















Saint Kitts and Nevis Energy Balance (2010 - 2012)

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List of Acronyms

bbl boe CAF CARICOM CARILEC CEIS CELAC CIPPET CO ₂ CREDP	Barrel Barrel Oil Equivalent Development Bank Of Latin America Caribbean Community Secretariat Caribbean Electric Utility Service Corporation Caribbean Energy Information System Community of Latin American and Caribbean States Caribbean Information Platform on Petroleum Carbon Dioxide
DO	Diesel Oil
ECCB	Eastern Caribbean Central Bank
ECCU	Eastern Caribbean Currency Union
	Eastern Caribbean Dollar Eastern Caribbean Eporgy Pogulatory Authority
FAO	Food and Agricultural Organization of the United States
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
OAS	Organization of American States
OECS	Organization of Eastern Caribbean States
OLADE	Latin American Energy Organization
SOL	SOL Group
tn	lones
USD	United States Dollar
SKELEC	Saint Kitts Electricity Company
NEVLEC	Nevis Electricity Company
SCASPA	Ports by the St Kitts Air & Seaport Authority

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 and Saint Kitts and Nevis was selected as the start-up country. (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 energy complementarity between countries in the region, 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.

This situation implies 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 featured report presents the Energy Balance of Saint Kitts and Nevis. The document is the result of a compilation process on available energy information and data collection from accurate primary and secondary sources such as direct surveys, interviews, Government published material, census records and reports or studies carried out by international energy and cooperation agencies. The guidelines and recommendations to develop this research were based on OLADE's Energy Balance 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 Saint Kitts and Nevis, 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 Saint Kitts and Nevis 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).

Saint Kitts and Nevis has constantly move efforts to become the first Caribbean Country that relies totally on renewable energy. The country has been trying to promote alternative energy sources such as geothermal energy in Nevis and increasing the potential of solar power in order to harness their high local potential.

Within the Saint Kitts and Nevis overall energy sector, in order to have an integrated energy planning and analyze other energy alternatives that will help to reduce the strong reliance on foreign oil, the country needs to centralize all the energy data that is spread all over several institutions. In that sense, supply and demand data is required to be gathered in the hydrocarbon, electricity and renewable subsectors. Some other additional information such as socio-economic data, energy infrastructure, vehicle fleet, and census, among others, is also required to have a complete overall picture of the energy sector of Saint Kitts and Nevis.

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, Saint Kitts and Nevis and CELAC's requirements.

3. Country description

3.1. General prome	
Country	Saint Kitts and Nevis
Capital city	Basseterre
Head of State	Queen ELIZABETH II (since 6 February 1952); represented by Governor General Sir Edmund LAWRENCE (since 2 January 2013)
Head of Government	Prime Minister Dr. Denzil Douglas (since 6 July 1995); DeputyPrime Minister Sam CONDOR (since 6 July 1995)
Government Characteristics	Parliamentary democracy and a Commonwealth realm with an unicameral National Assembly (14 seats, 3 appointed and 11 popularly elected from single-member constituencies; members servefive- year terms)
languages	English
	Eastorn Caribboan Dollar (EC\$)
Currency	
Exchange rate (2014)	USD 1: EC\$ 2.7169
Economy	Tourism, agriculture, manufacture, offshore- banking.
Population (Census 2014) ⁽²⁾	46.398 inhabitants
GDP (2012 - EC\$M) ⁽³⁾	1,687.51

3.1. General profile

Source: (1) United States, Central Intelligence Agency, The World Fact book, Saint Kitts and Nevis, Page last updated June 2015, (2) Preliminary Census Report St. Kitts and Nevis 2011. (3) Eastern Caribbean Central Bank, Gross Domestic Product official figures, 2012.

In 1493, in his second voyage, Christopher Columbus landed in the island of Saint Kitts and named it Saint Christopher. Later on, in 1624, the English Thomas Warner with other fourteen voyagers, founded in the island, the first non-Spanish European colony in the Caribbean, they changed the country's name to Saint Kitts. A few years later, in 1627, a small group of French arrived to the island led by Pierre Belain d'Esnambuc.

During the 18th century there were a lot of violence between the English and the French settlers. However the Treaty of Utrecht gave the country to the British in 1713. The constant war between the French and the British led to the capture of the Brimstone Hill by the French 1782. The Island was restored to the British in 1783.

When Columbus knew the island of Nevis, he named it like that because the island along with the volcano seems like the snow to him, "las nieves". However the British were the first colonists that arrived in 1628 and they made the island one of the most prosperous of the Antilles. This is important to highlight considering that Nevis suffered the French and the Spanish attacks during the 17th and 18th centuries.

In 1882 by a Federal Act, Saint Kitts and Nevis was united with Anguilla. Later on, they became an independent State with association of the United Kingdom in 1967. In that situation they had the possibility of self-governing and only, defense and international affairs, were controlled by the United Kingdom. Finally in 1980 Anguilla was separated

from Saint Kitts and Nevis and in 1983 Saint Kitts and Nevis became an independent State (British Encyclopedia, Visited November 2014)

3.2. International profile

Relevant	Memberships
TICIC VUIT	Memberships

ACP, AOSIS, C, CARICOM, CDB, CELAC, FAO, G-77, IBRD, ICAO, ICRM, IDA, IFAD, IFC, IFRCS, ILO, IMF, IMO, Interpol, IOC, ITU, MIGA, NAM, OAS, OECS, OPANAL, OPCW, Petrocaribe, UN, UNCTAD, UNESCO, UNIDO, UPU, WHO, WIPO, WTO

Source: Saint Kitts and Nevis country profile, CIA World Fact book (visited on 24th January 2015.

3.3 Geography

Region	Eastern Caribbean
Location	Caribbean, islands in the Caribbean Sea, about one- third of the way from Puerto Rico to Trinidad and Tobago
Geographic coordinates	17 18 N, 62 43 W
Surface area	261 km ² (Saint Kitts 168 km ² ; Nevis 93 km ²)



Sources: (1) Google earth (web page visited December, 15th2014) and (2) Government of Saint Kitts and Nevis, http://ciu.gov.kn/

St. Kitts and Nevis is a twin island country that is part of the Eastern Caribbean chain of islands. Saint Kitts is the larger island with 176 km². On the other hand there is Nevis, which has 93 km². In relation with the mountains, the highest point on St. Kitts is Mount Liamuiga, with 3,792 ft. (1,156 m), and on Nevis the Nevis Peak rises to 3,232 ft. (985

m), which is basically the entire island (Encyclopedia Britannica, webpage visited on January 2015).

