands) Current (2011)(1)	923,162
Added Value as % of GDP Hotels+Restaurants (2012)(1)	11,6%
Hotels Electricity Consumption (2010) (GWh) (2)	424.24

Table 4. Tourism (Hotels and Restaurants) Summary 2011

Source: (1) National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf (2) Promoting Sustainable Energy in The Bahamas, Fichtner, 2010

4.5. Agriculture and Fishing

The agriculture sector is ruled by the Agricultural Manufactories Act of 1965, which provides exemptions from customs duty on all machinery and material imported for agricultural activities. Tax-exemptions (as long as there are no strings attached) are a good thing and should be done for all business machinery, in all industries—not just politically popular ones.

[7] http://www.globalislands.net/userfiles/bahamas_1.pdf
[8] http://www.best.bs/webdocs/nepc_2ndreport_final.pdf

Agriculture and the fisheries represent a small sector that has an added value of 2.1% in the Bahamas economy. The agricultural sector includes products like lobsters and crawfish for exportation, vegetables and citrus. The main markets for these products are the United States and the European Union.

The domestic market consumes most of the Agricultural products. The islands of Eleuthera, Avacos, Andros and Grand Bahama, is where most of the agricultural activities take place (The Bahamas Guide, Visited January 2015)[9].

Added Value Agriculture+Fishing (EC$M) Current (2011)(1)	168,384
Added Value as % of GDP Agriculture+Fishing (2011)(1)	2.1%
Agriculture main products (2013) (2)	Lobster, crawfish, vegetable, citrus
Agricultural area (ha)(2013) (3)	1,000

Table 5. Agriculture, Fishing and Mining Summary 2011
Source: ((1) National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf

4.6. Transport

The Government of The Bahamas has constantly invest in transportation, especially in those areas related to tourism, water access, energy and telecommunications. Supporting this sector is fundamental to gain an economy growth. The new investments of the government in this sector are related to the traffic reduction, domestic travel and social meetings, which is very good for dispersed families.

The Government holds a Transport Policy and Planning Unit, which was formed as an initiative to develop new planning capabilities in the Transport Sector. The current focus of the unit is to deal with surface transport issues relating to improving the road traffic situation in New Providence and some other policies especially in the most crowded Islands (Road Traffic Department, Web page visited, January 2015).

By the year 2002, in the most crowded island, New Providence there were registered 111,184 vehicles. By 2006 this number increased to 156,480. According to the Statistics department in the year 2002 the population at New Providence was 218,000 and in2006 the population was 233,000. New Providence is considered an overpopulated island which has to deal with constant traffic issues (Transportation, Public Policy and Change in New Providence, Bahamas, 62 Foundation)[10].

Transport Total(GDP 2011) (B$ Thousands)	297,062
Added Value as % of GDP Agriculture+Fishing (2011)(1)	3.7%
Road Transport (GDP 2011) (B$ Thousands)	32,818
Sea Transport (GDP 2011) (B$ Thousands)	233,931

[9] http://thebahamasguide.com/business-investment/agriculture/
[10] http://nicobethel.net/uploads/transportation_report.pdf

Air Transport (GDP 2011) (B$ Thousands)	30,314

Table 6. 2011 Transport Sector Gross Domestic Product In Current Prices (B$ Thousands)
Source: National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf

4.7. Construction

This sector is focused on the expansion of the population in the country as well as in the number of visitors that came from the tourist sector. Construction for infrastructure in transport has been very important for the country in terms of land, air and sea connectivity. Schools, hospitals and police departments are some of the investments in this sector.

There are several important projects in the tourist sector related to resorts construction. The most important are the Resorts World Binimi Bay Project, which costs 200 million US. And the Albany Resort expansion Project which costs 140 million US. There are also a group of projects that were approved in order to achieve the New Providence Transformation and Modernization Programme.

The biggest Project is the Lynden Pindling International Airport re-Development and expansion programme, which costs 400 million US. This big Project is followed by The New Providence Road Enhancement Project, which states the construction of 24.6 miles of roads in 19 corridors, among others (Contribution to the 2014 United Nations Economic and Social Council (ECOSOC) Integration Segment, United Nations, The Bahamas 2014)[11].

Added Value (B$ Thousands) Current (2011)	700,923
Added Value as % of GDP(2011)	8.8

Table 7. Constructions and Others Summary – 2011
Source: (1) National Account Report 2013, Ministry of Finance, visited on January 2015, http://statistics.bahamas.gov.bs/download/066930400.pdf

5. Energy sector

The National Energy Policy (NEP) is the guideline document for the energy sector in The Bahamas. Currently, the NEP has 3 versions 2008, 2010 and 2013-2023. The entity in charge of elaborating the NEP for the first and second reports was the National Energy Policy Committee, which was appointed by the cabinet and had all the support of the main stakeholders of the country. Version 3 of the NEP was produced with the assistance of ECLAC and GIZ.

The country has received the support of the Inter-American Development Bank to elaborate its National Energy Policy documents. In 2008, the IDB contracted the German consulting firm Fichtner to review the first national energy policy of The

[11] http://www.un.org/en/ecosoc/integration/pdf/bahamas.pdf

Bahamas 2008 (NEP). From the findings of this review, the Government of the Bahamas, through its National Energy Policy Committee complemented its NEP (Energy Policy and Sector Analysis in the Caribbean (2010–2011)).

In the electricity sector, two institutions are the main stake holders in the country: The Bahamas Electricity Corporation (BEC) and the Grand Bahama Power Company, meet all the country's electricity needs. BEC is owned by the Government, an in 2010 it has 29 generation plants and one gas turbine generation plant. This company provides electricity in almost every island in the country with the exception of the Grand Bahama Island and some smaller islands and cays. The Bahamas Electricity Company has been using heavy fuel oil to generate almost half of its electricity.

On the other hand, the Grand Bahama Company, located in the Grand Bahama Island is part of the Grand Bahama Industrial Center, which is the main international port facility in the country. In 2010 the company has a steam plant, two gas turbines and a diesel oil plant.

The country is fully dependent of fossil fuels to meet its energy internal demand. International and national companies provide the petroleum products around the country. One of the major consumer of fossil fuels is the transport sector, however according to the National Energy Policy 2013-2023, there is a lack of information to be researched in this sector (National Energy Policy, 2010)

In light of these challenges, the government of The Bahamas has placed a series of commitments to improve of its energy sector. The government has pledge to achieve a 30% cap of renewable energy electricity generation by 2030. By now, successfully energy efficiency programs have been implemented throughout the country and though different channels. Public enterprises have engaged with local communities to improve the energy efficiency as well as private enterprises has conducted several energy audits, which identifies and implements energy effective solutions. This represents major economic savings, and aligns with government objectives, of reducing emissions and energy consumption. Secondly, government officials have identified several key renewable energy sources which can prove to be energy effective. Potential solar and wind electricity generation studies have been conducted widely and show very high viability. (Energy Transition Initiative – Energy Snapshot)

Furthermore the largest government attempt to promote optimization of the energy usage, energy efficiency and diversification of the energy matrix, has been through the implementation of the $4.6 million investment in the renewable energy sector between 2006 and 2012. However a wide renewable energy implementation has not been successfully conceived while major reforms affect the Bahamas Electrical Company

Successful implementation of renewable energy into The Bahamas´s energy matrix would have extensive positive economic and social externalities. Renewable electricity generation would lead to a more distributed matrix, which would save large costs in distribution infrastructure. Given the current prices of such technologies would also decrease the price of electricity generation and would lead to diversification from fossil fuels. (Caribbean News Now, Bahamas trails Caribbean in renewable Energy). (National Energy Policy 2013-2023).

5.1. Institutional structure

National Level

- **National Energy Policy Committee;** Appointed by the Cabinet, it is an entity formed with several stakeholders from different sectors, situation that gives an added value to the expertise and effectiveness of the Committee. The NEPC contains some of the authors of the most important reports that have been written in Energy matters. The NEPC is supported by several institutions such as the International Development Bank, Ocean Engineer and Energy Systems and an American company that has expertise in Ocean Thermal Conversion. The support of the IDB has been very important in order to elaborate, update and improve the National Energy Policy. However, in the 2010-second version, the document holds that the Transport Sector must still be analyzed to generate any recommendations related. Finally in the third version 2013-2023, there are important recommendations related to the Transport sector.
- **The Bahamas Environment, Science & Technology Commission (BEST):** It was established in 1994 to coordinate environmental matters. This Commission elaborated the 2008, and 2010 reports of the National Policy for the adaptation to Climate Change along with the National Climate Change Committee (Williams College, Sustainable Eleuthera: Eleutherans' Views of Energy and Climate Change, 2009).
- **Ministry of the Environment**: was created in 2007 with the scope of supporting the implementation of alternative energy as well as energy conservation. The Ministry has worked on several energy matters such as the light bulb change and solar water heaters in The Bahamas (Williams College, Sustainable Eleuthera: Eleutherans' Views of Energy and Climate Change, 2009).
- **Cape Eleuthera Institute (CEI) and Cape Systems, Ltd. (CSL):** Established in 2003 at the Eleuthera Island, it has the objective to promote development sustainable systems in the islands as well as in the rest of The Bahamas. The Institute along with Cape Systems have created the first school that relies almost entire on renewable energy, which is called the Island School. The future of this project is to share its technology and expertise with other public and private clients. The School uses wind and solar power. The campus also holds 100% solar water heaters, waste water treatment, biodiesel vehicles and rainwater catchment. It is important to notice that this campus has the first Biodiesel Production Facility of the country whit a production of 18,000 gallons in a year which are used mainly by CEI, the Island School and Deep Creek Middle School. In 2009, Cape Systems received government approval to begin biofuel production at a commercial scale plant in Nassau50 (Williams College, Sustainable Eleuthera: Eleutherans' Views of Energy and Climate Change, 2009).

Regional Level (Eastern Caribbean)

Electricity Sector

- **Caribbean Electric Utility Services Corporation –CARILEC–**: The CARILEC Secretariat serves as the focal point for general and technical information. The Secretariat takes the lead in advocating for change in the electric utility industry in the Caribbean and in this regard produces a number of information products and provides a range of services to members. Actually CARILEC has 88 members. This includes 32 Full Members that are electric utilities and 52 Associate Members that are service companies for the electric utility business and 4 Affiliate Members (CARILEC we page, 2014).

- **The Caribbean Renewable Energy Development Programme –CREDP–**: The CREDP is a joint project of CARICOM since 1998, integrated by 16 Caribbean countries including Saint Vincent and the Grenadines. The full implementation of the project started in 2004, and its main objectives are related to reduce greenhouse gas emissions by removing barriers to renewable energy development, establish the foundation for a sustainable renewable energy industry, and create a framework under which regional and national renewable energy projects are mutually supportive (CREDP web page, 2014).

Oil Sector

- **The Caribbean Information Platform on Petroleum –CIPPET–:** CIPPET was developed by the Scientific Research Council **–**SRC**–**, located in Kingston Jamaica, as a regional point for the **Caribbean Energy Information System – CEIS** is a network of 18 Caribbean Countries with responsibility for the coordination, gathering and dissemination of energy information for these countries to facilitate sharing of energy information among each other and to aid policy decision**–**making. CIPPET is managed by CEIS and will serve as a tool to facilitate the provision of Caribbean Petroleum Energy Information and Statistics to member countries of CEIS and other users of information related to petroleum. It creates a central access point through which member countries can submit their requests for information, it also allows users to "Be in the Know" on past and current issues relevant to the petroleum industry (CIPPET web page, 2014, http://www.ceis-caribenergy.org/).
- **Central Bank of The Bahamas: Central** The Bank, via the Research Department compiles and publishes a range of monetary and financial statistics. These include domestic banking statistics, specifically money and credit aggregates and movements in external reserves. Furthermore, as the Bank calculates the balance of payments. It does have official records of the total Oil imports and exports based on figures provide the Bahamas government custom department.

5.2. Legal and Policy Framework

- **The Bahamas National Energy Policy:** elaborated by the National Energy Policy is the guideline document for the energy sector in The Bahamas, there have been three reports, 2008, 2010, and 2013-2023 published. Each report proposes the adoption of new energy sector framework policies mainly in the electricity sector as well as in the renewable energy sector. These reports presented an overview of the energy sector in the country followed by short, medium and long term targets to reduce the dependence on fossil fuel imports in the country (National Energy Policy 2013-2023).
- **The Electricity Act (1956):** It gives exclusive rights for the generation and sale of electricity, prohibits self-generation and interconnection to the grid, and it does not impose a requirement that a certain percentage of electricity be generated from renewable sources. The Act does not allow any Independent Producer to sell to the grid.
- **Inter-American Development Bank (IDB)**: is one of the most important agencies that has supported the Bahamas in order to reach the sustainable planning at the energy sector. In 2009, the Government signed three Technical Cooperation agreements with the IDB:
    - Strengthening the Energy Sector in The Bahamas
    - Promoting Sustainable Energy in The Bahamas
    - Promotion of Energy Efficient Residential Lighting

These 3 projects involve important reports in terms of the research and analysis of the Bahamian Energy Sector and its characteristics.

- **Utilities Regulation and Competition Authority**: Before known as the Public Utilities Commission, was replaced in 2009. Currently regulates the electronics communication sector, but will be appointed to regulate the Electricity sector as well (Inter-American Development Bank, web page visited January 2015)[12].
- **Out Island Electricity Act:** allows for the creation and operations of private utilities to supply electricity to the Family Islands if "it is in the nation's best interest." It has been difficult for the private sector to meet this provision and as a result BEC continues to be the exclusive electricity provider except on Grand Bahama and a number of very small franchise holders which are allowed operation in the area controlled by the Grand Bahama Port Authority under the Hawksbill Creek Act. (Government of Bahamas, 2010; Organization of American States, 2010)
- **The Hawksbill Creek Act:** it set the regulatory framework to provide electricity as a franchise in specific areas including areas controlled by the Grand Bahama Port Authority (National Energy Policy, 2013-2023).

5.3. Electricity

Despite the high oil prices, electricity generation in The Bahamas has been constantly growing in the last 30 years. Due to the geographical characteristic of The Bahamas, the country has 16-isolated island grids distributed with small Diesel Oil plants whit a capacity around 20MW each. For the electricity generation there are several stakeholders, which need to be considered.

- **The Grand Bahama Power Company**, which supplies electricity to the island of Grand Bahama with a total of 18,800 customers. Grand Bahama Power is a majority owned subsidiary of Emera Inc. (EMA-TSX) but first it begun as a part of the Grand Bahama Port Authority, mainly to develop the Freeport. Finally the company was formed in 1964. It is owned by EMERA since 2008 when they purchase of 80.4% of the Grand Bahama Power Company Limited shares. Its license for electricity generation expires in 2054 (Grand Bahama Power Company, Web page visited on January 2015)[13].

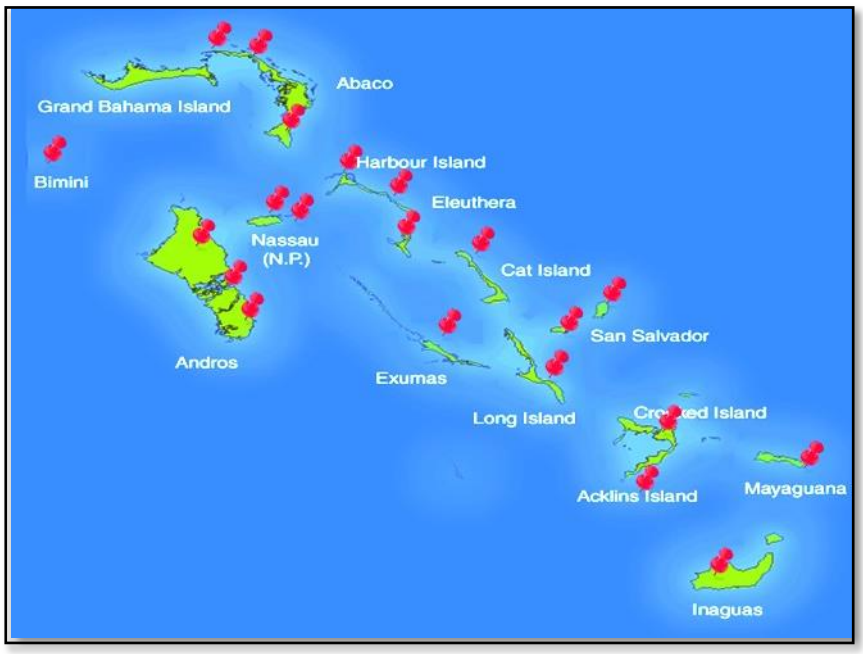
In the period 2010-2011, The Grand Bahama has 1 power plant with 9 Diesel Oil generators at Queens Highway facility with 27MW on installed capacity, 2 gas turbines with a capacity of 35MW and a steam plant with 75MW. The peak demand at Grand Bahama was 74 MW in 2010 and the total capacity of the utility was 141MW. The total sales in 2008 of time were 369 GWh (Energy Policy and Sector Analysis in the Caribbean (2010–2011)).

There is some interconnection between some islands, but they are not reported yet. National demand is growing in 3% to 4% each year. In 2007 Heavy fuel oil was used for the 68% of the generated electricity (Promoting Sustainable Energy in the Bahamas, BID, 2010)[14].