3.4 Climate

The climate of St Kitts and Nevis is tropical influenced by the northeast trade winds and tropical oceanic cyclonic movements. The country has a warm temperature with approximately 27-Celsius degrees. On the island of St. Kitts, mean annual rainfall ranges from about 16 cm in the coastal areas, to about 160 cm in the central mountain ranges. On Nevis the average annual rainfall is 117cm.

Average annual precipitations are from May to October rainfall is heavier while temperatures are a little hotter (National Report On Integrating The Management of Water sheds and Coastal Areas in St. Kitts and Nevis, Department of Environment Ministry of Health and Environment, 2011)

4. Socio-Economic Characteristics

4.1.General description

Saint Kitts and Nevis has cultural, social, political and economic characteristics that are very influenced by its colonial past. The country has a robust civil society that actively participates in domestic, regional and international discussions. Workers have the right to strike and organize, the independence of the Judiciary is respected and women are represented and participating in the Government (Saint Kitts and Nevis Private sector assessment report, 2013).

Since 2006, the economy of Saint Kitts and Nevis has growth driven mainly by activities related to construction, strong gains in agricultural and manufacturing outputs, and continued enormous growth in tourism and related services. It is important to notice that stronger economic activity in 2006 occurred within the context of higher domestic price levels (European Commission, St. Kitts and Nevis Review, 2007).

In the last decade there has been a higher revenue collection in terms of the implementation of some new policy measures that included, the introduction of the electricity surcharge, a higher rate for the social services levy and new rates on alcohol and tobacco. That was the result of the continued administrative improvements at both the Customs and Inland Revenue Departments.

In Saint Kitts and Nevis, inflation is driven by increases in the domestic price of fuel and also by the impact of increased tariffs on the electricity surcharges, which are caused by the dependence in international high oil prices. The higher fuel prices also led to increases in transportation charges and affected all other price categories, including food.

For example, in 2004 according to the Planning Unit from the Ministry of Finance Development and Planning, prices increases were recorded for all the major categories of items during the year. Food prices increased by an estimated 8.2%; transportation and communication 18.5%; fuel and light 2.8%; accommodations 5.8%; clothing and footwear 4.7%; alcoholic drinks and beverages 2.7%; education 11.3%; medical services

8.9%; and household supplies and operations 2.1% (European Commission, St. Kitts and Nevis Review, 2007).

The economy of the country is constantly affected by unexpected price increases in its major imports, considering hydrocarbons; while at the same time, it is influenced obtaining favorable gains from tourism. The adverse impact of 9/11 on the developing tourist industry demonstrates, how difficult it is for a small export dependent economy to face international influence; firstly to diversify the economy in terms of products and markets, and secondly how quickly this dependency can translate into economic vulnerability.

In the last decade there have been new and emerging economic activities include light manufacturing, financial services, telecommunications and information technology. The real economic transformation that has occurred over time is demonstrated by the fact that agriculture contributed only 5.25% to GDP in 2002 while, services amounted to approximately 60% of GDP (Planning Unit, 1994-3003). This contribution from agriculture, is about one-third of its contribution 20 years ago (Technical Cooperation Strategy St. Kitts and Nevis 2011–2014).

Currently, the global recession has been taking a part of the Saint Kitts and Nevis economy. According to the 2013 Compete Caribbean Private Sector Assessment Report, economic activity has decreased, particularly in tourism activities and those related to construction, which are the main economic activities in the country.

There has been a reduction in tourism receipts, foreign direct investment (FDI), and other capital flows. Insurance, investment, and banking linkages has also decrease their activities due to the global crisis that is evident in the local financial system (Saint Kitts and Nevis Private sector assessment report, 2013).

St. Kitts and Nevis is a member of the Organization of Eastern Caribbean States (OECS) and the Eastern Caribbean Currency Union (ECCU), the common currency framework for the OECS countries. The Eastern Caribbean Central Bank (ECCB), the monetary authority for the OECS, issues the Eastern Caribbean Dollar. In 2010, Saint Kitts and Nevis represented 12% of nominal GDP for the OECS, and ranked 3rdin GDP per capita (Saint Kitts and Nevis Private sector assessment report, 2013).

Current Macroeconomic results

Currently, the economy of the country depends on tourism. Since the 1970s tourism has replaced sugar as the traditional activity of the economy. Then, in 2005, the Government decided to close the sugar industry after several decades of losses. In order to rise the economy and mainly the lost jobs from the sugar industry, the Government has promoted a program to diversify the agricultural sector and to stimulate other sectors of the economy, such as tourism, export - oriented manufacturing and offshore banking.

According to the CIA World Fact Book, in the last decade, the government has made a notable progress on reducing its public debt, from 154% of GDP in 2011 to 83% in 2013 (CIA World Fact book, visited Sept. 2014)

4.2. Residential

According to the 2011 census, Saint Kitts Island had a population of 34,983 inhabitants and Nevis Island had a population of 11,415 inhabitants. In total there are 46,398 habitants in the country from which 49.2% are males and 50.8% are females.

Most of the population lives in the parish of Saint George in Saint Kitts. However there has been a decrease of the population in that parish comparing with the figures from the 2001 census. The decrease is also seen in the rest of the parishes (7 in St. Kitts and 3 in Nevis), with the exception of St. Thomas with an increase of 3.5% and St Peter with an increase of 22.4%, both in St. Kitts (Saint Kitts and Nevis preliminary Census Report, 2011).

In Nevis, the same situation occurred in St. James with a population increase of 8.6% and in St. John with an increase of 22.5%. Within those figures we can determine that there has been a small increase in the population, compared with the census of 2001, which recorded a population of 32,217 for Saint Kitts and 11,108 for Nevis.

On the other hand, the household population in 2011 was 17,390 with an increase of 10.9% compared with the 2001 census. However it is important to consider that there has been a decrease in the average household size, with 3.0 inhabitants in 2001 to 2.7 in 2011. The household population analyzed by parish reflects that in most of the cases there has been an increase in the population, being Trinity (23.5%) and Saint Peter (45.9%) the major figures in St. Kitts and in Nevis, St. James (21.0%) and St. John (27.5%).

Energy is essential for this sector, for example, in terms of electricity consumption; the residential sector consumed 41% of the total, and 23% in Nevis Island¹. In terms of consumption, according to the 2001 census, LPG was the fuel most used for cooking in the residential sector:

	COOKING FUEL							
	Coal	Wood	Gas/LPG/C ooking gas	Kerosene	Electricity	Other	Not Stated	TOTAL
Total	0,9	1,6	91,4	1,0	2,8	1,3	1,1	100,0

 Table 1. Residential Summary – Fuel used for cooking 2001

 Source: 2001 Preliminary CENSUS REPORT Saint Kitts and Nevis

LPG represented 91.4% of the energy matrix for cooking in 2001. On the other side, for the electricity generation, the 2001 census presents the following figures:

	TYPE OF LIGHTING							
	Gas	Kerosene	Electricity - Public	Electricity - Private Generator	Other	None	Not Stated	TOTAL
Total	0,3	4,0	91,3	1,8	1,1	0,8	0,8	100,0

 Table 2. Residential Summary, Fuel use for lightning, 2001

 Source: (1) 2001 CENSUS
 REPORT
 Saint Kitts and Nevis

Number of Households (2011) ⁽¹⁾	17,390	
Number of persons per Households (2011) $^{(1)}$	2.7	

¹ These figures are for the year 2004 (Towards a Sustainable EnergyPlan. K. De Cuba; 2006).

Electricity consumption St. Kitts (GWh) (2012) ⁽²⁾	51,974	
Electricity consumption Nevis (GWh) (2012) ⁽²⁾	16,413	

 Table 3. Residential Summary – 2010 - 2011

 Source: (1) 2011 Preliminary CENSUS REPORT Saint Kitts and Nevis (2) Saint Kitts Electricity Company and Nevis Electricity Company 2012

4.3. Industry and Manufacturing

With the closure of the sugar industry in 2005, in terms of manufacturing Saint Kitts and Nevis economy resides mostly in electrical and electronic equipment assembly for Boeing, along with a brewery and a bottling company in St. Kitts. There are some agricultural activities in an industrial scale mainly on the island of Nevis. Saint Kitts has one of the biggest electronic assembly industry of the entire Eastern Caribbean and has a many improvements in the apparel industry as well (Saint Kitts and Nevis Private sector Assessment Report, 2014).

The manufacturing sector plays a small role in the economy of Saint Kitts and Nevis. In 2010 the total GDP was approximately \$738 million, from which \$3,16 million corresponded to manufacturing. It is remarkable to notice that most of the employees of the sector are women, being a total of 2150 persons employed in these activities.

The most representative products are cotton, copra, clothing, footwear, beverages and electronics. Saint Kitts and Nevis is known to have the biggest electronic assembly industry in the Easter Caribbean Countries; the major export products are from electrical produce. The country has also the Carib Brewery, which is one of the biggest breweries of the Eastern Caribbean countries; it employs approximately 100 people and has other breweries in other countries.

The main markets for the manufacture and industrial products from Saint Kitts and Nevis are the United States, Canada, Denmark, Germany, and Turkey, which accounted 63% of all goods exported from the country. In 2008 Saint Kitts and Nevis was reported as the major exporter to the United Sates off all the OECS countries, mainly of manufactured products (Commonwealth Network, Webpage visited, February 2015)

Manufacturing Added Value (EC\$M) Constant (2012) ⁽¹⁾	114.58
Added Value as % of GDP ⁽¹⁾	8
Number of electricity consumers (2012) ⁽²⁾	40
Electricity consumption (GWh) (2012) ⁽³⁾	1.87

Table 4. Industrial Summary – 2012

Source: (1) ECCB, GDP Estimates for the ECCU 2000 - 2015 December 2014 (2) The Chamber of Industry and Commerce, Lists of members from the annual report 2011, category A and B, industries and commercial entities. (3) Energy Balance Saint Kitts and Nevis 2010-2012

4.4. Tourism

As a result of the closure of the sugar industry in 2005, the economy of Saint Kitts and Nevis has shifted to a tourism-oriented economy. The country has constantly intended to diversify the national economy by moving away from agriculture activities related to sugar as the main source of income.

It is important to consider that small island states such as St. Kitts and Nevis are particularly vulnerable to natural disasters, which could have economic and social effects. The rise of the sea level, hurricanes and the disappearance of beaches could have a profound impact on tourism, which is one of the main sources of income in the country.

The hurricanes Omar and Earl affected the country in 2008 and 2010, respectively. Omar caused major damage to the Four Seasons Resort located at Nevis Island. This resort is considered the largest on the island. The result was its closure close for two years, leaving behind 600 jobs in an island of 12,000 inhabitants. The damage caused by hurricane Omar was estimated in US\$ 19 million—about 3.5% of GDP of the country.

Despite that tourism sector has been constantly growing, in 2012 the sector started to recover from the impact of the hurricanes. Tourism flows started to recover in 2013 by a 9.3 % increase in stay-over arrivals. From 2006 to 2009 there has been an increase of 57% in visitors (Broadband in St. Kitts and Nevis, 2011). According to the Statistics Department in 2011 there were 710,673 total arrivals within the cruise ships and the excursionist.