[12] http://blogs.iadb.org/caribbean-dev-trends/2013/11/21/bahamas-energy-market/
[13] http://www.gb-power.com/en/home/aboutgbpc/history.aspx
[14] http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1867491

- **The Bahamas Electricity Company**: It is a Government owned electricity utility that covers New Providence and some other islands with a total of 80% of the country. The Bahamas Electricity Company generates its own tariffs and it was established by an Act in 1959. The National Energy Policy reported that the utility in 2010 had 93,000 customers. The company is governed by a Board of Directors and managed by an executive team led by a General Manager. The Executive Chairman reports directly to the Minister of the Environment

The Bahamas Electricity Corporation has along the country 28 internal combustion Plants (Diesel Oil and Heavy Fuel Oil) and 1 Natural Gas plant. In 2009 44% of the electricity was generated with Heavy Fuel Oil, while the rest 56% was generated using Diesel oil. (Energy Policy and Sector Analysis in the Caribbean (2010–2011)).



Graph 1: Location of the Bahamas Electricity Corporation´s facilities at The Bahamas

Source: BEC web page, visited on January 2015

By the period 2010-2011, the total capacity of the Bahamas Electricity Corporation was 438MW, which includes 283MW from internal combustion engines using Diesel Oil and Heavy Fuel Oil and 155MW from the Natural Gas Plant. In the same period of time the country's peak demand was 234MW. The total electricity sales in the same period were around 1,536 GWh at a price of 0.31 $US per kWh (including the fuel surcharge).

It is important to take account of the loses which are around 12,3% of the total electricity generated, caused by heat loses in the generation process and also taking into account the use of the Diesel oil and the Heavy fuel oil stations (National Energy Policy, 2010).

Considering that the Independent power producers (IPP) have not granted access to the grid by law; there are no self-generation electricity generators officially registered. The same situation happens in terms of the renewable energy use. Lack of clear technical and commercial grid connection rules makes BEC turn into a monopoly supplier and has no obligation to accept electricity generated by an independent power producer (IPP) be it from fossil or from regenerative energy resources(National Energy Policy, 2012-2023).

5.4. Electricity demand and Prices

Almost 99% of the habitants in the Bahamas have access to electricity; for the case of Grand Bahamas 100% of the citizens. Customers at The Bahamas are charged with a fuel surcharge tax per every kWh consumed. The residential consumers have two tariffs depending their consumption levels and the commercial customers have a different tariff with considerations on the Demand Charge. (Energy Policy and Sector Analysis in the Caribbean (2010–2011)).

Since 2008 there has been a campaign promoted by the Government which fosters to reduce the use of incandescent bulbs, but no effective energy efficiency assessment has been conquered. However the 3 version of the National Energy Policy take into account this matter.

The hotel sector is the major consumer of electricity in The Bahamas. Hotels consumed almost 40% of the total in 2010. In the large scale hotels electricity consumption accounts 90% of the total energy consumed. On the other side, medium scale hotels accounted 75% for electricity consumption in relation with the total energy consumed. This means that the rest of the energy consumed goes to LPG and Diesel Oil. Small hotels have almost the same characteristics, with the difference that they demand a lot more LPG in terms of their shares. (Promoting Sustainable Energy in The Bahamas, Fichtner, 2010).

5.5. Renewable Energies

The Renewable Energies are one of the priority areas in the National Energy Policy 2013-2023. However, Independent Power Producers, by law, are not allowed to have access to the grid, which is a major barrier in the use of renewable energy. The Electricity Act does not impose as a requirement that certain amount of electricity must be generated by renewable energies (National Energy Policy, 2010).

There have been several studies in this area and important stakeholders have support and advice the Government in the Renewable Energy Technologies. For the elaboration of the National Energy Policy, Ocean Engineering and Energy Systems (OCEES) and also The Ocean Thermal Energy Conversion Programme (OTEC) supported the elaboration Committee.

According to the National Energy Policy 2013-2023, the possible renewable energies that can be used in The Bahamas are, Bio-energy, Solar (hot water and electricity generation), wind, ocean thermal conversion or wave energy and waste energy.

The only use of renewable energy can be found in the island of Eleuthera at the Institute along with Cape Systems, which have created the first school that relies almost entire on renewable energy; the Island School.

Currently, the campus holds 100% solar water heaters, waste water treatment, biodiesel vehicles and rainwater catchment. It is important to notice that this campus has the first Biodiesel Production Facility of the country whit a production of 18,000 gallons in a year.

Mainly CEI, the Island School and Deep Creek Middle School use this fuel. In 2009, Cape Systems received government approval to begin biofuel production at a commercial scale plant in Nassau50 (Williams College, Sustainable Eleuthera: Eleutherans' Views of Energy and Climate Change, 2009).

5.6. Hydrocarbons

The Bahamas has several stakeholders in the hydrocarbon sector. Some of them distribute fuels and non-energy products for domestic consumption in the country and the other ones only use big the storage capacity facilities with a strategic location to distribute fuels to other countries.

- At The Bahamas operates the **SOL Group**[15]: which is an independent petroleum marketing company in the Caribbean, with operations across 23 countries. It was founded in 2005, when the company acquired Shell's assets in the Eastern Caribbean. Mainly supplies diesel, gasoline, lubricants and LPG. (Sol web page, January 2015)

- Other company that operates in The Bahamas is **RUBIS**[16], which is a French private limited company established in 1990. Its operations consist in the distribution of diesel, gasoline, LPG and lubricants. It has presence throughout the Eastern Caribbean including The Bahamas, Antigua, Barbados, Dominica, Grenada, Guyana, St Lucia as well as the Western and French Caribbean, among others countries and continents. During the year 2012, Rubis purchased several assets in the oil industry included the Chevron assets in The Bahamas, Cayman Islands and Turks and Caicos Islands (Rubis Web page, 2014).

- **The Bahamas Petroleum Company** in other important stakeholder: The Company was formed to invest in an offshore oil exploration program in license areas covering approximately 16,000 km^2 (4 million acres) in the territorial waters and maritime Exclusive Economic Zone (EEZ) of The Bahamas. The licenses are given by the Government. There are some recorded drilling explorations in 1947 and 1986; there are not available information on the findings of these projects so far.

- **The Bahamas Oil Refining Co. (BORCO)**: is a storage terminal in Freeport, Bahamas, which has a capacity of 20 million barrels. These facilities were owned by PDVSA and then sold to First Reserve Company. This facility is considered the largest in the Caribbean region. The facilities offer blending, transshipment and bunkering services from a strategically positioned location, located 80 miles from the coast of Florida, United Sates. First Reserve and other firm called Vopak completed their acquisition of the Bahamas Oil Refining Company (BORCO) terminal - renamed Vopak Terminal Bahamas - in April 2008. The equity value of the new company amounted to $550 million, split 80%-20% between First Reserve and Vopak respectively[17].

It is important to notice that The Bahamas is not part of the Petrocaribe Agreement. Despite The Bahamas signed the Petrocaribe agreement in 2005, the Cabinet did not ratify the arrangement when it was set to start operate[18]. However back in 1990 PDVSA bought from Chevron a 20 million barrel facility for storage activities that is located at the Freeport called BORCO, which was then sold to First Reserve Co. as stated in the last paragraph.

[17] http://www.bunkerindex.com/news/article.php?article_id=2161
[18] http://www.tribune242.com/news/2014/feb/24/bahamas-did-not-sign-petro-caribe-pact/

Most of the supplied fuels in the country as well as non-energy products (Lubricants, asphalts, among others) are used mainly in transport and electricity generation. The Bahamas has not any proved fossil oil reserve under its land, therefore the country relies almost totally on oil imports to meet the demand of energy.

According to the Inter-American Development Bank, on 2005 The Bahamas imported almost 6.5 million barrels of fuels for internal consumption. The country uses 26,000 barrels on a daily basis (Promoting Sustainable Energy in the Bahamas, BID, 2010). According to the National Energy Policy 2010 the country imported 6,594 millions of barrels in 2008 (National Energy Policy 2010, pp. 6).

Chapter II. Definition, Importance and Structure of the Energy Balance

6. Energy Balance Methodology

6.1. Definition and Importance of the Energy Balance

In line with OLADE's Methodology, Energy Balances are prepared in terms of physical and calorific units (kboe).

Conceptually, the energy balance is the accounting of the energy flow between the various transformation processes and economic activities of the energy chain and its balancing relations, for which energy is produced, exchanged with the outside, transformed and consumed; taking as analysis unit, a given country, for an established period (usually one year).
The energy balances are instruments that measure the annual energy sources and consumptions in different economic sectors.

It is adequate to bring up to the basic goals of an Energy Balance (OLADE, 2004):

- To centralize the energy information and figures in order to determine the status of the sector
- To assess the dynamics of the energy system in concordance with the economy of each country, determining the major economic–energy relations between the different sectors of the national economy.
- To serve as an instrument for energy planning
- To understand in detail the structure of the national energy sector
- To determine the competitive and non–competitive uses of each energy source, in order to promote substitution processes wherever feasible.
- To create the appropriate bases that will lead to energy information enhancement and systematization.
- To be utilized to enable energy forecasts and outlooks on the short, medium and long term.

6.2. General structure of the Energy Balance

According the OLADE Methodology for Preparing Energy Balances, the energy balance of OLADE is comprised by a double–entry matrix where the columns indicate the energy sources and the rows correspond to the activities, which form part of the energy system.

A barrel of oil equivalent (boe) is the calorific unit used to display the energy balance.

The basic components of the energy balance are:

- Energy sources
  - Primary energy
  - Secondary energy
- Activities
  - Supply
  - Transformation
  - Demand

The energy balance matrix developed by OLADE, in terms of final energy, reflects the relations among all of the stages of the energy process.

In Table 8, three stages described below can be distinguished:

Supply	Energy supply through the combination of production, importation, exportation and variation in stocks.
Transformation	Physical, chemical and/or biochemical modification of one energy source or form to another, in a transformation center.
Demand	Consumption of energy sources by final consumers in the different sectors, priori to some chemical or physical conversion of energy.

		PRIMARY SOURCES										SECONDARY SOURCES												TOTAL
		NON RENEWABLES SOURCES				RENEWABLES SOURCES																		
		Petroleum	Natural Gas	Coal	Fission Fuels	Hydroenergy	Geothermal	Firewood	Sugar Cane Products	Other Primary	Total Primary	Electricity	L.P.G.	Gasoline / Alcohol	Kerosene	Diesel Oil	Fuel Oil	Coke	Charcoal	Gases	Other Secondary	Non-Energy	Total Secondary	
		kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe	kBoe
SUPPLY	PRODUCTION (PP)																							
	IMPORT (IM)																							
	EXPORT (X)																							
	INVENTORIES (IV)																							
	UNUSED (UN)																							
	TOTAL SUPLY																							
TRANSFORMATION	REFINERY																							
	POWER PLANTS																							
	SELF PRODUCERS																							
	GAS TREATM.PLANT																							
	CHARCOAL PLANT																							
	COKE/BLAST FURNAC																							
	DISTILLERY																							
	OTHER CENTERS																							
	TOTAL TRANSFORMATION																							
FINAL CONSUMPTION	OWN CONSUMPTION																							
	LOSSES																							
	ADJUSTMENT																							
	TRANSPORTATION																							
	INDUSTRY																							
	RESIDENTIAL																							
	COMMERC.,SERV.PUB																							
	AGRIC.,FISH.MIN.																							
	CONSTRUCTION,OTH.																							
	ENERGY CONSUMPTION																							
	NON ENERGY CONSUM																							
	FINAL CONSUMPTION																							

Table 8. Structure of an Energy Balance

Source: OLADE (2004)

6.2.1. Sources

Primary energy sources

Primary energy sources are obtained directly from nature or following an extraction process. Directly: water energy, solar energy, wind, firewood and other vegetable fuels. After an extraction process: petroleum, natural gas, coal, geothermal energy, etc.

The primary energy sources considered in this methodology are listed and defined as follows:

Non–renewable energy sources

- Crude oil: This is a complex mixture of hydrocarbons having different molecular weights, in which there are usually a small proportion of compounds containing sulphur and nitrogen. The composition of petroleum is variable and may be divided into three types, according to distillation residues: paraffin, asphalt or a mixture of both.
  Crude oil is used as a feedstock in refineries, where it is processed to obtain derivatives.

- Natural gas (free and associated): This is a mixture of gaseous fuels and includes both free natural gas and it is present in coal mines or geopressure zones. Herein, both (the net free and associated gas produced) are placed under the same heading due to their similar nature and uses.

  - Free Natural Gas

  A gaseous mixture of hydrocarbons made up primarily of methane obtained from gas fields. Since it generally does not contain condensates, it is commonly called “dry gas”.

  - Associated Natural Gas:

  This is a gaseous mixture of hydrocarbons that is produced in association with crude oil. It generally contains fractions of light liquid hydrocarbons (condensates), so is frequently called “wet gas”.

- Coal: This is a black or dark brown solid fuel mineral that essentially contains carbon, as well as small amounts of hydrogen and oxygen, nitrogen, sulfur and other elements. It results from the degradation of the remains of plant organisms during long periods, due to the action of heat, pressure, and other natural physical–chemical phenomena.

  Due to the different degrees of change in the process, coal is not a uniform mineral and is classified by ranks according to its degree of degradation, in series that range from lignites and anthracites, which have considerable differences in their volatile contents, fixed carbon and caloric value.

- Fissionable Fuel or Nuclear Energy: This energy is obtained from the mineral uranium following a purification and/or enrichment process. What is considered

primary energy as “nuclear fuels” is not the mineral uranium in and of itself, but the contents of the fissionable material that is what feeds the nuclear plants.

Renewable Energy Sources

- Hydroenergy: The energy potential of a water flow

- Geoenergy: Geothermal energy is stored under the earth’s surface in the form of heat, which can be transmitted to the surface through a fluid that is in contact with the heated rock. This fluid is generally made up of water in liquid state, steam, or a combination of both. Only the portion of this energy source that is used in power generation is considered.

- Wind energy: This energy is produced by the wind and can be used jointly with a turbine–generator

- Firewood: This energy is obtained directly from forest resources. It includes tree trunks and branches, but excludes timber industry wastes, which are included under the definition of “plant wastes” used for energy purposes.

- Sugarcane products (molasses, juice, and bagasse for energy purposes): These include sugar cane products for energy purposes. They include bagasse, the sugarcane juice and the molasses.

- Other primary sources (animal waste and other vegetable waste, recovered energy, etc.)

  - Animal Wastes: This refers to wastes from farm activities and urban wastes. These may be used directly as a fuel in dry form or converted to biogas, through a process of fermentation or decomposition method.

  - Vegetable wastes: These are energy sources obtained from farm and forestry wastes. This includes all farm wastes (except for sugarcane bagasse), such as: rice husks rice husks, coffee husks, palm nut husks, etc., sawmill wastes (not included under the heading of firewood nor bagasse, etc.), for energy purposes.

  - Industrial or Recovered Wastes: Substances with energy contents produced in industrial plants as a byproduct of the production process, such as black pulp liquor, chemical industry wastes (except for petrochemicals, which should be considered secondary products because they come from natural gas or petroleum derivatives), etc.

  - Other Primary Energy Sources: These include solar (water heating in households and hotels, grain drying, lighting with photovoltaic cells), urban wastes (garbage or liquid wastes) and any other primary source that is not mentioned in the descriptions above, but are relevant to the energy structure of the country.

Secondary energy sources

Secondary energy refers to the different energy products whose origin is the different transformation centers, after undergoing a physical, chemical or biochemical process, and whose destination are the diverse consumption sectors, and/or other transformation centers.

The secondary energy sources considered in this methodology are listed and defined bellow.

- Liquefied gas (LPG): This consists of a combination of light hydrocarbons that are obtained from distilling oil and/or treating natural gas.
  They can be of three types:
  a) Combination of hydrocarbons from the C3 group (propane, propene, propylene)
  b) Combination of hydrocarbons from the C4 group (butane, butylene)
  c) Combination of C3 and C4 in any proportions

- Gasoline and Naphtha (aviation gasoline, motor gasoline, natural gasoline and naphthas): A combination of light liquid hydrocarbons obtained by distilling oil and/or treating natural gas, whose boiling range is generally between 30–200 degrees Celsius. It also includes the alcohol obtained from distilleries that is used as an energy product. This group includes:
  - *Aviation Fuel*: This is a combination of reformed naphthas of high–octane, high volatility and stability, and high freezing point, used in propeller–driven aircraft with piston motors.
  - *Motor Gasoline*: A complex mixture of relatively volatile hydrocarbons used, with or without additives (such as lead tetra–ethyl) for operating internal combustion engines.
  - *Natural Gasoline*: A product of natural gas processing, used as a raw material for industrial processes (petrochemical) in refineries or mixed directly with naphthas.

- Alcohol: Includes both ethanol (ethyl alcohol) and methanol (methyl alcohol) used as fuels.
  - *Ethanol:* is a colorless liquid that can be produced by fermentation of plant materials with a high sugar content, such as sugarcane juice or molasses; plant materials with high starch content, such as cassava, corn, etc.; and materials with high cellulose content: firewood, plant wastes. It can be used as anhydrous or hydrated alcohol, alone or mixed with gasoline in internal combustion engines.
  - *Methanol:* is also a colorless liquid that can be produced from several raw materials such as firewood, plant wastes, methane, natural gas, coal, etc. It is used in internal combustion engines.

- Kerosene and Jet fuel*:*
  - *Kerosene*: A liquid fuel made up of the oil fraction that is distilled between 150 and 300 degrees Celsius. It is used as a fuel for cooking foods, lighting, in motors, in refrigeration equipment, and as a solvent for domestic waxes and insecticides.
  - *Jet fuel*: This is kerosene with a special degree of refining, with a freezing point below that of common kerosene. It is used in reaction motors and turbo propellers.

- Diesel oil *(also including gas oil*): Liquid fuels obtained from atmospheric distilling of oil from 200 to 380 degrees Celsius, are heavier than kerosene and are utilized in diesel engines and other compression–ignition engines.

- Fuel Oil or Heavy Fuels: This is waste from refining oil, which includes all heavy products and is generally used in boilers, power plants and navigation.