The constant rising of the tourism sector place pressure on the future of energy in Saint Kitts and Nevis. The Energy Action Plan has taken this issue as one of the most important challenges. In order for the tourism industry and other economic sectors to be competitive, the country needs to rely on more reliable and cleaner energy supplies and increase its energy efficiency levels as well as diversify the energy matrix. This is one of the objectives of the National Energy Policy in order to provide more price stability with lower energy generation costs. (National Energy Policy Draft, 2011)

According to the World Travel and Tourism Council, in 2013 tourism sector in Saint Kitts and Nevis contributed to the generation of 5000 jobs. The participation of the sector in the GDP evolve as follows (Travel and Tourism economic impact 2014 Saint Kitts and Nevis, 2014):



GRAPH 1: TOURISM EVOLUTION ON THE GDP

Source: Travel and Tourism economic impact 2014 Saint Kitts and Nevis, 2014

Added Value Hotels + Restaurants (B\$ Thousands) Current (2012) ⁽¹⁾	91.38
Added Value as % of GDP Hotels+Restaurants (2012) ⁽¹⁾	6.38
Hotels Electricity Consumption (2010) (GWh) ⁽²⁾	
Table 5. Tourism (Hotels and Restaurants) Summary 2011	

Source: Eastern Caribbean Central Bank, Gross Domestic Product official figures, 2012.

4.5. Agriculture and Fishing

For the last 3 decades, until 2005, the sugar industry had been the main activity of the agricultural landscape of St Kitts and Nevis. However in 2004, the agricultural sector contributed approximately 5% to Gross Domestic Product (GDP), which is about one-third of its contribution 20 years ago (Technical Cooperation Strategy St. Kitts and Nevis 2011–2014).

Since the year 2000, the constant rise of the debt finally forced the government to close the sugar industry in 2005 and then to diversify the economy of the country. The agricultural sector has been of significant economic, social, and environmental importance to the country, being an important source of employment as well.

In the task of diversifying the economy of the country since the closure of the sugar industry, the Government of Saint Kitts and Nevis designed and approved a Sugar Adaptation Strategy (SAS) (2006-2013). This strategy incorporates the Agriculture's Strategic Plan 2005-2009, whose main objective was to increase the output of crops, focusing on the commercialization and livestock production to transform the sector into one that is more competitive and diversified (Technical Cooperation Strategy St. Kitts and Nevis 2011 – 2014).

The Agricultural Strategic Plan (2005-2009) was elaborated along with the European Union (EU) and aims to expand the development of the non-sugar agriculture sector and increase its contribution to the country's Gross Domestic Product (GDP). Specific objectives include, developing of farmer advice groups for all the activities in the production process.

The closure of the sugar industry left behind a lot of jobs and chain business that were declining rapidly due to the competitiveness of other economic activities. That is why the government has encouraged the Sugar Diversification Foundation. This program was established in 2006, with the National Bank Trust as the main founder. The main activity was to assist the government in the transition from a non-sugar economy to a diversified option by promoting social projects to the citizens of the country.

Added Value Agriculture (EC\$M) Constant (2012) ⁽¹⁾	12.39
Added Value as % of GDP Agriculture $(2013)^{(2)}$	0.92
Agriculture main products ⁽²⁾	Sugarcane, rice, yams, vegetables, bananas, fish
Agricultural area (ha)(2012) ⁽³⁾	6(1000) Ha

 Table 6. Agriculture, Fishing and Mining Summary 2011

Source: (1) ECCB, GDP Estimates for the ECCU 2000 - 2015 UPDATED 23 October 2014; (2) CIA World Fact book visited on Oct. 2014; (3) FAO, Saint Kitts and Nevis Country profile, UPDATED 23 October 2014

4.6. Transport

In Saint Kitts and Nevis, the transport sector is a very important service that fosters the economic and social development of the country. However, most of the imported petroleum products are consumed by this sector: gasoline, diesel oil and jet fuel.

Currently the government is perusing the elaboration of policy measures that help to conserve in a sustainable way the consumption of fuels and also increase the efficiency of their use in a long-term period promoting economic and environmental benefits for the country.

Transport Total (GDP 2012) (EC\$M)	101.33
Added Value as % of GDP $(2012)^{(1)}$	7.08
Road Transport (GDP 2012) (EC\$M)	63.47
Sea Transport (GDP 2012) (EC\$M)	1.20
Air Transport (GDP 2012) (EC\$M)	0.67

 Table 7. 2011 Transport Sector Gross Domestic Product In Current Prices (EC\$M)

 Source: ECCB, GDP Estimates for the ECCU 2000 - 2015 UPDATED 23 October 2014

4.7. Construction

Since the last decade, the construction sector has started a strong growth mainly with public sector projects and also with tourism-sector-related constructions. On average, the construction sector accounted for around 19% of GDP between 2000 and 2010. The public sector projects were related to road improvement and maintenance, port development, development of the waterfront at Charlestown, airport expansion, and water supply infrastructure development.

The Government has implemented several incentives in this sector to encourage its continuous growth. One of the most important is the Building Materials Incentive Programme, which grants duty-free concessions for imports of building materials for home construction, for first-time home-owners.

Added Value Construction (EC\$M) Constant (2012)	192.91
Added Value as % of GDP Construction (2012)	12.24

 Table 8. Constructions and Others Summary – 2011

 Source: ECCB, GDP Estimates for the ECCU 2000 - 2015 UPDATED 23 October 2014

5. Energy sector

Electricity

Each island - Saint Kitts and Nevis - has its own utility structures. In the case of Saint Kitts, the Saint Kitts Electricity Company (SKELEC) provides electricity services, which is owned by the Government. On the other hand, in Nevis, electricity services are provided by the Nevis Electricity Company (NEVLEC), which is a Government owned entity. (Caribbean Regional Electricity Generation, Interconnection, and Fuels Supply Strategy – Final Report, 2010).

Considering the fact that the country is on a major proportion dependent on hydrocarbon imports for energy generation, the volatility of crude oil prices in the world oil market is constantly affecting St. Kitts and Nevis. Therefore, in the past decade the country has promoted the diversification of its energy portfolio by using substitute energy sources.

However, it was back then in 2004 when the country, especially in St. Kitts, suffered from constant electricity blackouts. The Prime Ministry along with a Government team from the energy sector and also with the support of Stanley Consultants of Iowa, planned the expansion of the generation system from 2005 to 2015. Both SKELEC and NEVLEC participated in the initiative. (Ing. Kevin H. de Cuba, 2006).

Since then, the country has constantly moving efforts to increase its generation capacity, taking care of the citizens, promoting a suspension of tax and duties payment to every individual that imports an electricity generation plant and also providing more efficient devices for electricity consumption, such as the use of led lights for the entire country².

Renewable Energy

In terms of the use of renewable energy, the country has several studies that explore its natural geothermal capacity as well as the wind and solar power, being the first one, the most ambitious project for the future of Saint Kitts and Nevis. These projects give the country the possibility to become the first OECS country that will rely totally on renewable energy.

Currently there is a big solar farm in St. Kitts, next to the airport that has an installed capacity of 0.75 MW and there are some solar panels installed in the industry sector as well as in the tourist sector. In the case of Nevis, NEVLEC has a wind farm that generated 4.75 GWh in 2012.

Hydrocarbons

The SOL Group, which is an independent petroleum marketing company in the Caribbean, has operated the distribution of hydrocarbons in the country ever since the year 2010.

RUBIS company, which is a French private limited company established in 1990, has been operating in Saint Kitts and Nevis up-to 2013.

Saint Kitts and Nevis signed the Petrocaribe agreement on June 29, 2005 in Puerto La Cruz Venezuela, taking into account a purchase of 700 barrels of Venezuelan oil on preferential terms (PDVSA, 2005). As an extension of the Petrocaribe Agreement, the

² Net News, Power crisis forces St Kitts-Nevis PM to take over energy ministry, 2005 http://www.caribbeannewsnow.com/caribnet/2004/10/21/power.htm

joint venture PDV Saint Kitts & Nevis LTD is created on June 27, 2006. With 55% share of PDV Caribe and 45% share of the Government of the Island through the company Saint Kitts Energy Company Limited.

Delta Petroleum is another oil company that has been importing and distributing fossil fuels in the country. It is important to notice that Delta Petroleum and Sol distribute hydrocarbons in Nevis. Therefore this island does not receive oil from the Petrocaribe Agreement. In the case of St. Kitts, the distribution is done by Rubis, Sol and Petrocaribe.

According to the Energy Action Pan, in 2010 St. Kitts spent 877 million EC\$ on imports, out of which, EC\$ 61 million were used for the import of petroleum and petroleum products.³ The constant variation in petroleum international prices may affect the development plans of the country reducing the money available for development and social programs (Energy Action Plan 2010, pp. 11).

5.1.Institutional structure

National Level

- Ministry of Housing, Public Works, Energy & Public Utilities: Is the institution in charge of the renewable energy programs, as well as the management of the international cooperation whit specific stakeholders related to the energy Sector. It is located in Saint Kitts.
- Saint Kitts Electricity Company: it's the public utility that provides and distributes electricity to the citizens in the island of Saint Kitts. The power station is located at Needsmust and comprises 10 diesel generators operating together, with a total capacity of 43 MW.
- Ministry of Communications, Works, Public Utilities, Posts, Physical Planning, Natural Resources & Environment: Part of the Nevis Island Administration, is the institution designated in charge of the public utilities and the energy sector. It is located in Nevis.
- Nevis Electricity Company: it's the Institution in charge of providing electricity to the citizens in the island of Nevis. The company opened its doors on September 1, 2000. It is a fully owned subsidiary of the Nevis Island Administration. With the opening of NEVLEC, the Nevis Island Administration has increased the power generation, transmission and distribution.

Regional Level (Eastern Caribbean)

Electricity Sector

- Caribbean Electric Utility Services Corporation –CARILEC–: CARILEC is the focal point for general and technical information related to electricity in the Caribbean. The Secretariat 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. The Saint Kitts Electricity Company and the Nevis Electricity Company are part of this corporation (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 Kitts and Nevis. 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

³ Central Statistical Office Saint Kitts and Nevis, March 2010

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).

Eastern Caribbean Energy Regulatory Authority –ECERA-: ECERA is expected to provide regulation and oversight to the electricity utilities to achieve cost efficiency in electricity supply creating lower electricity rates to consumers in the medium to long term. ECERA also advice the OECS countries on renewable energy development, electricity sector plans and cross border interconnection, which is critical for geothermal development within the OECS. The World Bank is the main founding partner, and it has made available credit facility from the Adaptable Program Credit (APC) to support the establishment of ECERA (ECERA 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. (CIPPET web page, 2014, http://www.ceis-caribenergy.org/).
- Energy Cooperation Agreement PETROCARIBE 2005: the agreement was born on June 29th, 2005, after the Energy Cooperation Agreement signed by 14 Caribbean nations during the First Energy Meeting of Heads of State / Government of the Caribbean on Petrocaribe. Today, this regional integration initiative has 18 countries grouped by solidarity and inspired by the independence and sovereignty of peoples (Petrocaribe web page, 2014).

5.2.Legal and Policy Framework

- Electricity Supply Act: Passed by the National Assembly in April 2011, it's the document that states the obligation and right in terms of electricity production and distribution. It also specifies the licensing required for generating electricity in the country.
- National Energy Policy 2011: This document is intended to clarify the position of the Government of St. Kitts and Nevis regarding the nation's energy development. It is also intended to foster the development of an appropriate legal, institutional and economic framework as well as management mechanisms for enabling sustainable and sound economic energy activities and services. Currently, the document is in a Draft version.
- Nevis Geothermal Resources Development Ordinance (2008): Drafted with the assistance of GSEII (Wilson 2009, p. 100), states that the Geothermal Resources Advisory Committee, chaired by the Minister of Natural Resources, coordinates renewable energy policy in Nevis
- Sustainable Energy Plan it's a document elaborated in March 2006 with the support of the Organization of American States and it presents long term electricity cost assessment of electricity supply scenarios for promoting the introduction of Renewable Energy Technologies on Saint Kitts and Nevis.

5.3. Electricity

Currently in Saint Kitts and Nevis operates two government owned utilities, one in Kitts, the St. Kitts Electricity Department (SKELEC), and in Nevis, is called the Nevis Electricity Company (NEVLEC). Both utilities work independently and are not interconnected.

- St. Kitts Electricity Department (SKELEC): In St. Kitts, the Electricity Department finalized its corporatization process in 2011 to become the Saint Kitts Electricity Company (SKELEC). (National Energy Policy, 2010).
- Nevis Electricity Company (NEVLEC): NEVLEC, as an energy department, initiated its corporatization process in 2003 and currently it is the only electricity generator in the island.