- Coke*:* The general term "coke" applies to a solid, non–smelting material with high carbon content, obtained as a result of the destructive distilling of coal, oil and other carbon materials. There are different types of coke that are normally identified by adding the name of the material of origin to the end. Included in this source are oil coke and coke oven coke.

- Electricity: This is energy transmitted by electrons in movement. It includes electric energy generated with any resource, whether primary or secondary, in hydroelectric, thermal, geothermal or nuclear plants.

- Charcoal: This fuel is obtained from the destructive distilling of wood in absence of oxygen, in charcoal plants. This product absorbs humidity rapidly, and often contains 10 to 15 % water, besides 0.5 to 1.0 % hydrogen and 2 to 3 % ash, with lower caloric power of around 6,500 Kcal / Kg. These characteristics may vary according to the quality of the firewood of origin. In some cases it can substitute coke in foundry processes, and be consumed in industries such as brick making, and in the residential sector for cooking.

- Gases (biogas, coke gas, furnace gas, refinery gas): Included in this category are gaseous fuels obtained as by–products of refining activities, coke ovens and blast furnaces. It also includes the gas obtained in bio–digesters.
  - *Refinery Gas:* Non–condensable gas obtained from refining crude oil. Consists primarily of hydrogen, methane and ethane used mostly in refining processes.
  - Blast furnace Gas: Obtained as a by–product of steel production in blast furnaces, being used generally as a fuel for heating purposes in the plant.
  - Coke Oven Gas: The gas obtained as a by–product in the intense heating of coal or coke, with a combination of air and steam, in coke ovens. Composed of carbon monoxide, nitrogen and small amounts of hydrogen and carbon dioxide.
  - Urban Gas: Gas produced by the total carbonization or gasification of petroleum derivatives, with or without enrichment. Used fundamentally for food cooking in households, although it may have some industrial type uses.
  - Biogas The gas, primarily methane, obtained from the anaerobic fermentation of biomass wastes.
  - Other Gases All those not mentioned, having an energy use.

- Other Energy Fuels: All the secondary energy products that have not been included in the above definitions and have a share in the energy structure of a country.

- Non–Energy Products All products that are not used for energy purposes, although they contain a considerable energy content, among which are the asphalts, solvents, naphthas, oils and greases, lubricants, etc.
  - Naphtha: A volatile liquid obtained from processing oil and/or natural gas. Used as a raw material in refineries, as a solvent in manufacturing paints

and varnishes, and as a cleansing agent. Also used in petrochemistry and the production of fertilizers.

6.2.2. Activities

Supply

Production

i. **Primary Energy Production**
All energy, extracted, exploited, harvested, etc., is considered to be of importance to country, and of course that it has been produced within the national territory.

ii. **Secondary Energy Production**
It refers to the amount of energy that is generated from primary energy processing and/or in transformation plants before accounting for self–consumption. If any part of the production is recycled to the same transformation center that it comes from, this should be deducted from production.

All secondary energy production should be accounted at the transformation center where each energy product is produced..

Imports and Exports of Primary and Secondary Products

This explanation is valid for any energy source that can be imported and/or exported. The most common ones that are exchanged among countries are oil, natural gas, coal, nuclear fuel, other primary sources, electricity, liquefied gas, gasoline / alcohol, kerosene / jet fuel, diesel oil, fuel oil, charcoal, non–energy sources, and other secondary products.

i. **Imports**
It includes all primary and secondary energy sources originated outside the borders and that come into the country to be part of the total energy supply system.

ii. **Exports**
It is the amount of primary and secondary energy that a country spends on the foreign trade. Some countries follow the practice of considering the aviation gasoline and jet fuel sold to foreign aircraft, as well as the bunker sold to foreign ships as exports. OLADE does not recommend this procedure, because in order to be consistent, it would have to take what domestic ships and craft load abroad as imports.

According to OLADE's conception, the amount purchased by a consumer within a country is assumed to be part of final consumption although the physical process of consumption may take place in international spaces or waters. The same occurs when a vehicle loads gasoline in one country and then crosses the border consumes it in a neighboring country.

Stock change

Stock change is the difference between initial stocks (at January 1) minus final stocks (at December 31) for a given year, in the storage facilities for different products.

Inventory variation is considered according to its nature. Thus, an inventory increase means a reduction in the total supply and vice–versa.

Unused

This unused energy is the amount of energy that is presently not being used due to the technical and/or economic feasibility of developing it. Those most commonly dealt with under this heading are:

- Spilled crude oil
- Unused natural gas In countries that are large producers of oil–associated gas, it is common for a large part of that gas to be burned in the open. This is the unused natural gas, and the reasons for its non–use may be:
- Insufficient market
- The market exists, but there is no gas pipeline to transport the gas to the user's doors
- The market and the gas pipeline exist, but oil extraction requires that the amount of gas produced be greater than the demand can use

In any of these cases, unused natural gas represents a waste of an energy product that is highly valued by consumer sectors. Other Unused Primary Energy Sources You should take into account the amounts of "other primary sources" that have been considered as production but that do not reach final consumption.

Transformation Centers

This refers to energy that enters special processors called transformation centers for modification; these centers produce physical or chemical changes from one energy source to another or others, seeking in this way to improve the use of energy.

One of the paths that TOTAL SUPPLY can follow is as feed for transformation centers. In the case of primary energy, the flow is called TRANSFORMATION; if it is secondary, RECYCLING.

Refinery

It is a processing plant where oil is transformed into derivatives. Refineries basically separate crude oil into its different components (Figure No. 4). This methodology will treat all refineries as if they were a single processing unit. Although this representation does not allow you to completely describe the transformation center in terms of refining, or analyze the internal flexibility of each refinery, it suffices to establish the input and output ratios for the balance that proposed herein. There are different types of refineries with different types of processes, which do not always obtain the same products.

Power Plants

Depending on the case, these transformation centers may consist of hydroelectric plants, conventional thermoelectric plants with steam turbines, gas turbines and internal combustion engines, nuclear power plants and geo–thermoelectric plants.

Gas Treatment Center

In treatment plants, natural or associated gas is processed for the primary purpose of recovering compound liquid hydrocarbons such as gasoline and naphthas, pure hydrocarbons such as butane, propane, ethane or a combination thereof, and non–energy products such as carbon through a process of physical separation of gas components.

Charcoal Plants

This is essentially a furnace where partial combustion of firewood is achieved,

producing charcoal, non–volatile and volatile products, and generally the latter are not used. Note that wood, in the form of charcoal, has a greater caloric value.

Coke/Blast furnaces

These are found in the foundry industry. Coal is transformed into coke and coke oven gas in the coke oven. The coke then goes to a blast furnace, from which pig iron and blast furnace gas are obtained. Coke ovens for coal treatment produce coke, coke oven gas and non–energy products (benzols, tars, etc.). Part of the coke is obtained in the production of blast furnace gas, and the other part is consumed in the mineral reduction process in the blast furnace.

Distillery

These are centers where mostly sugarcane juice is treated to produce alcohol. Likewise, they include alcohol distilleries that process other raw materials such as beets, cassava, or other products with high starch or cellulose contents.

Other Centers

These may the anaerobic digesters and pyrolysis furnaces, etc., which take farm, animal, forest, agroindustial, and urban wastes, plus those from energy plants or any other transformation centers that are included in the country's balance and that are not among the above.

Total Transformation

The total transformation is the sum of both primary and secondary energy for all inputs into transformation centers. When there is no energy source feed to transformation centers, the total is zero.

Note: OLADE's Energy Balance uses the negative sign as a convention for inputs from energy sources to transformation centers to transform them into other energy sources. Inputs for power generation are an example.

Self–Consumption

This is one of the four possible paths for SUPPLY. Self–consumption is the part of primary and secondary energy that the energy sector itself uses for its operations.

Statistical Adjustment

This line serves primarily, in some cases, to make up for differences due to conversion of different sources, from their original measurement units to units that are compatible for preparing the balance; and in other cases to make up for differences that are imperceptible and very difficult to find. In all cases, adjustment should not be greater than 5 % of the total supply.

Adjustment = Domestic Supply – Total Transformation – Losses – Total Final Consumption

6.2.3. Demand

Transportation Sector

The final consumption of a country's transportation sector is the total amount of fuel required to move its vehicle fleet. The modes of transportation may be: a) Highway, b) Railroad, c) Air, d) River, and e) Maritime.

Industrial Sector

An industry is an establishment classified as such in the “large division 3” of the Standard Industrial Classification.

Final consumption of the industrial sector consists of any energy source used in the processes that are carried out within the limits of the establishment, in which certain raw materials are transformed into final products.

This definition leaves out certain fuels that the industries purchase to facilitate delivery of their products to the market. It is common for certain industries such as beverages to distribute their products using their own vehicle fleet. However, that consumption belongs to the transportation sector.

Sometimes the distinction between industry and agriculture may not be very clear: the recommended criteria to solve doubtful cases is to consider as agricultural all activities carried out within the farm and as industry otherwise.

Residential Sector

The final consumption of this sector pertains to a country’s urban and rural households. A household is what the population census defines as such, and there are as many households as the census and derivative mechanisms have determined. It is important to emphasize that the energy balance has no particular definitions for population parameters, and is based on the definitions of available demographic studies, even when those definitions may be or appear incorrect.

Commercial, Service and Public Sectors

The sector information unit is an establishment belonging to one of the following groups from the Standard Industrial Classification:

Div. 4 = Electricity, gas and water; Note: Electricity and gas are not counted here, as they belong to the energy sector (self– consumption), which leaves only water.

Div. 6 = Wholesalers, retailers, restaurants, and hotels.

Div. 7 = Transportation and communications; only business establishments but not vehicle fleets, whether or not they belong to the above.

Div. 8 = Financial establishments (banks), insurance companies, and services provided to other companies.

Div. 9 = Social and community services, such as schools, universities, health, churches, movies, theaters, repair businesses, public administration, defense, etc.

Final consumption for this sector is that of all establishments listed above, provided it is produced within the building where the establishment is located. This excludes vehicle consumption. For a complete description, consult the Standard Industrial Classification (revision 2).

Agriculture, Fishing and Mining Sectors

The informational unit of the farming, fishing and mining sectors is an establishment defined as follows in the Standard Industrial Classification data code:

Div. 11 = Agriculture and hunting

Div. 12 = Forestry and saw mills

Div. 13 = Fishing

Div. 2 = Extraction of minerals and metals

When it is difficult to separate agriculture from agroindustry, fishing from the fishing industry, and mining from metallurgy, the Standard Industrial Classification method supposes that the establishment is classified according to the group that most of its activities fall under. The best recommendation is to adopt the rule followed by the office in charge of developing national accounts.

Construction and Other Sectors

This sector consists of two sub–sectors: Construction and Other Sectors.

Construction includes:

- New buildings and remodeling of old buildings;
- New industrial establishments;
- Civil works, such as bridges, reservoirs, tunnels, etc.;
- New roads and maintenance of the existing road system.

Other Sectors refers to any energy consumer that is not specified in the identified sectors; this item is generally used to complete consumption and as such should not be very large. If it were over 5 % of all final consumption, for example, this would mean that your country's balance is not well disaggregated.

Final Energy Sector Consumption

This refers to the total amount of primary and secondary products used by all the aforementioned consumption sectors to meet their energy needs, and is therefore the sum total of all energy consuming sectors.

Final Non–Energy Consumption

This sector is defined by the consumers that use energy sources as raw material for the manufacture of non–energy source goods. Here are some examples:

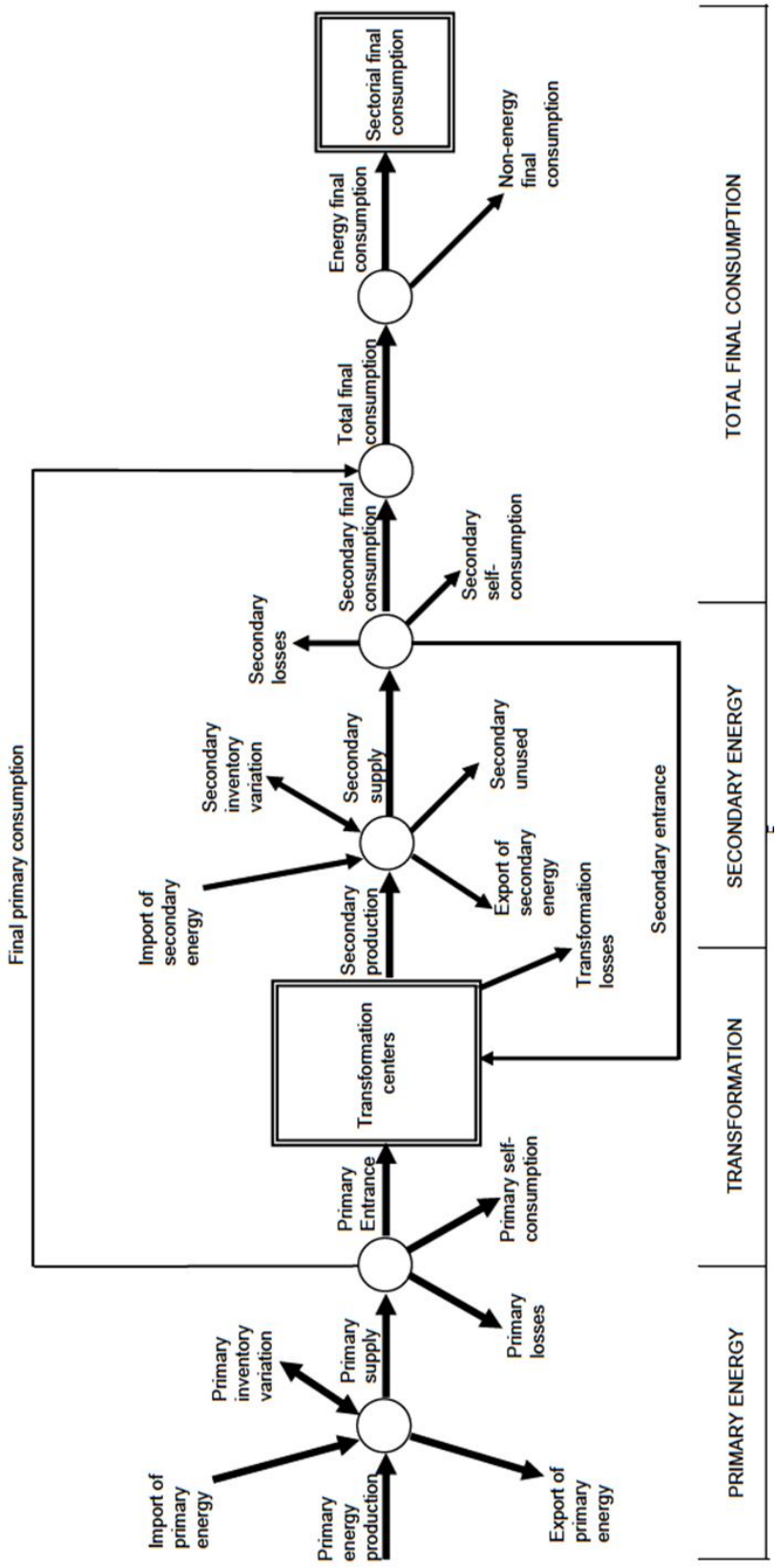
- Natural gas and petroleum derivatives (naphtha, reformatting, refinery gas, etc.), consumed in petrochemistry to make plastics, solvents, polymers, rubber, etc.
- Bagasse for making paper or pressed board
- Animal waste as fertilizers
- Plant wastes as feed for cattle

Total Demand

This is all energy that is delivered to the consumption sectors, both for use as energy sources and as non–energy sources. The sum of all energy consumption (Line No 25) plus non–energy consumption (Line No 26) is the result of this sum

6.3. Energy Chain

Figure 1. Energy Chain



Chapter III. Data Gathering Process

Following OLADE's methodology for Energy Balances, the questionnaires designed for data collection purposes consider the three stages of the energy chain: supply, transformation and consumption.

7. Data collection -

The process of data collection consists of:

a) Characterize the energy sector:
   - Energy sources
   - Energy facilities
   - Energy consumers
   - Key stakeholders

b) Identify the most important sources and data requirements of information that will permit to build the metadata, so as to ensure the transparency, traceability, reliability and replicability of Energy Balance preparation;

c) Design the contact list and agenda for OLADE's technical visit to The Bahamas with help of the Focal Point; and,

d) Develop the templates and data collection surveys according to the defined OLADE's methodology for Energy Balances.

7.1. Surveys Description

General Energy Variables

Survey 1. Q1_F03_ TBH _2015

Oil and Products (Section 1)

This form enables to collect annual *Oil* data by *Activity* and *Energy Source*. Activities are disaggregated in *Production, Exports, Imports* and *Consumption*, each of which divided into energy sources; *Oil, LPG, Gasoline, Kerosene and Jet Fuel, Diesel Oil* and *Fuel Oil*. Physical units are expressed in barrels (kbbl). *Natural Gas* is disaggregated in *Production* (Without reinjection or flaring), *Flaring* (Burned into the atmosphere), *Exports, Imports* and *Consumption*. In this last case, classification includes *Power generation, Transportation, Residential, Commercial, Industrial, Agriculture, Fishing and Mining* and *Others*. Physical units are expressed in millions of cubic meters (MMm^3).

Other Energy Sources (Section 2)

As in the previous case, *Other Energy Sources* sheet permit to collect data from *Other Energy Sources* and some *relevant activities* as follows: *Coal* (*Production, Exports, Imports* and *Consumption*), *Alcohol* (*Production* and *Consumption*), *Biodiesel* (*Production, Exports, Imports* and *Consumption*), *Firewood* (*Consumption*), *Sugar Cane Products* (*Production* and *Consumption*), and *Agricultural Wastes* (*Production* and *Consumption*). Depending on the type of energy source, physical units are expressed in tones (t), barrels (bbl.) and barrels of oil equivalent (boe).