Internal combustion engines, fueled with Diesel Oil, generate almost the entire electricity in the country. Considering that the country is totally dependent on fossil fuels imports, this situation presents a challenge to the energy security of Saint Kitts and Nevis.

According to the National Energy Policy, in 2010 the installed capacity of the St. Kitts Electricity Department (SKED) was 28.5 MW, with a peak demand of 25.3 MW and a minimum consumption of about 16MW. It is important to notice that in 2009 the utility went through a fire that caused problems with two brand new diesel generators.

This situation forced the Department to rent two diesel generators from Aggrekko that accumulate a total capacity of 7.5 MW, which had reported losses in a range of about 17%. By that time, the base low demand was 16 MW and the peak demand was around 25.2MW (National Energy Policy, pp12, 2011).

Due to the losses from the fire in SKED, the Government decided to purchase 2 new generators of 3.9 MW each, which were shipped one to St. Kitts and the other one to Nevis (National Energy Policy, 2010).

Electricity – Operating Statistics NEVIS										
Number of Customers										
Sector	2010	2011	2012							
Residential	6400	6500	6600							
Commercial, Services & Public	970	980	1041							
TOTAL	7370	7480	7641							

Table 9. Total Sales Nevis Electricity Company 2010-2012 Source: Nevis Electricity Company / Survey OLADE, 2014

According SKED, the annual increase of electricity demand is assumed to be around 5%, but considering the constant development in tourism related activities, and also the increase in the number of households, the demand may increase substantially in the short-to-medium term.

In Nevis, NEVLEC produces and distributes electricity to all sectors. In 2010, the utility had an installed capacity of 13.2 MW⁴. According the National Energy Policy, in 2008 the peak load capacity in the Nevis system was 9 MW and the minimum load was 5 MW.

The low demand of electricity in Nevis in 2008 was due to the momentary closure (almost 2 years) of the Four Seasons Resort, which was severely beaten by Hurricane Omar in 2008. According to the government official figures from 2010, in Nevis consumption, the Four Seasons represented about 1.1 - 1.2 MW of power demand (SKELEC Survey, 2014).

The demand of electricity has constantly grown in both islands. In terms of the electricity generation, statistics indicate that from the year 2000 to 2009, in St. Kitts, there was an increase of 45.6%. In the case of Nevis Island, the increase reordered was near 64% during the same period of time.⁵ (National Energy Policy, 2010). There are some studies telling that there was registered a peak demand for both islands together close to 40 MW in the year 2010 (Caribbean Regional Electricity Generation, Interconnection, and Fuels Supply Strategy – Final Report, 2010). If the total installed capacity for this year was 41.7 MW, then the peak demand was so close to the total installed capacity that it could be required to increase the installed capacity after this year.

Currently, the private sector in St Kitts and Nevis has access to public and private infrastructure related to electricity. Electrical shutdowns are counted at 4 times per month, on average. This is supported by reports that show that the private sector investment in generators for self-electricity production is still high: at 54%. Two thirds of the firms in the country identified electricity as a major problem for doing business; that situation is related to the consumption rates (Ministry of Public Works, Utilities, Energy and Housing, 2010).

Description of indicators of electricity supply reliability	Indicator						
Number of Electrical Outages in a Typical Month	4.2						
Duration of a Typical Electrical Outage (hrs.)	2.6						
Losses Due to Electrical Outages (% of Annual Sales)	1.6						
Percent of Firms Owning or Sharing a Generator							
Proportion of Electricity from a Generator	0.7						
Days to Obtain an Electrical Connection	15.7						
Percent of Firms Identifying Electricity as a Major Constraint	63.7						

Table 10. Indicators of Electricity supply reliability Source: World Bank, Enterprise Surveys, 2010

Self-producers

According to the National Energy Policy, The Marriot Hotel has a 24-hour electricity generation with a private owned power plant. The hotel has a diesel generator with an installed capacity of 4 MW. The Marriot uses economizers (heat recovery system) to heat

⁴ By August 2008, the largest unit with a capacity of 2.7 MW was not online and another 2.5 MW unit was found unreliable

⁵ St. Kitts Electricity Department (SKED) and Nevis Electricity Department via Central Statistical Office, March 2010

water as well. According the National Energy Policy, in 2010 the hotel consumed from 100 to 120 imperial gallons of Diesel oil per month.

It is important to notice that since 2004 the imports of small electricity generators have increased due to constant outages by that time. Also the Government helped the importation of these products to help the industry and the tourist sector. However, currently there are no official figures in terms of the number of self-producers in the country.

In Saint Kitts and Nevis, as well as in the rest of the OECS countries the prices of electricity are high, mainly due to the dependency on fossil fuels international prices. However, in the case of St. Kitts, electricity prices have been kept low through a subsidy scheme since 2005. With this, the fuel surcharge is removed for residential electricity clients. In the case of Nevis, the fuel surcharge is applied to every electricity rates (National Energy Policy, 2010, pp. 15).

5.4. Renewables

Currently in Saint Kitts and Nevis, solar and wind power are the only renewable energy operational. Despite that the Utilities don't have a complete list of the renewable energy self-producers in the country, during the technical visit to the country, OLADE realized that the use of these technologies are mainly applied in the industry and the hotels sector.

It was in 2007 when the winds were measured for the first time in the country by the GTZ. The study determined the existence of wind speeds of around 6.18 m/s on St. Kitts and 7.89 m/s on Nevis. Currently there is a wind farm fully operational in Nevis, which covered in 2010 20% of the electricity demand in this Island (National Renewable Energy Laboratory & Organization of American States, 2010-2011).

Solar power, in small scale, is widely used across the country. There are a lot of water heaters, as well as solar panels installed on the roof of some of the most important industry and hotel facilities. In St. Kitts there is a solar farm of 0.75 MW of installed capacity. The St. Kitts-based Taiwanese company, Speedtech, was in charge of the construction of the solar farm. The facility has 3,500 solar panels and it is basically to generate electricity to the St. Christopher Air and Sea Ports Authority (SCASPA). The excess energy not consumed by SCASPA is fed into the public grid operated by SKELEC (St. Christopher Air and Sea Ports Authority, web page visited, 2015).

It is well known by several studies that Nevis has an important geothermal potential. According to a ranking of 22 countries in the Caribbean, in terms of the renewable energy potential, Nevis is ranked 8th. Nevis has a potential of 300 MW in terms of geothermal power for electricity generation. (Caribbean Regional Electricity Generation, Interconnection, and Fuels Supply Strategy – Final Report, 2010)

The geothermal development on Nevis is currently ongoing. An agreement was signed between NEVLEC and West Indies Power (WIP) in 2009 for the construction of a 10 MW geothermal power plant. The project has the financing support of the Scotia Bank with the guarantee on the EXIM Bank from the U.S. (National Energy Policy, 2010)

At the same time, a negotiation with SKELEC has already taken place for the submarine interconnection between both islands, after that, there are plans for an additional 30 MW geothermal power project in Nevis (Caribbean Regional Electricity Generation, Interconnection, and Fuels Supply Strategy – Final Report, 2010).

5.5. Hydrocarbons

For the years 2010 to 2012, four hydrocarbon companies operated in Saint Kitts and Nevis. In the Island of Saint Kitts:

- The SOL Group, which is an independent petroleum retailer 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. In the country it supplies mainly diesel, gasoline, jet fuel, LPG and non-energy products. Sol Eastern Caribbean Limited operates in Saint Kitts and Nevis. (Sol web page, 2014)
- Other company that operated in the country during the mentioned period is **RUBIS**, 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 Antigua, Barbados, Dominica, Grenada, Guyana, St Lucia as well as the Western and French Caribbean, among others countries and continents. (Rubis Web page, 2014). Currently it does not operates in the country because it left St. Kitts in 2012
- Petrocaribe is another important stakeholder established in the country since the initiative was launched in 2005. The supply quota is 1 kbd for the years 2010 to 2012 of petroleum-based products, including diesel, gasoline and non-energy products. The construction of some facilities was part of the cooperation agreement, besides social plans. (Petrocaribe Web page, 2014).
- In the case of Nevis, the hydrocarbon distribution is made by the Sol Group and Delta Petroleum, which is a company founded in 1985, Delta serves Nevis with diesel oil, gasoline and LPG (Delta Petroleum Web Page, 2014).

It is important to notice that The Petrocaribe Agreement only operates in St. Kitts Island, where the Governmental institutions utilized petroleum products for transportation and power generation. According to the Petrocaribe Agreement, the country purchases petroleum products at international market prices but with the benefit of a credit of 60% of the value of each barrel with the interest of 1% in a period of 25 years. Tankers from Venezuela ship with a frequency of about 10-15 days to St. Kitts and store the fuel in the storage tanks located at Sol (where the government rents the storage tanks).

Despite Nevis does not participate in the Petrocaribe Agreement, Nevis Island Administration has imported some non-energy products such as asphalt for road construction from Venezuela. It is important to notice that Nevis does not participate in the Petrocaribe Agreement due to the impossibility to match some requirement related to the storage capacities and logistics that must be in place so that the fuels can be brought in and stored (National Energy Policy, 2010).

Transport Sector

The GHG Inventory performed in 2004 and recorded at the National Energy Policy determines that the transport sector is one of the largest sources of GHG emissions in St. Kitts and Nevis. Despite the high oil prices, this sector is the major consumer of fossil fuels. The demand is constantly increasing, for example, according to the NEP, the

supply of gasoline varied from 3.27 millions of gallons in 2000 to 4.86 million of gallons in 2005. 6

By 2010, Saint Kitts and Nevis had about 320 km of roads, of which 136 km were paved; the main roads circle each island. In the year 2009 there were 14,625 vehicles in St. Kitts and 7,022 vehicles in Nevis. However if we compare with the figures from 2011 the amount of vehicles has increased in both islands. St. Kitts has 15,192 vehicles and Nevis 7,191 (Statistic Department Saint Kitts and Nevis, visited on 2014).

In terms of the sea transport, according to a research of the Maritime affaires Department, the cruise passenger vessels in the year 2012 consumed 19,429,505 imperial gallons of Diesel oil, this fuel is counted in the Ports by the St Kitts Air & Seaport Authority (SCASPA).

On the other hand, local ferry vessels in the year 2012 consumed 546,920 imperial gallons, local cargo vessels consumed 263,145 imperial gallons, local pleasure vessels consumed 94,326 imperial gallons in the same year. Basseterre and Charlestown are the principal ports, where state-run and privately operated motorboat services are maintained between St. Kitts and Nevis. (Maritime Affaires Department, 2014)

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.

⁶ De Cuba, K and Rivera-Ramirez, M.H., Background discussion paper on bio-energy potential for St. Kitts and Nevis. The General Secretariat of the Organization of American States and Energy Security Group; August 2007

- 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
 - o Supply
 - Transformation
 - o **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 11, 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															
		ı	NON RENEW	ABLE SOURCE	S		RENEWABLE	E SOURCES																TOTAL
		Petroleum	Natural Gas	Coal	Fission Fuels	Hydroenergy	Geothermal	Firewood	Sugar Cane	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
	PRODUCTION (PP)																							
	IMPORT (IM)																							
PLΥ	EXPORT (X)																							
SUP	INVENTORIES (IV)																							
	UNUSED (UN)																							
	TOTAL SUPLY					•																		
	REFINERY																							
	POWER PLANTS																							
NO	SELF PRODUCERS																							
AAT	GAS TREATM.PLANT																							
ORN	CHARCOAL PLANT																							
NSF	COKE/BLAST FURNAC																							
TRA	DISTILLERY																							
	OTHER CENTERS																							
	TOTAL TRANSFORMATION																							
	OWN CONSUMPTION																							
	LOSSES																							
	ADJUSTMENT																							
Z O	TRANSPORTATION																							
IPTI	INDUSTRY																							
SUN	RESIDENTIAL																							
NON N	COMMERC.,SERV.PUB																							
IAL	AGRIC., FISH.MIN.																							
Ē	CONSTRUCTION, OTH.																							
	ENERGY CONSUMPTION																							
	NON ENERGY CONSUM																							
	FINAL CONSUMPTION																							

Table 11. 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 naphtha): A combination of light liquid hydrocarbons obtained by distilling oil and/or treating natural gas, its 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 naphtha 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 naphtha.
- Alcohol: Includes both ethanol (ethyl alcohol) and methanol (methyl alcohol) used as fuels.
 - *Ethanol:* is a colourless 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 colourless 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 petro chemistry 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 selfconsumption. If any part of the production is recycled to the same transformation centre that it comes from, this should be deducted from production.