Electricity (Section 3)

Data collection of annual *Electricity* variables is disaggregated in five activities: *Production, Exports, Imports, Consumption* and *Losses*. In the case of *Production*, the information is classified into two categories: *Public Generation* (By technology: *Hydro, Thermal, Geothermal, Wind, Photovoltaic* and *Nuclear*) and *Self-Producers' Generation* (By technology: *Hydro* and *Thermal*). *Consumption* is divided in economic sectors such as *Transportation, Residential, Commercial, Industrial, Agriculture, Fishing and Mining,* and *Others*. Units are expressed in GWh.

Potential and Storage (Section 4)

This sheet is intended to collect data about *Reserves*, –in the case of *Oil, Natural Gas* and *Coal*; *Capacity*, –in the case of *Alcohol Distillery* and *Biodiesel Plants*; and *Potential*, –in the case of *Electricity* (*Estimated* and *Installed*).

Survey 1. Q2_HC_ TBH _2015

Storage (section 1)

The *Hydrocarbons Survey –HC–* permit to collect information about *Storage Capacity, Supply* and *Sales* of each energy source. In the first case, data include the identification of *Facilities* (name and location), and its *Storage Capacity* reported for each of its energy sources (*Oil, Gasoline, Diesel Oil, Fuel Oil, Kerosene and Jet Fuel, LPG, Asphalts, Lubricants* and *Greases*), expressed in physical units (kbbl).

Supply and Other Variables (section 2)

This section is oriented to determine the amount of *Production, Imports, Exports, Initial/Closing Stocks, Unused* and *Losses* of each energy source previously mentioned, expressed in physical units (kbbl).

Hydrocarbons' Total Sales (section 3)

Section 3 enables to identify *Total Sales* of each energy source, previously mentioned, among different economic sectors, expressed in physical units (kbbl).

Survey 2. Q3_EE_ TBH _2015

This form is designed to identify the general characteristics of the Electricity Sector, including annual key variables such as *Power Plants General Characteristics* including a range of information from the *Name* and *Location* (**section 1**), to *Technology Type*, *Installed Capacity, Plant Factor, Electricity Generation, Fuel Consumption, Own Consumption* and *Losses* (**section 2**). On the other hand, **section 3** refers to *Hydroenergy Technical Specifications* (*Reservoir Name, Capacity* and *Flow*, *Average Flow, Precipitation Flow, Turbine Flow*, among others).

Survey 3. Q4_CTR_ TBH _2015

The CTR Survey allows collecting Transportation Sector characteristics both in general terms like *Added Value* and *Total Fleet* by type of each transportation category (*Road, Sea* and *Air*).At more detailed level, information includes *Consumption* by relevant energy sources and *Characterization of Vehicle Fleet* in *Public* and *Private*(By fossil fuel used), and *Annual Average of Kilometers Travelled* (km/year).

Survey 4. Q5_CIN_ TBH _2015

Characterization of Industrial Sector (section 1)

This Form is oriented to the Industrial Sector and has three sections. This one includes general information such as *Number of Industrial Facilities, Added Value, Production* and *Number of Employees*.

Consumption by Energy Sources (section 2)

This section provides information on Energy Consumption of each industry category (Food products, beverages and tobacco; Textiles and Clothing, Footwear and Leather, Wood and Furniture, among others), by energy source (Electricity – *Purchased* and *Self-Generated*–, *Crude Oil, Gasoline, Diesel Oil, Fuel Oil, Kerosene, LPG, Coke, Charcoal*, *Firewood* and *Others*).

Great Energy Consumers (section 3)

In order to establish a detailed level of data collecting, information is based on a *List of Great Industries*, which include *Facility Name* and *Category of Industrial Subsector, Location, Added Value, Production* and *Number of Employees*.

Self–Generators (section 4)

The *Characterization of Self–Generators* is based on the Inputs used for self – generation: *Hydro*, *Diesel Oil, Fuel Oil, Photovoltaic, Bagasse* and *Others,* and a final column added for *Self–Generated Electricity*.

Survey 5. Q6_CIN2_ TBH _2015

The Form 6 was designed with the purpose to be an *Energy Survey of Industry Sector,* which allows to access key information from *Major Energy Consumers*.

Survey 6. Q7_CCO_ TBH _2015

General Information of the Commercial Sector (section 1)

This form aims to collect information about *General Characteristics of Commercial Sector*, by providing information on *Number of Beds and Rooms, Occupation Factor of Beds and Rooms* and *Added Value.*

Electricity and Fossil Fuel Purchases (section 2)

In that case, it is needed to report the annual Amount (Physical units) and Sales (Currency), made by overall sector for each single energy source(*Diesel Oil, Fuel Oil, Charcoal*, *Firewood, LPG, and subtotal on Electricity Purchased, Self–Generated* and *Others*).

Survey 7. Q8_CCOH_ TBH _2015

The form correspond to the same structure than the described below, but instead of being addressed to the total Commercial Sector it is oriented to each Hotel Facility, constituting on a particular *Energy Survey of Hotel Industry*.

Survey 8. Q9_CCOR_ TBH _2015

The form corresponds to the same structure than the described for the Form 6, but instead of being addressed to the total Commercial Sector it is oriented to each Restaurant Facility, constituting on a particular *Energy Survey of Restaurant Industry*.

Survey 9. Q10_CRW_ TBH _2015

General Information of the Agricultural Sector (section 1)

This form is designed to identify the general characteristics of the Agricultural Sector. Annual key variables include *Added Value, Production*, *Number of Agricultural Production Facilities, Area Harvested* and *Level of Mechanization.*

Consumption by Energy Sources (section 2)

The section provides information on Energy Consumption of each Agriculture category (Crops 1, 2, etc., and Livestock), by energy source (Electricity –*Purchased* and *Self-Generated*–, *Crude Oil, Gasoline, Diesel Oil, Fuel Oil, Kerosene, LPG, Coke, Charcoal*, *Firewood* and *Others*). In Fishing activity, consumption of energy sources are focused on four of them: *Gasoline, Diesel Oil, Electricity* and *Others*.

Characterization of the Level of Mechanization (section 3)

This sheet compiles information on the level of mechanization, typically based on a percentage of the technology involved on agricultural processes such as *Irrigation, Tractors, Harvester and Fumigation,* among others, or a *Global Level*.

Survey 10. Q11_NV_ TBH _2015

Information from the National Variables

This Form corresponds to the compilation of National Variables, related to social and economic data. **Section 1** compiles information about *Information Units* (Hotels, Restaurants, Public Sector and Services), whilst **Section 2** on *Energy Consumption* by energy source.

Survey 11. Q701_CCOSC_ TBH _2015

General Information for the Shopping Centers

This questionnaire is designed to identify the main characteristics of shopping centers General Characteristics of the Mall by providing information on the name or company, contact details, and size of Shopping centers among others. It gathers data about energy consumption by each Energy Sources (Electricity, LPG, Diesel Oil, Charcoal, Firewood, Fuel Oil and Others).

Q41_CTR2_ TBH _2015.xlsx

General information from Individual Drivers

It was designed to collect data from individual drivers within the country. It obtains the total kilometers or miles that a common citizen does per day, also the amount of gallons that are pumped to the vehicle, the age of the vehicle, brand and classification. This survey is delivered to public transportation drivers as well.

8. Technical Visit Agenda

ORGANIZATION OF LATIN AMERICA AND ENERGY (OLADE) - THE BAHAMAS - ENERGY BALANCE										
	Mon - 1/11/16		Tue - 1/12/16		Wed - 1/13/16		Thur - 1/14/16		Fri - 1/15/16	
Time	Meeting Title	Venue	Meeting Title	Venue	Meeting Title	Venue	Meeting Title	Venue	Meeting Title	Venue
									Flight Nassau To Freeport	
9:00 AM	Survey Transport Sector Sampling Private,Public Transprt vehicels & Gas Stations	Street Sampling	Ministry of The Environment and Housing	Charlotte and Shirley Street (Charlotte House Building) 2ND Floor	Commonwealth Brewery	Clifton Pier	Central Bank of the Bahamas	Thompson Blvd.	The Bahamas Oil Refining Company (BORCO)	Heavy Industrial Area, Queens Hwy.
9:30 AM										
10:00 AM										
10:30 AM					Sun Oil Company (FOCAL	Clifton Pier				
11:00 AM			Bahamas Electricity Corporation	Blue Hill, Tucker Road.			Ministry of Tourism	Sampling Private,Public Transprt vehicels &		
11:30 AM									Grand Bahama Power Company	Pioneer's & East Mall Drive
12:00 PM					Survey Tursim Services Sector: Hotels and Restaruants	Clifton Pier	Ministry of Foreign Affairs & Immigration	Goodman's Bay Corporate Centre		
12:30 PM										
1:00 PM										
1:30 PM										
2:00 PM	Survey Tursim Services Sector: Hotels and Restaruants	Street Sampling	Department of Statistics	Thompson Blvd (Clarence A. Bain Building)	Sol Petroleum Bahamas Ltd.	Windsor Field Road (near to the airport)	Rubis Bahamas Ltd.	Thompson Blvd.	Grand Bahama Port Authority	Pioneer's & East Mall Drive
2:30 PM										
3:00 PM										
3:30 PM							Ministry of Transport andf Aviation			
4:00 PM										
4:30 PM			Survey Tursim Services Sector: Hotels and Restaruants	Street Sampling	Survey Tursim Services Sector: Hotels and Restaruants	Street Sampling				
5:00 PM										
5:30 PM										
6:00 PM									Flight Nassau To Freeport	
7:00 PM										

Table 9. The Bahamas Technical Visit Agenda

8.1. Developed Activities

- In every visit to each stakeholder, a brief explanation of the objective of the project was presented, as well as the importance of the final results to The Bahamas

- OLADE visited the Ministry of Environment and Housing as well as the Ministry of Foreign Affairs and Immigration to start with the different visits and gather official information relevant to elaborate the study. As well to obtain good contacts in other public institutions.

- OLADE team visited New Providence (Nassau) and The Grand Bahamas (Freeport) islands in order to collect information from the main stakeholders in the energy sector of the country.

- The Central Bank of The Bahamas was visited in order to obtain the hydrocarbons statics given that the act as the main information and tax revenue collector for oil derivate products imports and exports.

- In terms, of the privates sector, OLADE visited the most relevant Hydrocarbons private stakeholders personally, as well as relevant industrial activities.

Electricity and renewable energy sector institutions responsible for policies, regulations, prices, production, trade, distribution or supply, were visited.

- The Statistic department of the Bahamas was visited in order to get information of the residential sector, related to the number of households in the country, the type of dwelling as well as the specific fuel used for cooking and lightning.

- Government officers at the Tourism Ministry kindly provide us with contact details of government officials and the Department of Transport. Then OLADE visited the licensing authority in order to obtain the number of vehicles and their characteristics for the years 2010-2012. OLADE also visited the maritime terminal, to obtain information about the fuel consumption of this type of transportation.

- Technical visits were made to the institutions that provided information on GDP, agriculture, fishing, industrial, wholesale and retail establishments, hotels, restaurants, among others.

As a result of the Technical Visit, OLADE elaborated two-flow matrix. The first energy flow matrix contains the relationship between the energy sources and activities performed in the country.

PARAMETERIZATION OF THE ENERGY INFORMATION SYSTEM OF THE BAHAMAS

DEFINITION OF TYPE OF INFORMATION UNITS, INFORMATION UNITS, PROFILES AND USERS

Updated: January, 2015

		INFORMATION UNITS						
	FUELS	Rubis	SOL	SUN	BAHAMAS ELECTRICITY CORPORATION	FOCOL	THE BAHAMAS OIL REFINING CO.	GRAND BAHAMAS POWER COMPANY
1	CRUDE OIL							
2	LPG							
3	JET FUEL & KERO							
4	GASOLINE							
5	NATURAL GAS							
6	DIESEL OIL							
7	FUEL OIL							
8	NON ENERGY PRODUCTS							

Table 10. Energy Sources Vs. Stakeholders Identification

PARAMETERIZATION OF THE ENERGY INFORMATION SYSTEM OF THE BAHAMAS

DEFINITION OF THE ENERGY BALANCE MATRIX

	Firewood	Electricity	LPG	Gasolines	Kerosene & Jet Fuel	Diesel Oil	Fuel Oil	Charcoal	Non Energy Products
	Unit:	Unit:	Unit:	Unit:	Unit:	Unit:	Unit:	Unit:	Unit:
	Kt	KWh	Kbbl	Kbbl	Kbbl	Kbbl	Kbbl	Kt	Kboe
Production									
Imports									
Exports									
Unused									
Stock Change									
Bunker									
Transfers									
Power Plants									
Self-producers									
Transport sector									
Industrial sector									
Residential sector									
Commercial, Services and Public									
Farming, Forestry and Fishing									
Mining and Quarring									
Construction sector and Others									
Non Energy Consumption									
Own Consumption									
Losses									

Table 11. Parameterization of the Energy Balance Variables

8.2. Additional results of the technical visit:

- As OLADE introduced the project to the decision makers in the energy sector, the Government of The Bahamas recognized the importance of the data gathering process and the benefits of having accurate Energy Balances and GHG Emissions inventory for policy making in the energy sector.

- The contacts that were visited understood the importance of having specific sector information to elaborate the Energy Balance.

- Fifteen public and private institutions were visited and data collection surveys were performed by most of them.

- Additional information and documentation related to the supply and demand of energy was obtained from other institutions, including the Ministry of Tourism, Economic Development and the Bahamas Central Bank.

- A technical inventory of the power plants and fuel storage facilities were obtained directly from the Electricity public utilities.

- The macro energy consumers in each sub sector (residential, commercial, manufacture, agriculture, fishing, transport, tourism, electricity) were identified and their consumption was calculated for the three years.

- Fuel consumption of the sea transport sector was estimated with important information obtained directly from the fisheries and the maritime authority.

- The use of charcoal and Firewood were estimated for the years 2010-2012 based on the information provided by the Statistics Department on national census, showing a minimal usage of this resource, due to the increasing participation of LGP for cooking purposes.

8.3 Data processing

During the process of gathering information, OLADE had the opportunity to obtain information related to the supply, demand and transformation processes that are needed to build the Energy Balance (EB) of the Bahamas. The information available to calculate the EB was the following:

- The 3 major oil companies solely importers of hydrocarbons were, Sol, Sun and Rubis. According to the interviews, such enterprises did not provide information on imports as they stated that the Central Bank already compiled such information. OLADE obtained such records through the Bahamas Central Bank's personnel, which are used for balance of payments calculations. This information was obtained by The Bahamas Central Bank from Customs and Migration and Taxing authorities. However, some import values from Freeport are not registered, due to its special regime. Due to the legal nature and unique jurisdiction system, imports from the Bahamas Oil Refining Company (BORCO), were not taken into account into the Bahamas Energy Balance. Since BORCO leases its storage facilities for international operations rather than commercializing oil products. Finally, with this information, it was possible to determine the final consumption of the different

sectors (residential, commercial, industrial, agricultural, mining, electricity generation and gas stations) by the use of each energy source;

- Additional information on supply, transformation and consumption of electricity came from yearly financial and operational reports from both the Bahamas Electricity Company (BEC) and the Grand Bahama Power Company (GBPC) and also from the questionnaires related to the electricity information of the years 2010 – 2012.

- Residential consumption of firewood and charcoal was calculated according to the information provided by the Statistics and Census Department and also estimated on the basis of OLADE's residential consumption model, using data about population and housing distribution, family size and living arrangements and housing statistics (lighting and cooking), contained in population censuses published by the Central Statistics Office;

- Energy consumption in the transport sector was calculated using the number of vehicles and vessels registered in the country with the information provided by the importers in terms of the total sales of the fuel stations and also the storage tanks for filling the sea transportation. OLADE have also provided individual questionnaires to citizens, including taxi drivers and official Government vehicles. With these questionnaires, it was possible to obtain information related to the vehicle transportation in terms of the type of vehicle, the fuel that it is used and their distance in annual basis.

- To calculate the consumption in different sectors and economic activities, OLADE has also provided specific questionnaires to each of those sectors. The industry sector, commercial & public services, the agriculture, fishing and mining and the construction were asked about their energy consumption in terms of electricity consumption, fuels used and size of each enterprise (hotels, restaurants, industries, and commercial businesses).

Chapter V. Energy Balance Processing

9. Energy Balance of The Bahamas

9.1. Energy Balance sheets

All the data that was gathered during the first technical visit, later on were processed per each Energy Source and located in each one of the following tables that are divided into: Energy Balance Main Sheet, Main Supply Sheet, Main Transformation Sheet, Main Consumption Sheet, and the Auxiliary Sheets.

Main Balance Sheet

It registers horizontal subtotals of the matrix of Energy Balance.

MAIN FORM: BALANCE						
SOURCE		UNIT	kt	COUNTRY		
YEAR	1 TOTAL SUPPLY	2 TOTAL TRANSFORMATION	3 OWN CONSUMPTION	4 LOSSES	5 FINAL CONSUMPTION	1-2-3-4-5 ADJUSTMENT
2005	-	-			-	-
2006	-	-			-	-
2007	-	-			-	-
2008	-	-			-	-
2009	-	-			-	-
2010	-	-			-	-
2011	-	-			-	-
2012	-	-			-	-
2013	-	-			-	-

Table 12. Main Energy Balance Sheet

Main Supply Sheet

Considers the internal energy supply flows formed by: Production, Import, Export, Stock Changes and Unused.

SOURCE	Diesel Oil	UNIT	kbbl	COUNTRY		
YEAR	1 PRODUCTION	2 IMPORTS	3 EXPORTS	4 STOCK CHANGE	5 UNUSED	1+2-3+4-5 TOTAL SUPPLY
2005						
2006						
2007						
2008						
2009						
2010						
2011						
2012						
2013						

Table 13. Main Supply Sheet

Main Transformation Sheet

The sheet registers data about loads and production coming from processing centers, such as refineries, power plants,–or self-producers–, gas plants, Charcoal plants, cookeries and distilleries.

MAIN FORM: TRANSFORMATION										
SOURCE	Charcoal	UNIT	kt	COUNTRY						
YEAR	1 REFINERIES	2 POWER PLANTS	3 SELF PRODUCERS	4 GAS PLANTS	5 CHARCOAL PLANTS	6 COKE PLANTS / BLAST FURNACE	7 DISTILLERY	8 OTHER PLANTS	TOTAL TRANSFORMATION	TOTAL PRODUCTION
2005										
2006										
2007										
2008										
2009										
2010										
2011										
2012										
2013										

Table 14. Main Transformation Sheet

Main Consumption Sheet

It aims to register the final energy consumption in economic sectors: Industry, Transportation, Residential, Commercial, Public and Services, Agriculture, Fishing and Mining, and Construction and Others.

MAIN FORM: FINAL CONSUMPTION								
SOURCE	Charcoal	UNIT	kt	COUNTRY				
YEAR	1 TRANSPORT	2 INDUSTRY	3 RESIDENTIAL	4 COMMERCIAL	5 FARMMING, FISHING AND MINING	6 CONSTRUCTION OTHERS	7 NON ENERGY CONSUMTION	1+2+3+4+5+6+7 FINAL CONSUMPTION
2005								-
2006								-
2007								-
2008								-
2009								-
2010								-
2011								-
2012								-
2013								-

Table 15. Main Consumption Sheet

Auxiliary Sheet

This form is designed to consolidate data from previous forms when information is available at a more disaggregated level.

AUXILIARY WORKSHEET:								
SOURCE	-	UNIT		COUNTRY	-			
YEAR	1	2	3	4	5	6	7	TOTAL
2005								
2006								
2007								
2008								
2009								
2010								
2011								
2012								
2013								
2014								

Table 16. Main Auxiliary Sheets

9.2. Results of The Bahamas Energy Balances (2010-2012)

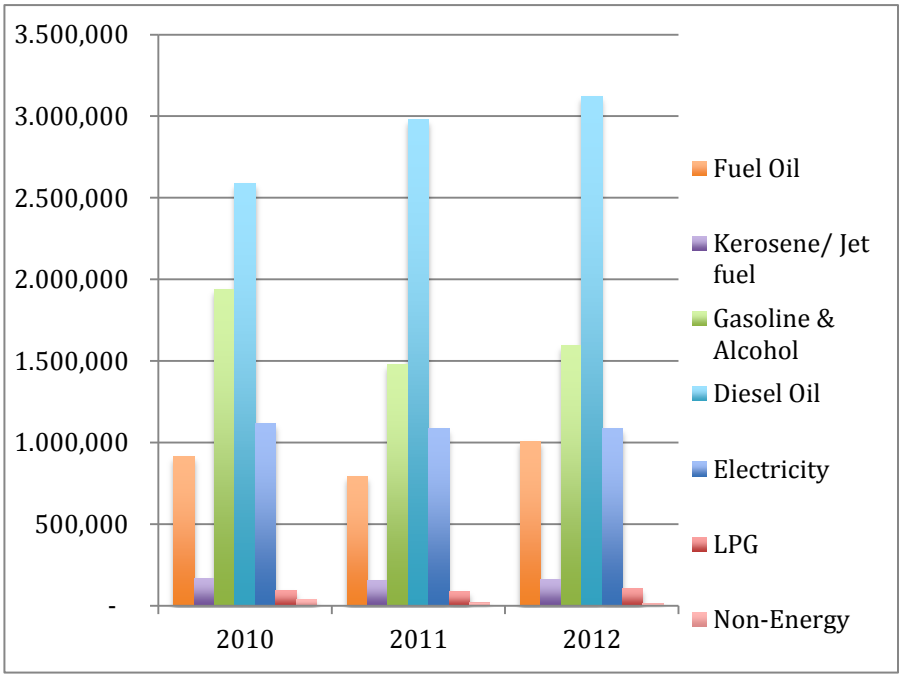
The Energy Balances of The Bahamas allowed the elaboration of a wide range of analyses, graphs and tables in which it is possible to appreciate key energy inputs. Such inputs were obtained by applying the methodology in a consistent matter. This led to the creation of a solid platform for designing, evaluating and understanding the processes in this specific sector.

As seen in the Energy Balance 2010 – 2012 (from page. 50-57), the country is a net importer of energy. The total energy supply was based on imports of fossil fuels, especially, diesel oil, fuel oil, gasoline/alcohol LPG and Jet fuel/kerosene.

Supply

Energy Imports and total supply

According to the results obtained from the Energy Balance of the Bahamas (2010-2012), basically the country relies almost a 99% on secondary energy sources and less than 1% on primary energy sources. The units of those secondary sources have been transformed into calorific units (kBoe), in order to standardize the information and for consistent analysis in a percentage basis. The following results were obtained:



Graph 2. Secondary Energy Matrix

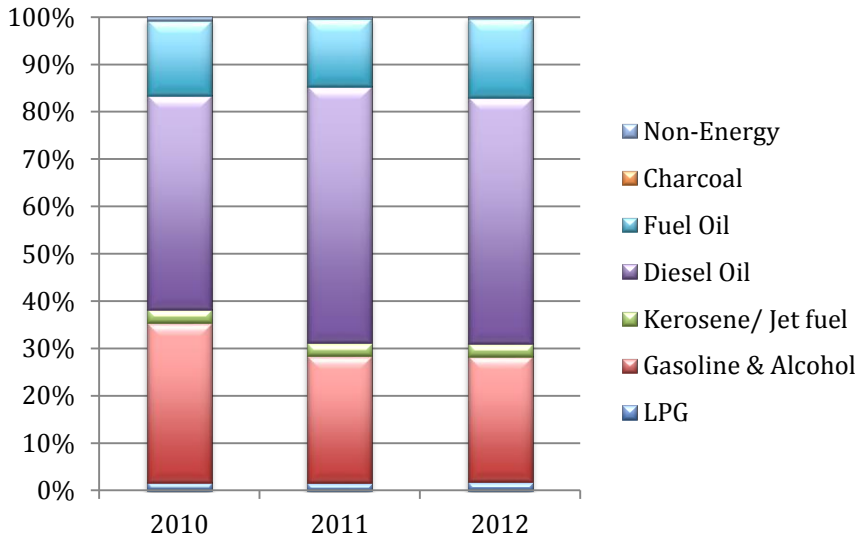
Source: The Bahamas Energy Balances 2010 – 2012

As Graph 2 shows, Diesel oil, primary used for electricity production, had a major participation in the secondary energy matrix of the country, with an average of 42.30 % of the supply and an average of 2.898.34 kBoe in the 2010-2012 period. The second most used energy source is Gasoline which accounts an average of 24.38 % of participation with 1.670.66 kBoe. Generally, countries with similar characteristics would have trends in both Diesel and Gasoline consumption, since both are used on Transportation which is an energy intense activity. Electricity accounts an average of 16% of the energy matrix and 1.096.22 kBoe. Then, followed by Fuel Oil with an average of 13.2% and 904.35 kBoe along with Jet Fuel/Kerosene, with 2.34 % and

160,04 kBoe participation. The rest of the participation is divided between LPG. Non Energy products and Charcoal.

In terms of the primary sources of energy, the only source used during this period was firewood with an average consumption of 5.49 kBoe.

Based on the information reveled by this study, we can determine that the country relies entirely on hydrocarbon imports. Therefore, in this case the imports equal the secondary energy sources without the electricity, since it is generated within the country. Diesel Oil is the largest energy source, which is widely used for electricity generation via power plants and self-producers.



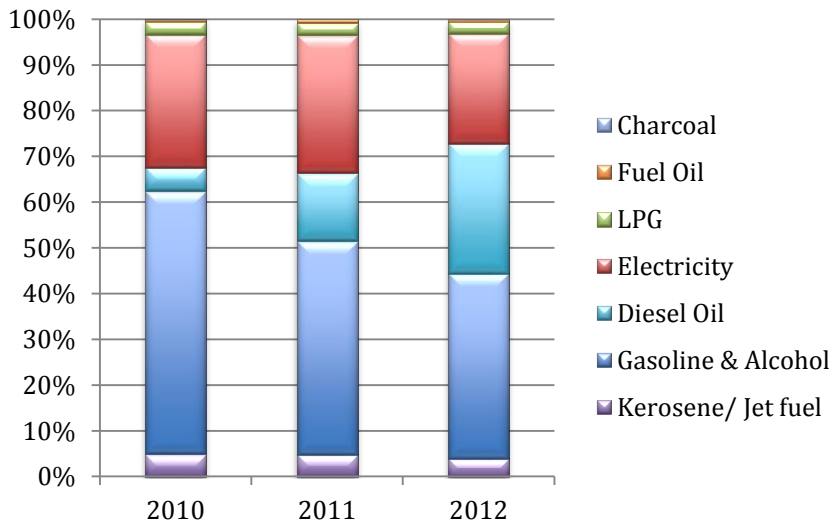
Graph 3. Imports by Energy Source

Source: The Bahamas Energy Balances 2010 – 2012

Consumption

Final Consumption

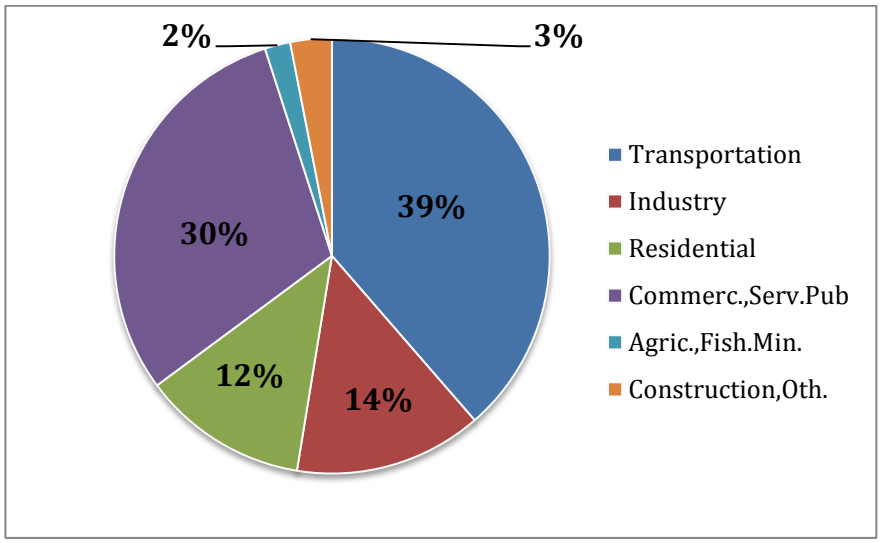
According with the current results, as Graph 3 shows, Gasoline has the largest share in terms of energy consumed from the total amount of energy used in the country for final consumption. Gasoline had an average share of 40.29 % and it is followed by Diesel Oil with 28.47 % for the years 2010-2012. Electricity had an important share with a 23.99% participation, followed by Kerosene/Jet Fuel with a 4.04% share. The smallest share of the energy consumed is divided between LPG, Fuel Oil Firewood and Charcoal.



Graph 4. Final Consumption

Source: The Bahamas Energy Balances 2010 – 2012

According to the results of the Energy Balance of The Bahamas, the final consumption of each energy source varies depending on the specific economic activity. Therefore, there are some activities that we can determine as major players in the consumption matrix of the country, which will be further explained in this section of the report.



Graph 5. Average 2012-2012 Consumption by Economic Activity

Source: The Bahamas Energy Balances 2010 – 2012

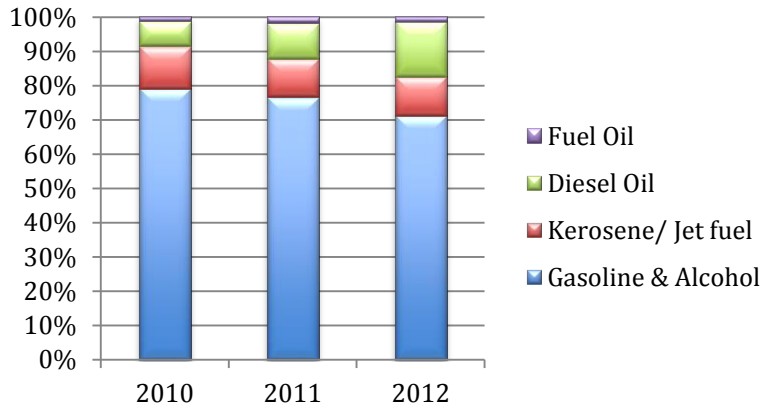
In order to have a more detailed understanding of the energy consumption of the Bahamas, it is imperative to dissect the data by economic activity. Graph 5 shows, that the sector that consumed most energy was transport, which accounted an average of 39% of the total share and 1.354.11 kBoe, for the 2010-2012 period. This is a general trend among most nations since transportation is one of the most energy intense activities. This sector is followed by the commercial and public services sector which is related to the tourism sector with a 30 % share and 1.057.67 kBoe. This is due to the fact that the Bahamas economy is disproportionally dominated by the tourism and services sector, especially financial services.

The Industrial sector is the next economic sector that consumed an average of 14% of the total of the energy consumed in The Bahamas with 489.11 kBoe. This is given the proportionally large industrial base located in the Grand Bahama Island. The residential sector follows with a participation of 12%. The rest of the energy is consumed by the construction 3 % sector along with the Fisheries & Agriculture sector which accounted an average of 2%.

Transport sector

According to the results of the Energy Balance of The Bahamas, the transport sector represents the largest energy consumption. According to the official UN records and estimations based on the 2011 Population Census, there were an estimated of 140.334 registered vehicles in 2012. Approximately, around 90% of those vehicles used Gasoline.

By 2010 The Bahamas had about 2.700 km of roads, of which 1620 km were paved; which also are the main roads in each island. From the total of estimated vehicles registered for 2012, 134.039 were in the category of motorcars, such as private cars, taxi cars, taxi SUVs, rental cars and pick-ups. The rest of the vehicle fleet comprises by: two wheel vehicles (877), Buses (841), Trucks (4578). In Graph 6, we can appreciate the different use of each fuel in the transport sector.



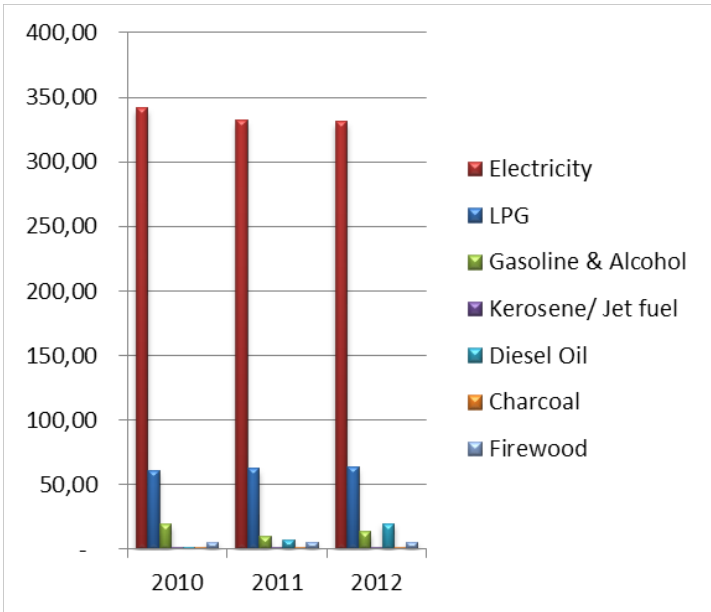
Graph 6. Fuel used in the Transport sector

Source: The Bahamas Energy Balances 2010 – 2012

As Graph 6 shows, Gasoline is the most widely fuel used in the Transport sector due the large base of Gasoline powered Motor vehicles. Gasoline accounts a 76% of the total share of consumption in the sector followed by a share of 12% and 11%, of Jet Fuel and Diesel Oil respectively. Fuel Oil accounts a very small share 1.35% and it is generally used for maritime vehicles.

Residential Consumption

As Graph 7 shows, the Residential sector consumption is mainly composed by two sources of energy. Electricity is the most relevant source, which is primarily used for Lighting. Furthermore, LPG accounts for the second most used energy source, which is almost solely used for cooking purposes. Other energy sources are used in very low amounts for cooking purposes or to run small back-up, diesel or gasoline, electricity generators. Electricity represents an average of 77.82 % of the residential consumption matrix, followed by LPG with 14.476 % for the years 2010-2012.



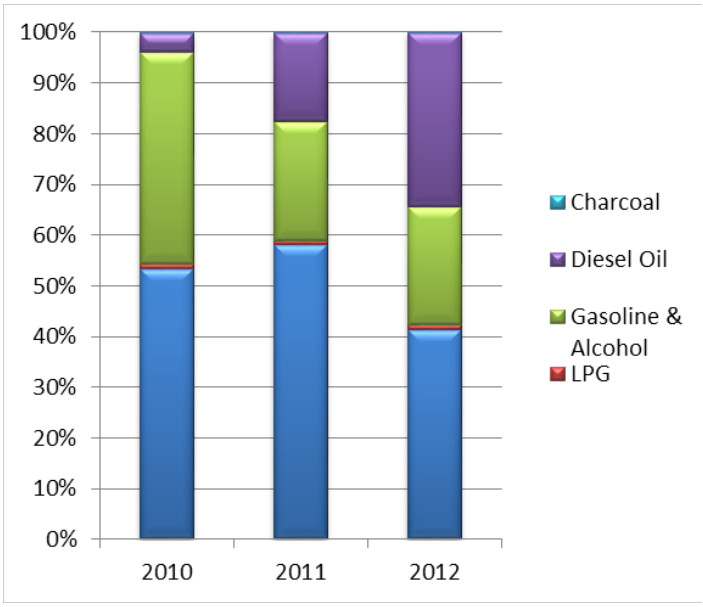
Graph 7. Energy Source used in the Residential sector

Source: The Bahamas Energy Balances 2010 – 2012

Commercial and Public Services

The commercial sector is the largest energy consumer in The Bahamas. It consists mainly in tourism services, restaurants, businesses, government consumption and the financial sector. In this sector electricity is the largest energy source since the Bahamas economy is a well-developed service oriented energy intense economy.

Electricity accounts an average of 49% in terms of the total energy consumptions in this sector. There is a small portion of charcoal consumption of less than 0.2%. Gasoline and Diesel Oil represent a share of 29.7% and 19.76% respectively. Both energy sources are mainly used to power small medium in-house electricity generators. This is a common practice in large touristic installations where they are used as back-up power and for support generation, given to the fact that the Bahamas is made from 700 islands with some lacking access from the local utilities companies.

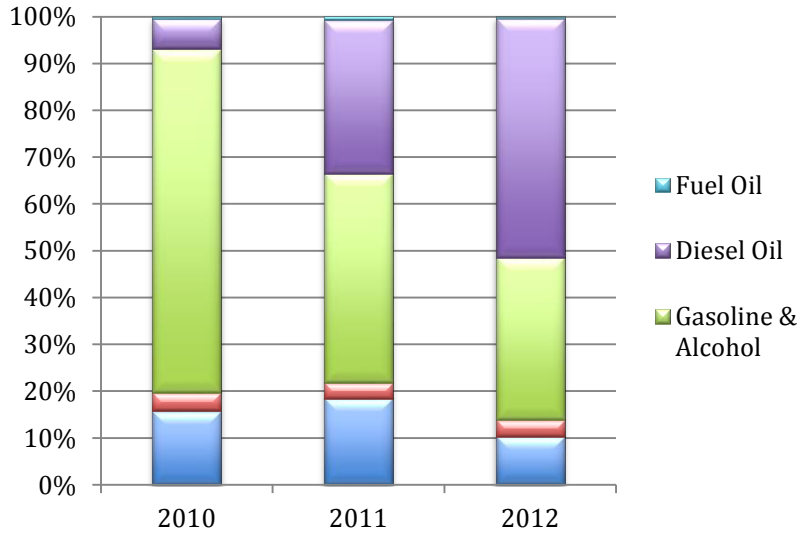


Graph 8. Sources used at the Commercial and Public services sector

Source: The Bahamas Energy Balances 2010 – 2012

Industry

Compared with the rest of the OECS countries, the Bahamas has a small industrial sector. This sector mainly consumes Gasoline, Electricity and Diesel Oil. As Graph 9 shows, Gasoline represents an average of 49 % participation. Electricity and Diesel Oil accounted for a 14 % and 33% participation respectively.

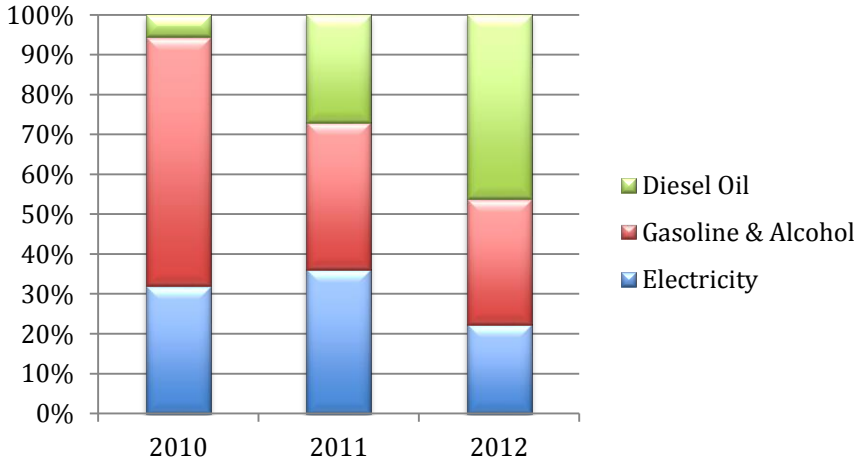


Graph 9. Sources used at the Industry sector

Source: The Bahamas Energy Balances 2010 – 2012

Agriculture, Fishing and Mining

In terms of the relevance as an economic activity and energy consumer, the Agriculture, Fishing and Mining sector represents a very small share. Energy sources consumption was estimated using several industrial benchmarks and economic indicators. Given the small size of the agricultural sector, information was not fully available. Estimates are presented in Graph 10. Gasoline represents an average of 42.4% participation. Electricity, and Diesel Oil accounted for a 29% and 28% respectively.

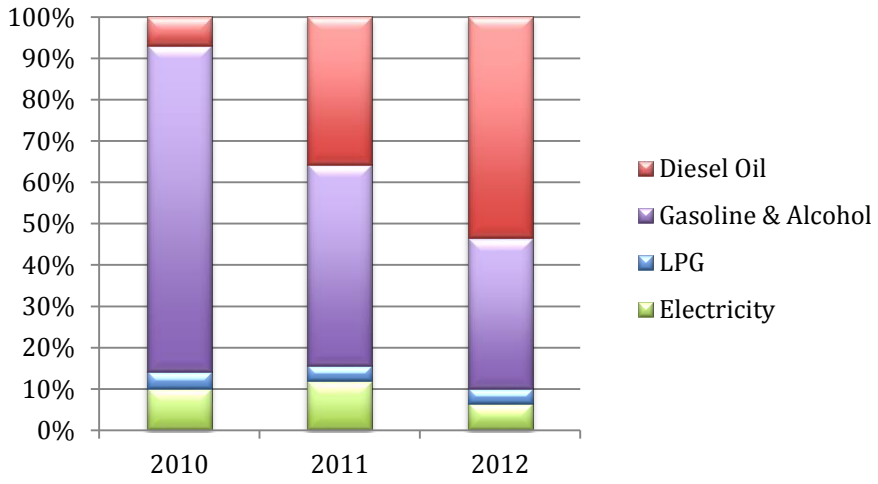


Graph 10. Sources used at the Agriculture & Fishing sector

Source: The Bahamas Energy Balances 2010 – 2012

Construction & others

The construction sector has experienced an expansion as an economic activity due to its direct relation with the tourism sector. Graph 11, represents the sources of energy as a share of the total consumption in the construction sector. It is important to notice that this sector also consumed asphalts, which are listed into the Non-Energy Products.



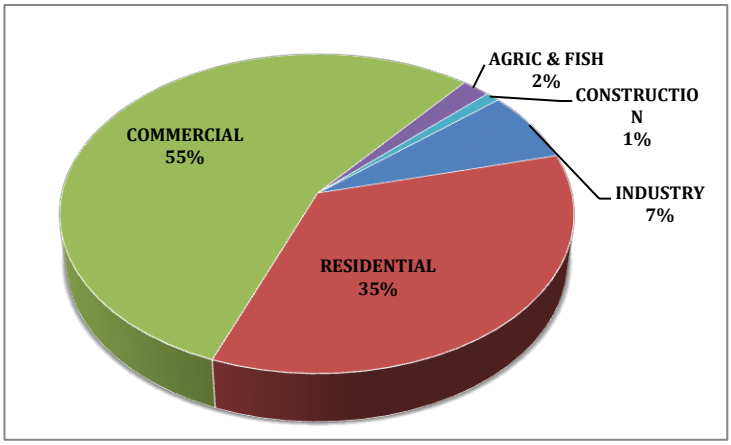
Graph 11. Fuel used at the Construction & Others sector

Source: The Bahamas Energy Balances 2010 – 2012

As Graph 11 shows, Gasoline represents an average share of 52 %. Diesel Oil, Electricity and LPG accounted for a 35%, 8.9% and 4 % respectively.

Electricity consumption

The Bahamas, the commercial and public services, is the sector that consumed the most electricity generated, followed by the residential sector. This pattern is very common in non-industrialized nations. According to the results of the Energy Balance for 2010-2012 periods, the commercial and public services sector consumed around 56% of the total electricity generated. As Graph 12 shows, the residential sector represented 36% of the total electricity consumption, Industry and the construction sectors consumed 7% and 1% of the electricity produced respectively.

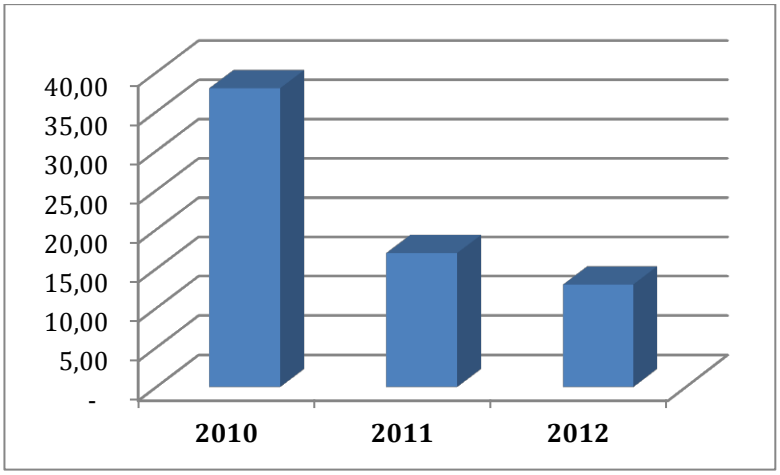


Graph 12. Electricity consumption by each sector

Source: The Bahamas Energy Balances 2010 – 2012

Non Energy Product consumption

Regarding the consumption of the non-energy products, which comprises lubricants and asphalts, there have not been any significant variations. The consumption of non-energy products have decreased during this period of time. However changes are minimal. As Graph 13 shows, in 2010 the country consumed an amount of 38 kBoe. In 2011, 17 kBoe was consumer and in 2012 consumption was 13 kBoe. This reflects the decrease in economic activities displayed in the GDP values.

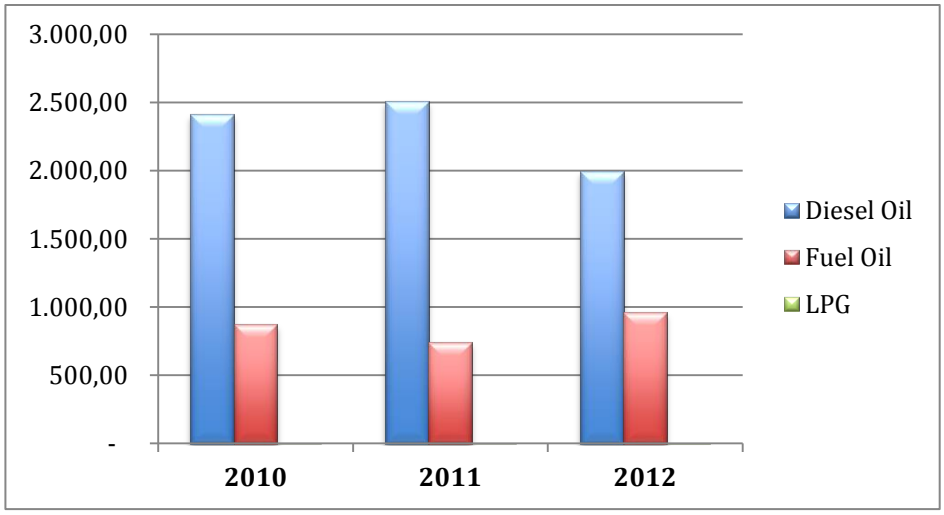


Graph 13. Supply of Non-energy products

Source: The Bahamas Energy Balances 2010 – 2012

Electricity Generation

The Bahamas mainly used Fuel Oil and Diesel Oil as fuels for electricity generation. Technical and distribution losses are on average 12.34%. Diesel Oil accounted about 72.81% of the fuel used and Fuel Oil 27.11 %. A very small percentage of LPG was used trough small electricity generators. This is a normal tendency in countries like Bahamas where the Energy matrix entirely relies on fossil fuels for electricity production. However, the government is strongly encouraging to diversify its energy matrix towards implementation of renewable energy as a primary energy sources. Government policies will be further explained the chapter below.



Graph 14 Sources for Electricity Generation

Source: The Bahamas Energy Balances 2010 – 2012

Energy Balance 2012
Physical units

	ACTIVITY			SECONDARY							
		FIREWOOD	OTHER PRIMARIES	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY PRODUCTS
		kt	Kboe	GWh	kbbl	kbbl	kbbl	kbbl	kbbl	kt	kBep
SUPPLY	PRODUCTION	2,15	(0,00)	1.749,49							
	IMPORT				160,00	1.787,00	167,00	3.119,00	978,00	0,61	13,00
	EXPORT										
	INVENTORIES										
	UNUSED										
TOTAL	SUPPLY	2,152	0,000	1749,490	160,000	1787,000	167,000	3119,000	978,000	0,612	13,000
TRANSFORMATION	REFINERY										
	POWER PLANTS			1698,534				-1906,123	-960,000		
	SELF PRODUCERS			50,956	-2,687			-86,723			
	GAS TREATM.PLANT										
	COKE/BLAST FURNAC										
	DISTILLERY										
	OTHER CENTERS										
TOTAL	TRANSFORMATION	0,000	0,000	0,000	-2,687	0,000	0,000	-1992,846	-960,000	0,000	0,000
END CONSUMPTION	OWN CONSUMPTION										
	LOSSES			215,187							
	ADJUSTMENT	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	TRANSPORTATION					1098,435	165,761	221,660	16,200		
	INDUSTRY			109,703	34,465	254,470		334,270	1,800		
	RESIDENTIAL	2,152		534,705	94,466	14,969	1,239	19,663		0,245	
	COMMERC.,SERV.PUB			843,867	20,274	329,314		432,584		0,367	
	AGRIC.,FISH.MIN.			30,686		29,938		39,326			
	CONSTRUCTION,OTH.			15,343	8,109	59,875		78,652			
CONSUMPTION	ENERGY SOURCE	2,152	0,000	1534,303	157,313	1787,000	167,000	1126,154	18,000	0,612	0,000
	NON ENERGY CONSUM										13,000
CONSUMPTION	FINAL	2,152	0,000	1534,303	157,313	1787,000	167,000	1126,154	18,000	0,612	13,000

Table 17. The Bahamas Energy Balance 2012 (Physical units)

Calorific units (kboe)

					SECONDARY									
	ACTIVITY	FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	TOTAL SECONDARY	TOTAL
SUPPLY	PRODUCTION	5,583	0,000	**5,583**	1083,984								**1083,984**	**1089,567**
	IMPORT					107,216	1596,506	160,036	3123,679	1007,731	3,044	13,000	**6011,212**	**6011,212**
	EXPORT												**0,000**	**0,000**
	INVENTORIES												**0,000**	**0,000**
	UNUSED												**0,000**	**0,000**
TOTAL	SUPPLY	**5,583**	**0,000**	**5,583**	**1083,984**	**107,216**	**1596,506**	**160,036**	**3123,679**	**1007,731**	**3,044**	**13,000**	**7095,196**	**7100,779**
TRANSFORMATION	REFINERY												**0,000**	**0,000**
	POWER PLANTS				1052,412				-1908,982	-989,184			**-1845,754**	**-1845,754**
	SELF PRODUCERS				31,572				-86,853				**-55,280**	**-55,280**
	GAS TREATM.PLANT												**0,000**	**0,000**
	COKE/BLAST FURNAC												**0,000**	**0,000**
	DISTILLERY												**0,000**	**0,000**
	OTHER CENTERS												**0,000**	**0,000**
TOTAL	TRANSFORMATION	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**-1995,835**	**-989,184**	**0,000**	**0,000**	**-2985,019**	**-2985,019**
END CONSUMPTION	OWN CONSUMPTION												**0,000**	**0,000**
	LOSSES				133,330								**133,330**	**133,330**
	ADJUSTMENT	**0,000**	**0,000**	**0,000**	**0,000**	**1,800**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**1,801**	**1,801**
	TRANSPORTATION						**981,342**	**158,849**	**221,992**	**16,692**			**1378,875**	**1378,875**
	INDUSTRY				**67,972**	**23,095**	**227,343**		**334,771**	**1,855**			**655,036**	**655,036**
	RESIDENTIAL	**5,583**		**5,583**	**331,303**	**63,301**	**13,373**	**1,187**	**19,692**		**1,217**		**430,074**	**435,657**
	COMMERC.,SERV.PUB				**522,860**	**13,585**	**294,209**		**433,233**		**1,827**		**1265,714**	**1265,714**
	AGRIC.,FISH.MIN.				**19,013**		**26,746**		**39,385**				**85,144**	**85,144**
	CONSTRUCTION,OTH.				**9,507**	**5,434**	**53,493**		**78,770**				**147,203**	**147,203**
CONSUMPTION	ENERGY SOURCE	**5,583**	**0,000**	**5,583**	**950,654**	**105,416**	**1596,506**	**160,036**	**1127,843**	**18,547**	**3,044**	**0,000**	**3962,047**	**3967,629**
	NON ENERGY CONSUM											13,000	**13,000**	**13,000**
CONSUMPTION	FINAL	**5,583**	**0,000**	**5,583**	**950,654**	**105,416**	**1596,506**	**160,036**	**1127,843**	**18,547**	**3,044**	**13,000**	**3975,047**	**3980,629**

Table 17. The Bahamas Energy Balance 2012 (Calorific units)

Energy Balance – 2011

Physical units

	ACTIVITY			SECONDARY							
		FIREWOOD	OTHER PRIMARIES	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY PRODUCTS
		kt	Kboe	GWh	kbbl	kbbl	kbbl	kbbl	kbbl	kt	kBep
SUPPLY	PRODUCTION	2,117	0,000	1753,667							
	IMPORT				130,000	1655,000	159,000	2977,000	766,000	0,602	17,000
	EXPORT										
	INVENTORIES										
	UNUSED										
TOTAL	SUPPLY	2,117	0,000	1753,667	130,000	1655,000	159,000	2977,000	766,000	0,602	17,000
TRANSFORMATION	REFINERY										
	POWER PLANTS		0,000	1702,590				-2465,123	-742,000		
	SELF PRODUCERS		0,000	51,078	-2,575			-43,570			
	GAS TREATM.PLANT										
	COKE/BLAST FURNAC										
	DISTILLERY										
	OTHER CENTERS										
TOTAL	TRANSFORMATION	0,000	0,000	0,000	-2,575	0,000	0,000	-2508,693	-742,000	0,000	0,000
END CONSUMPTION	OWN CONSUMPTION										
	LOSSES			215,701							
	ADJUSTMENT	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	TRANSPORTATION					1156,888	157,781	141,735	21,600		
	INDUSTRY			109,965	18,917	184,085		120,689	2,400		
	RESIDENTIAL	2,117		535,981	92,929	10,829	1,219	7,099		0,230	
	COMMERC.,SERV.PUB			845,881	11,128	238,228		156,186		0,372	
	AGRIC.,FISH.MIN.			30,759		21,657		14,199			
	CONSTRUCTION,OTH.			15,380	4,451	43,314		28,398			
CONSUMPTION	ENERGY SOURCE	2,117	0,000	1537,966	127,425	1655,000	159,000	468,307	24,000	0,602	0,000
	NON ENERGY CONSUM										17,000
CONSUMPTION	FINAL	2,117	0,000	1537,966	127,425	1655,000	159,000	468,307	24,000	0,602	17,000

Table 18. The Bahamas Energy Balance 2011 (Physical units)

Calorific units (kboe)

					SECONDARY									
	ACTIVITY	FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	TOTAL SECONDARY	TOTAL
SUPPLY	PRODUCTION	5,492	0,000	**5,492**	1086,573								**1086,573**	**1092,064**
	IMPORT					87,113	1478,577	152,370	2981,466	789,286	2,995	17,000	**5508,806**	**5508,806**
	EXPORT												**0,000**	**0,000**
	INVENTORIES												**0,000**	**0,000**
	UNUSED												**0,000**	**0,000**
TOTAL	SUPPLY	**5,492**	**0,000**	**5,492**	**1086,573**	**87,113**	**1478,577**	**152,370**	**2981,466**	**789,286**	**2,995**	**17,000**	**6595,379**	**6600,871**
TRANSFORMATION	REFINERY												**0,000**	**0,000**
	POWER PLANTS				1054,925				-2468,821	-764,557			**-2178,453**	**-2178,453**
	SELF PRODUCERS				31,648				-43,635				**-11,988**	**-11,988**
	GAS TREATM.PLANT												**0,000**	**0,000**
	COKE/BLAST FURNAC												**0,000**	**0,000**
	DISTILLERY												**0,000**	**0,000**
	OTHER CENTERS												**0,000**	**0,000**
TOTAL	TRANSFORMATION	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**-2512,456**	**-764,557**	**0,000**	**0,000**	**-3277,013**	**-3277,013**
END CONSUMPTION	OWN CONSUMPTION												**0,000**	**0,000**
	LOSSES				133,648								**133,648**	**133,648**
	ADJUSTMENT	**0,000**	**0,000**	**0,000**	**0,000**	**1,726**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**1,725**	**1,725**
	TRANSPORTATION						**1033,563**	**151,202**	**141,948**	**22,257**			**1348,970**	**1348,970**
	INDUSTRY				**68,134**	**12,676**	**164,462**		**120,871**	**2,473**			**368,615**	**368,615**
	RESIDENTIAL	**5,492**		**5,492**	**332,094**	**62,272**	**9,674**	**1,168**	**7,110**		**1,198**		**413,516**	**419,008**
	COMMERC.,SERV.PUB				**524,108**	**7,457**	**212,833**		**156,421**		**1,797**		**902,615**	**902,615**
	AGRIC.,FISH.MIN.				**19,058**		**19,348**		**14,220**				**52,627**	**52,627**
	CONSTRUCTION,OTH.				**9,529**	**2,983**	**38,697**		**28,440**				**79,649**	**79,649**
CONSUMPTION	ENERGY SOURCE	**5,492**	**0,000**	**5,492**	**952,924**	**85,387**	**1478,577**	**152,370**	**469,009**	**24,730**	**2,995**	**0,000**	**3165,992**	**3171,484**
	NON ENERGY CONSUM											17,000	**17,000**	**17,000**
CONSUMPTION	FINAL	**5,492**	**0,000**	**5,492**	**952,924**	**85,387**	**1478,577**	**152,370**	**469,009**	**24,730**	**2,995**	**17,000**	**3182,992**	**3188,484**

Table 19. The Bahamas Energy Balance 2011 (Calorific units)

Energy Balance – 2010

Physical units

	ACTIVITY			SECONDARY							
		FIREWOOD	OTHER PRIMARIES	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY PRODUCTS
		kt	Kboe	GWh	kbbl	kbbl	kbbl	kbbl	kbbl	kt	kBep
SUPPLY	PRODUCTION	2,083	0,000	1804,564							
	IMPORT				141,000	2168,000	175,000	2586,000	889,000	0,593	38,
	EXPORT										
	INVENTORIES										
	UNUSED										
TOTAL	SUPPLY	2,083	0,000	1804,564	141,000	2168,000	175,000	2586,000	889,000	0,593	38,000
TRANSFORMATION	REFINERY										
	POWER PLANTS		0,000	1752,004				-2388,016	-872,000		
	SELF PRODUCERS		0,000	52,560	-2,483			-23,658			
	GAS TREATM.PLANT										
	COKE/BLAST FURNAC										
	DISTILLERY										
	OTHER CENTERS										
TOTAL	TRANSFORMATION	0,000	0,000	0,000	-2,483	0,000	0,000	-2411,674	-872,000	0,000	0,000
END CONSUMPTION	OWN CONSUMPTION										
	LOSSES			221,961							
	ADJUSTMENT	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
	TRANSPORTATION					1181,383	173,800	96,562	15,300		
	INDUSTRY			113,156	25,812	364,619		28,739	1,700		
	RESIDENTIAL	2,083		551,537	91,449	21,448	1,200	1,691		0,237	
	COMMERC.,SERV.PUB			870,431	15,183	471,860		37,191		0,356	
	AGRIC.,FISH.MIN.			31,652		42,896		3,381			
	CONSTRUCTION,OTH.			15,826	6,073	85,793		6,762			
CONSUMPTION	ENERGY SOURCE	2,083	0,000	1582,603	138,517	2168,000	175,000	174,326	17,000	0,593	0,000
	NON ENERGY CONSUM										38,
CONSUMPTION	FINAL	2,083	0,000	1582,603	138,517	2168,000	175,000	174,326	17,000	0,593	38,000

Table 20. The Bahamas Energy Balance 2010 (Physical units)

Calorific units (kboe)

					SECONDARY									
	ACTIVITY	FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	TOTAL SECONDARY	TOTAL
SUPPLY	PRODUCTION	5,404	0,000	**5,404**	1118,108								**1118,108**	**1123,512**
	IMPORT					94,484	1936,891	167,703	2589,879	916,026	2,947	38,000	**5745,929**	**5745,929**
	EXPORT												**0,000**	**0,000**
	INVENTORIES												**0,000**	**0,000**
	UNUSED												**0,000**	**0,000**
TOTAL	SUPPLY	**5,404**	**0,000**	**5,404**	**1118,108**	**94,484**	**1936,891**	**167,703**	**2589,879**	**916,026**	**2,947**	**38,000**	**6864,038**	**6869,442**
TRANSFORMATION	REFINERY												**0,000**	**0,000**
	POWER PLANTS				1085,542				-2391,598	-898,509			**-2204,564**	**-2204,564**
	SELF PRODUCERS				32,566				-23,694				**8,872**	**8,872**
	GAS TREATM.PLANT												**0,000**	**0,000**
	COKE/BLAST FURNAC												**0,000**	**0,000**
	DISTILLERY												**0,000**	**0,000**
	OTHER CENTERS												**0,000**	**0,000**
TOTAL	TRANSFORMATION	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**-2415,291**	**-898,509**	**0,000**	**0,000**	**-3313,800**	**-3313,800**
END CONSUMPTION	OWN CONSUMPTION												**0,000**	**0,000**
	LOSSES				137,527								**137,527**	**137,527**
	ADJUSTMENT		**0,000**	**0,000**	**0,000**	**1,664**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**0,000**	**1,664**	**1,664**
	TRANSPORTATION						**1055,448**	**166,553**	**96,707**	**15,765**			**1334,473**	**1334,473**
	INDUSTRY				**70,112**	**17,296**	**325,751**		**28,782**	**1,752**			**443,692**	**443,692**
	RESIDENTIAL	**5,404**		**5,404**	**341,732**	**61,280**	**19,162**	**1,150**	**1,693**		**1,178**		**426,195**	**431,599**
	COMMERC.,SERV.PUB				**539,319**	**10,174**	**421,560**		**37,247**		**1,769**		**1010,070**	**1010,070**
	AGRIC.,FISH.MIN.				**19,612**		**38,324**		**3,386**				**61,321**	**61,321**
	CONSTRUCTION,OTH.				**9,806**	**4,070**	**76,647**		**6,772**				**97,295**	**97,295**
CONSUMPTION	ENERGY SOURCE	**5,404**	**0,000**	**5,404**	**980,581**	**92,821**	**1936,891**	**167,703**	**174,588**	**17,517**	**2,947**	**0,000**	**3373,046**	**3378,451**
	NON ENERGY CONSUM											38,000	**38,000**	**38,000**
CONSUMPTION	FINAL	**5,404**	**0,000**	**5,404**	**980,581**	**92,821**	**1936,891**	**167,703**	**174,588**	**17,517**	**2,947**	**38,000**	**3411,046**	**3416,451**

Table 21. The Bahamas Energy Balance 2010 (Calorific units)

Chapter VI. Greenhouse Emissions Methodology

10. Greenhouse Gas Emissions

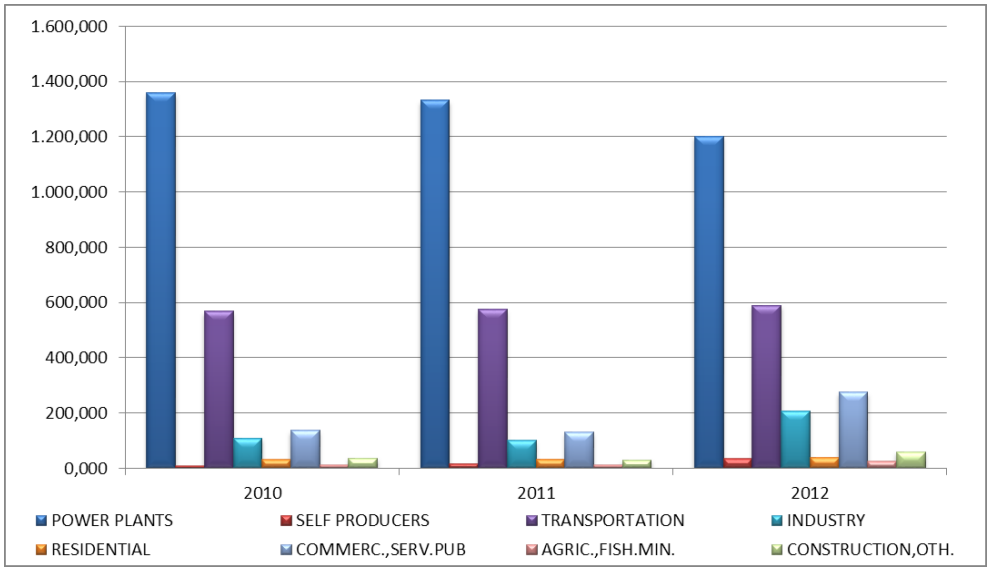
The Inventory of Greenhouse Gases is a double entry matrix that provides relevant information on the contribution of Greenhouse Gas Emissions of the Country, by energy sources, activities and/or subsectors.

Two methodologies could be applied to obtain Greenhouse Gas Emissions: Technology approach and Reference approach.

10.1. Technology approach

This IPCC[19] Methodology is based on the calculation of emissions by pollutants and according to the consultation variables: country, energy source, energy activity carried out in the process and the applicable year. The results of this methodology are presented on pages 66 - 69

The methodology of the technology approach used the values reported by the countries, on the fundamental data, according to the energy source used in each economic activity. Those are operated with the factors of contamination of a given technology and applied according to the pollutant in mention; therefore emissions are obtained by source. This report will consider only the CO_2 emissions. Therefore, the graph 15 shows that electricity generation via power plants is the activity that produces the most representative part of the emissions, with a participation of 56.17% on average for the three years. Transportation accounted as the second activity that produces the most CO2 emissions with 25% share.



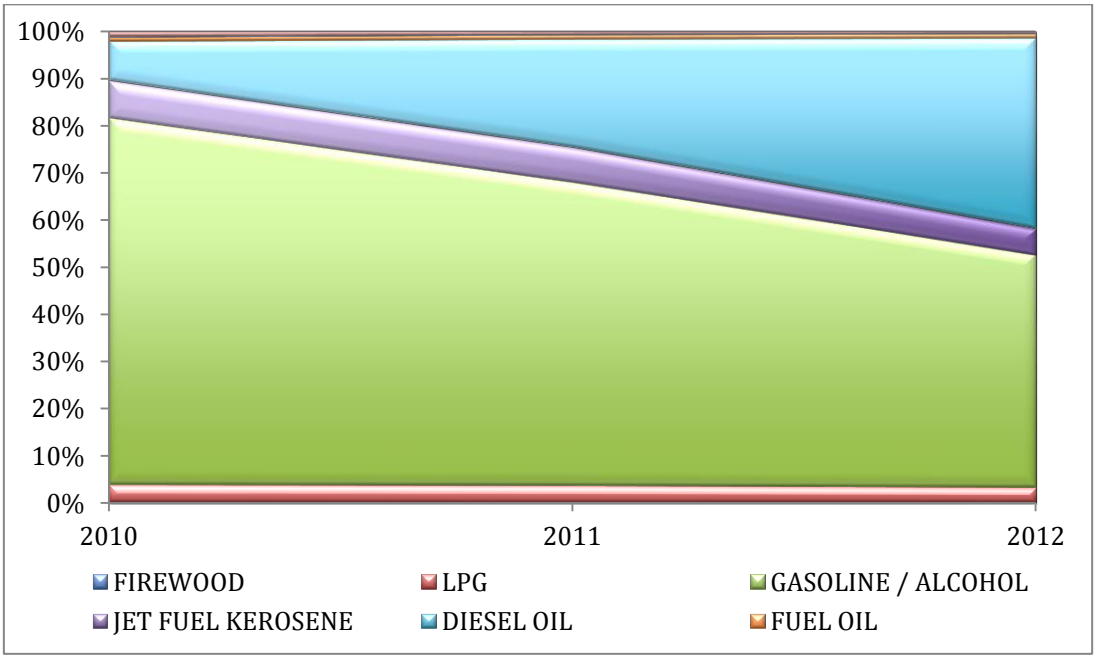
[19]Intergovernmental Panel On Climate Change (IPCC), is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. http://www.ipcc.ch/index.htm#.Utm37DlziqQ (web page visited on Jan, 16th 2014).

Graph 15. CO2 Emissions by Economic Activity

Source: The Bahamas Energy Balances 2010 – 2012

If we dissect the data by emissions generation by energy source. The largest source of emissions is Gasoline which accounts an average of 62.34%. Fuel Oil is primary used for large scale electricity generation. Diesel Oil accounted for the second largest source of emissions which accounts an average of 35.73%, which is not common among countries with similar socio-economic characteristics. Disproportional consumption of this energy source would be further explained in the Energy and Economic Indicators section below.

Jet Fuel/Kerosene and LPG accounted an average of 6.88%and 3.40% respectively. Non-energy products, Charcoal and firewood account for less than 1%.



Graph 16. CO2 Emissions by Energy Source

Source: The Bahamas Energy Balances 2010 – 2012

10.2. Reference approach

Procedure of calculation of Emissions of CO2 based on basic indicators of Apparent Consumption, Content of Coal and non-energy Consumption of the energy sources. The obtained results are emissions in Gg CO2. The factors can also be consulted used in the calculation process (See, Greenhouse Gas Emissions calculated by Reference Approach on page 77-78.

For the purposes of this chapter, presented results are related to Technology approach. Results may be revised in Annex Greenhouse Gas Emissions by Reference Approach, page 77-78.

10.3. CO2 Emissions According to Technology approach

ENERGY SOURCE		FIREWOOD	OTHER PRIM	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	SECONDARY	TOTAL
SUPPLY	PRODUCTION			-								-	-
	IMPORT			-								-	-
	EXPORT			-								-	-
	INVENTORIES			-								-	-
	UNUSED			-								-	-
TOTAL	SUPPLY	-	-	-	-	-	-	-	-	-	-	-	-
TRANSFORMATION	REFINERY			-								-	-
	POWER PLANTS							775,906	426,106			1.202,01	1.202,01
	SELF PRODUCERS							34,831				34,83	34,83
	GAS TREATM.PLANT											-	-
	CHARCOAL PLANT											-	-
	COKE/BLAST FURNAC											-	-
	DISTILLERY			-								-	-
	OTHER CENTERS			-								-	-
TOTAL	TRANSFORMATION	-	-	-	-	-	-	810,74	426,11	-	-	1.236,84	1.236,84
END CONSUMPTIO	OWN CONSUMPTION			-							2,511	2,51	2,51
	TRANSPORTATION			-	0,000	415,441	68,047	98,863	7,360			589,71	589,71
	INDUSTRY			-	9,026	62,807	0,000	136,083	0,799			208,72	208,72
	RESIDENTIAL	3,013		3,01	21,624	3,909	0,483	8,638		0,680		35,33	38,35
	COMMERC.,SERV.PUB			-	5,310	81,280	0,000	188,822		1,020		276,43	276,43
	AGRIC.,FISH.MIN.			-	0,000	7,389	0,000	17,540				24,93	24,93
	CONSTRUCTION,OTH.			-	2,137	22,646	0,000	35,079				59,86	59,86
CONSUMPTION	FINAL	3,01	-	-	38,10	593,47	68,53	485,02	8,16	1,70	2,51	1.197,49	1.197,49

Table 22. The Bahamas Gas Inventory 2012 (Technology Approach)

ENERGY SOURCE		FIREWOOD	OTHER PRIM	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	SECONDARY	TOTAL
SUPPLY	PRODUCTION			-								-	-
	IMPORT			-								-	-
	EXPORT			-								-	-
	INVENTORIES			-								-	-
	UNUSED			-								-	-
TOTAL	SUPPLY	-	-	-	-	-	-	-	-	-	-	-	-
TRANSFORMATION	REFINERY			-								-	-
	POWER PLANTS			-				1.003,453	329,344			1.332,80	1.332,80
	SELF PRODUCERS			-				17,499				17,50	17,50
	GAS TREATM.PLANT			-								-	-
	CHARCOAL PLANT			-								-	-
	COKE/BLAST FURNAC			-								-	-
	DISTILLERY			-								-	-
	OTHER CENTERS			-								-	-
TOTAL	TRANSFORMATION	-	-	-	-	-	-	1.020,95	329,34	-	-	1.350,30	1.350,30
END CONSUMPTION	OWN CONSUMPTION			-							3,284	3,28	3,28
	TRANSPORTATION			-	0,000	437,549	64,771	63,215	9,813			575,35	575,35
	INDUSTRY			-	4,954	45,435	0,000	49,133	1,065			100,59	100,59
	RESIDENTIAL	2,964		2,96	21,272	2,828	0,475	3,119		0,670		28,36	31,33
	COMMERC.,SERV.PUB			-	2,914	58,798	0,000	68,175		1,000		130,89	130,89
	AGRIC.,FISH.MIN.			-	0,000	5,345	0,000	6,333				11,68	11,68
	CONSTRUCTION,OTH.			-	1,173	16,382	0,000	12,666				30,22	30,22
CONSUMPTION	FINAL	2,96	-	2,96	30,31	566,34	65,25	202,64	10,88	1,67	3,28	880,37	883,33

Table 23. The Bahamas Gas Inventory 2011 (Technology Approach)

ENERGY SOURCE		FIREWOOD	OTHER PRIM	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	JET FUEL KEROSENE	DIESEL OIL	FUEL OIL	CHARCOAL	NON-ENERGY	SECONDARY	TOTAL
SUPPLY	PRODUCTION			-								-	-
	IMPORT			-								-	-
	EXPORT			-								-	-
	INVENTORIES			-								-	-
	UNUSED			-								-	-
TOTAL	SUPPLY	-		-	-	-	-	-	-	-	-	-	-
TRANSFORMATION	REFINERY			-								-	-
	POWER PLANTS			-				972,065	387,046			1.359,11	1.359,11
	SELF PRODUCERS			-				9,502				9,50	9,50
	GAS TREATM.PLANT			-								-	-
	CHARCOAL PLANT			-								-	-
	COKE/BLAST FURNAC			-								-	-
	DISTILLERY			-								-	-
	OTHER CENTERS			-								-	-
TOTAL	TRANSFORMATION	-		-	-	-	-	981,57	387,05	-	-	1.368,61	1.368,61
END CONSUMPTION	OWN CONSUMPTION			-							7,341	7,34	7,34
	TRANSPORTATION			-	0,000	446,813	71,347	43,068	6,951			568,18	568,18
	INDUSTRY			-	6,760	89,994	0,000	11,700	0,754			109,21	109,21
	RESIDENTIAL	2,917		2,92	20,933	5,601	0,467	0,743		0,670		28,41	31,33
	COMMERC.,SERV.PUB			-	3,976	116,462	0,000	16,234		0,970		137,64	137,64
	AGRIC.,FISH.MIN.			-		10,587		1,508				12,10	12,10
	CONSTRUCTION,OTH.			-	1,600	32,448		3,016				37,06	37,06
CONSUMPTION	FINAL	2,92	-	2,92	33,27	701,91	71,81	76,27	7,71	1,64	7,34	899,94	902,86

Table 24. The Bahamas Gas Inventory 2010 (Technology Approach)

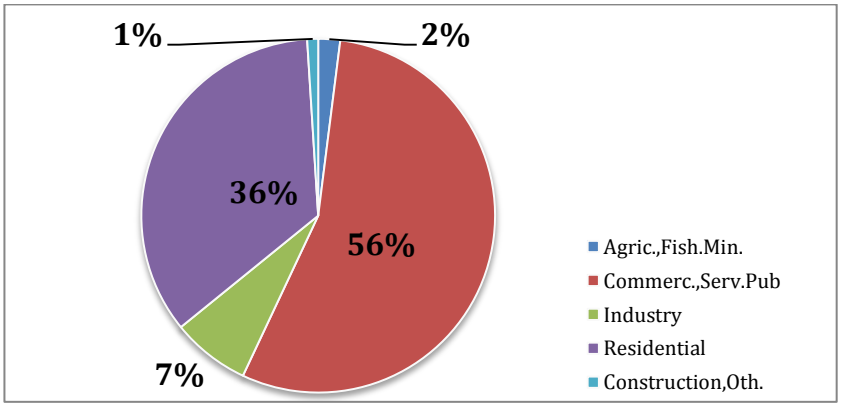
Chapter VII. Energy and Economic Indicators

The Bahamas is the third largest economy in the Americas. When compared to other similar economies The Bahamas is one of the most well off in terms of living standards due to the high volume of economic activities. Given the large financial base the Bahamas, its citizens have enjoyed a larger widespread of wealth than other similar nations. According to the World Bank´s 2014 World Development Report, The Bahamas was ranked second nation in the Caribbean in terms of its Gross Domestic Product (GDP per Capita) $ 21.941 Such indicator is the gross national income of a country divided by its total population. It highlights the individual income when compare to other countries. The Bahamas utility rates are approximately $0.32 U.S. dollars (USD) per kilowatt-hour (kWh), which is slightly below the Caribbean regional average of $0.33 USD/kWh.

To further understand the energy economic performance of the Bahamas, table 25 compares different economic and energy indicators of the Bahamas with the average Latin American and East Caribbean countries, by using available data already processed in the OLADE´s Energy Balances for the 2010-2012 period.

Based on the information presented in table 25, we can see that The Bahamas has a higher energy consumption per capita than other countries with similar socio-economical characteristics. This can be attributed mainly to several major factors:

- As mentioned above, the Tourism sector is one the most vibrant economic activates in the Bahamas. As a service based economic activity is an energy intensive activity which reflects on the large electrical consumption (56%). Secondly the financial sector industry and the large industry participation, also drive large electrical consumption. Therefore, electricity generation is fairly high, despite the fact of the outstanding low figures in terms of network loses (12.36%).
- As a high income per capita nation the Bahamas correlates its economic base in terms of residential electrical consumption. Therefore, in terms of individual households, electrical consumption is high.



Graph 17. CO2 Electrical Consumption by Economic activity

Source: The Bahamas Energy Balances 2010 – 2012

- The Bahamas is also a nation with the one of the most ownerships of motor vehicles per capita. As 2012, the Bahamas accounted an estimated of 140.334 cars. Such large vehicles base and large engine used in such vehicles reflects

in the large Gasoline consumption as it is the most widely used fuel used in road vehicles. This tendency also correlates to the large emissions per capita when compared to other countries in the table.

- As in other Caribbean nations the Bahamas is fully dependent in fossil fuels which reflect on the large CO2 and other missions. Such dependency of this type of fuels creates instability and large electrical prices given the variances of prices of such fuels in international markets.

	Final Energy Consumption per capita	Total Electricity Consumption per capita	Total Energy Consumption in Residential Sector per capita	Total Electricity Consumption in Residential Sector per capita	Energy Intensity	Industrial Energy Intensity	Total CO2 Emissions per capita	Intensity of CO2 Emissions in Electricity Sector / Generation
Year	(kbep/10(3)inhab)	(GWh/10(3)inhab)	(kbep/10(3)inhab)	(kWh/inhab)	(bep/10(3) EC$)	(bep/10(3) EC$)	(Gg CO2 /bep/10(3)inhab)	(Gg CO2/GWh)
Bahamas								
2010	9,48	5,01	1,20	0,95	0,43	3,11	2,50	0,76
2011	8,70	4,79	1,15	0,91	0,40	2,65	2,41	0,77
2012	10,71	4,71	1,18	0,89	0,50	4,84	3,22	0,71
Average	**9,63**	**4,83**	**1,18**	**0,92**	**0,44**	**3,53**	**2,71**	**0,75**
Antigua and Barbuda								
Average	10,17	4,77	1,18	0,90	0,47	4,18	2,97	0,73
Dominica								
Average	3,65	1,85	0,76	0,35	0,22	1,84	1,75	0,55
St. Lucia								
Average	4,63	1,43	0,69	0,42	0,71	0,12	1,29	0,72
St. Vincent & The Grenadines								
Average	3,20	1,19	0,63	0,55	0,19	0,43	1,79	0,62
St. Kitts and Nevis								
Average	7,19	3,88	0,91	1,05	0,19	0,18	5,08	0,78
Latin America and Caribbean								
Average	7,38	1,21	1,14	0,52	1,29	2,82	2,70	0,22

Table 25. Energy and Economic Indicators (2010 – 2012)

Chapter VIII. Conclusions and recommendations

- OLADE performed an extensive assessment in terms of the data gathering process for the 2010-2012 Bahamas Energy Balance. Crucial information was collected, reviewed and analyzed from several key private and public institutions. OLADE performed technical visits to 15 institutions as a part of an effort for compiling relevant data. As a result, OLADE holds a unique data set that integrates the different actors and characterizes the dynamics behind the energy resources of the Bahamas.

- Meticulous data processing allowed generating extensive findings and more accurate estimations. For example, The Bahamas Central Bank kindly provided detailed information regarding their number of fossil fuel imports, including dissected data. Such level of detailed allowed generating very accurate estimations of the level of hydrocarbons consumption. This makes these study findings better in terms of its relevance.

- One of the main challenges presented in the data gathering process was posed due to the fact that private institutions manage their own information separately. As most local enterprises change ownership, like in the case of Rubis. Data specific information regarding the operational information was lost as previous owners did not disclose such information and which was highly relevant for the study. This posed a statistical challenge in terms of devising the energy flows presented in this report. Although, this issue was solved by obtaining further relevant data from a series of other stakeholders. This highlights one of the major issues for policy makers and industry experts when trying to uncover the characterization of the energy framework and infrastructure. Furthermore, it validates the importance of The Bahamas Energy Balance when consolidating information from a large number of institutions and dissecting it into crucial information than otherwise could not have been produced. This Energy Balance Report has become an important instrument with which, the country could take the first steps in order to centralize all the information related to energy. It is very important to centralize all the information regarding the supply, demand and transformation activities. In order to promote the energy planning process, with a base of research and accurate data.

- Evaluation of key economic and financial indicators of The Bahamas, play a major role in the development of this report. In terms of its economic standards, the Bahamas has the highest standards of living compared to most nations. When looking the variables in detail, we concluded that the Bahamas economy is more energy intense. As most sectors are very large users. Also, the energy consumption per capita is higher. This is correlated to the GDP per capita, consumption per each citizen would be greater. This trend can be seen in developed nations where historically, as they increased the living standards, energy demand per person would rise accordingly. Firstly, this is because a more develop economy requires more sophisticated and energy intense economic activities. Secondly, as individuals improve the purchasing power, they tend to demand more energy intense goods and services, such as motor vehicles and household appliances. As a consequence the Bahamas in one of the nations with the most motor vehicles per person in the Americas.

- In terms of the economic impact and relation with the energy sector, this study highlights some key findings for guidance for policy makers. The energy markets of The Bahamas posed a major challenge due to its high cost to the final consumers and local business enterprises. 0.32 USD/kWh is a price above the average Latin American electricity cost and slightly below the Caribbean average price. This makes the Bahamas competitive compared to other Caribbean nations but far less competitive with the Latin American average. This directly undermines on the economic competitiveness of The Bahamas. Additionally, the energy sector has failed to diversify its energy matrix as the energy production is solely based on fossil fuel imports (Bahamas Electricity Corporation, Company Profile).

- In light of these challenges, the government of The Bahamas has placed a series of commitments to improve of its energy sector. The government has pledge to achieve a 30% cap of renewable energy electricity generation by 2030. Furthermore the largest government attempt to promote optimization of the energy usage, energy efficiency and diversification of the energy matrix, has been through the implementation of the $4.6 million investment in the renewable energy sector between 2006 and 2012.

- Finally, a more elaborate and centralized data gathering permanent process would contribute to better results and should be considered in terms of national and regional policies. OLADE advices to continue with the process of elaboration of the Energy Balances, which would create the groundwork for consistent energy forecasts and better policy implementation. Planning at a state level must be based on Energy Balances, as a platform for simulating different energetic scenarios and forecasting at a national level. As this report has proven to be a powerful tool in terms of assessing the current situation of the energy sector in this country, it very well serves a benchmark for measuring results of undergoing government policies.

Main Energy Variables

The Results								
Gg CO2	Diesel Oil	Fuel Oil	LPG	Gasoline	Kerosene/Jet Fuel	Firewood	Non Energy	TOTAL
2010	7.083,810	205,877	34,274	772,058	68,969	2,337	6,011	**8.173,336**
2011	7.224,326	177,392	31,601	589,371	62,664	2,375	2,689	**8.090,417**
2012	7.775,234	226,488	38,893	636,378	65,817	2,414	2,056	**8.747,280**

Table 27.Results Greenhouse Gas Emissions by Technology Approach

The Bahamas - 2010						
	Apparent Consumption (TJ)	Non energy consumption (TJ)	C02 emissions (Gg CO2)	Emission Factor (tC/TJ)	Fraction of Carbon Storage (%)	Fraction of Carbon Oxidized (%)
Sugar Cane & Derivates	0,000		0,000	29,000	1,000	0,700
Diesel Oil	15.047,197	0,000	1.103,351	20,200	0,500	0,990
Fuel Oil	5.322,109		205,877	21,100	0,500	0,500
LPG	548,953	0,000	34,274	17,200	0,800	0,990
Natural Gas	0,000		0,000	15,300	0,330	0,995
Gasoline	11.253,338	0,000	772,058	18,900	0,800	0,990
Kerosene/Jet Fuel	974,352	0,000	68,969	19,500	0,800	0,990
Firewood	31,399		2,337	29,000	1,000	0,700
Non Energy	220,780	220,780	6,011	20,000	0,625	0,990
Petroleum	0,000		0,000	20,000	1,000	0,990

Table 28. Greenhouse Gas Emissions by Technology Approach 2010

The Bahamas - 2011						
	Apparent Consumption (TJ)	Non energy consumption (TJ)	C02 emissions (Gg CO2)	Emission Factor (tC/TJ)	Fraction of Carbon Storage (%)	Fraction of Carbon Oxidized (%)
Sugar Cane & Derivates	0,000		0,000	29,000	1,000	0,700
Diesel Oil	17.322,315	98,770	1.266,555	20,200	0,500	0,990
Fuel Oil	4.585,754		177,392	21,100	0,500	0,500
LPG	506,127	0,000	31,601	17,200	0,800	0,990
Natural Gas	0,000		0,000	15,300	0,330	0,995
Gasoline	8.590,532	0,000	589,371	18,900	0,800	0,990
Kerosene/Jet Fuel	885,268	0,000	62,664	19,500	0,800	0,990
Firewood	31,907		2,375	29,000	1,000	0,700
Non Energy	98,770	98,770	2,689	20,000	0,625	0,990
Petroleum	0,000		0,000	20,000	1,000	0,990

Table 29. Greenhouse Gas Emissions by Technology Approach 2011

The Bahamas - 2012						
	Apparent Consumption (TJ)	Non energy consumption (TJ)	C02 emissions (Gg CO2)	Emission Factor (tC/TJ)	Fraction of Carbon Storage (%)	Fraction of Carbon Oxidized (%)
Sugar Cane & Derivates	0,000		0,000	29,000	1,000	0,700
Diesel Oil	34.907,454	0,000	2.559,624	20,200	0,500	0,990
Fuel Oil	5.854,918		226,488	21,100	0,500	0,500
LPG	622,925	0,000	38,893	17,200	0,800	0,990
Natural Gas	0,000		0,000	15,300	0,330	0,995
Gasoline	9.275,699	0,000	636,378	18,900	0,800	0,990
Kerosene/Jet Fuel	929,810	0,000	65,817	19,500	0,800	0,990
Firewood	32,435		2,414	29,000	1,000	0,700
Non Energy	75,530	75,530	2,056	20,000	0,625	0,990
Petroleum	0,000		0,000	20,000	1,000	0,990

Table 30. Greenhouse Gas Emissions by Technology Approach 2012

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