All secondary energy production should be accounted at the transformation centre 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 neighbouring 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 Centres

This refers to energy that enters special processors called transformation centres for modification; these centres 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 centres. 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 centre in terms of refining, or analyse 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 centres may consist of hydroelectric plants, wind power plants, solar farms, conventional thermoelectric plants with steam turbines, gas turbines and internal combustion engines, nuclear power plants and geo-thermoelectric plants.

Gas Treatment Centre

In treatment plants, natural or associated gas is processed for the primary purpose of recovering compound liquid hydrocarbons such as gasoline and naphtha, 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 centres 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 Centres

These may the anaerobic digesters and pyrolysis furnaces, etc., which take farm, animal, forest, agro-industrial, and urban wastes, plus those from energy plants or any other transformation centres 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 centres. When there is no energy source feed to transformation centres, the total is zero.

Note: OLADE's Energy Balance uses the negative sign as a convention for inputs from energy sources to transformation centres 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, theatres, repair businesses, public administration, defence, 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 remodelling 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
 - $\circ \quad \text{Key stakeholders} \\$
- 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 Saint Kitts and Nevis 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 SK&N 2014

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 (MMm³).

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 2. Q2_HC_ SK&N _2014

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 3. Q3_EE_ SK&N _2014

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 4. Q4_CTR_ SK&N _2014

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 Kilometres Travelled* (km/year).

Survey 5. Q5_CIN_ T SK&N _2014

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 6. Q6_CIN2_ SK&N _2014

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 7. Q7_CCO_SK&N_2014

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 8. Q8_CCOH_ SK&N _2014

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 9. Q9_CCOR_ SK&N _2014

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 10. Q10_CRW_ SK&N _2014

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 11. Q11_NV_ SK&N _2014

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.

Survey12. Q701_CCOSC_ SK&N _2014

General Information for the Shopping Centres

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

Survey 13. Q41_CTR2_ SK&N _2014

General information from Individual Drivers

It was designed to collect data from individual drivers within the country. It obtains the total kilometres 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.

Chapter IV. Technical Visits

As OLADE experienced some difficulties in order to get and gather all the information that is required to build the Energy Balance, two technical visits were held in the country. In the first technical visit, held on October 2014, 25 contacts were visited and in the second one, held on May 2015, 19 contacts were visited. Most of the difficulties were related to lack of relevant information, such as the hydrocarbons imports, directly from the main importers of the country and the industries and hotels energy consumption. Some the most important stakeholders were unwilling to share information.

Before both technical visits to the country, OLADE made a research and analysis of the energy sector of Saint Kitts and Nevis. Therefore it was necessary to determine the characteristics of every subsector that is related to the supply and the demand of energy.

In order to determine the institutions that are needed to be visited, OLADE prepared a General Contact List of 56 institutions from a wide range of selected stakeholders from industry and manufacturing, tourism (hotels and restaurants), agriculture, fisheries, transport, government agencies, private hydrocarbon importers, public utilities, among others. In this sense, visiting both Saint Kitts and Nevis islands was vital to gather this important information and also to get to know some of the physical characteristics of the facilities and the stakeholders.

Once the institutions were identified, a pre-analysis of the type of information that could be collected was defined and a specific survey to collect the information was prepared for each case. Once the surveys were delivered to each contact, OLADE chose 25 contacts from the General Contact list, to elaborate the first Technical Visit Agenda. For the second Technical Visit, most of the initial stakeholders were visited again, some were asked for the completed survey and others were visited in order to get additional information.

The target was to interview, in a participative way, some of the stakeholders in order to obtain the most accurate information possible. Some of the main stakeholders are The Saint Kitts Electricity Company, Nevis Electricity Company, Sol Petroleum, Delta Petroleum, Petrocaribe, and St. Kitts Statistic Department, among others.

Each interview was held with the support of the Ministry of Housing, Public Works, Energy & Public Utilities. In every visit, the project was introduced to the stakeholder and each fulfilled survey was analysed together, to get information related to the supply or the demand of energy, depending on each case. For each day, four to five appointments were scheduled according to the geographical characteristics of the country.

As OLADE determines the importance of visiting some of the main stakeholders in order to get a consistent perception of their participation in the energy matrix, it also gave the opportunity of visiting their facilities and to get additional information for a deeper analysis. Important information was obtained in terms of fuel storage, self-electricity generation and energy consumption.

Finally, with all this gathering process, OLADE manages to get centralize all the information related to the energy sector and include it in this report according to the OLADE's Energy Balance Methodology.

8. Technical Visit Agendas

First Technical Visit

	SAINT KITTS AND NEV	IS TECHNICAL VISIT OCTOBER, 2014 (6-10)	40 ade	Dipanitación Latinoumericana de Energía anin American Energo Organization Organization Latino-Americane d'Exergía Topanização Latino-Americane de Energía
Ν		INSTITUTION	TYPE OF INFORMATION	VISIT DATE
1	Main Energy Supply Demand Variables	Ministry of Housing, Public Works, Energy and Public Utilities (ST. Kitts)	Q1_F03_SKN_2014 Q12_NV_SKN_2014 Q4_CTR_SKN_2014	Monday, October 6th
2	National Statistical Variables	Department of Statistics (Ministry of Sustainable Development)(ST. Kitts)	Q1_F03_SKN_2014 Q12_NV_SKN_2014 Q4_CTR_SKN_2015	Monday, October 6th
3	Industry	Ministry of International Trade, Industry, Commerce and Consumer Affairs (ST. Kitts)	Q5_CIN_SKN_2014 Q7_CCO_SKN_2014	Monday, October 6th
4	Construction related	St. Kitts Masonry Products	Q6_CIN2_SKN_2014	Monday, October 6th
5		Petrocaribe	Q2_HC_SKN_2014	Tuesday, October 7th
6	Hydrocarbons	SOL EC Ltd.	Q2_HC_SKN_2014	Tuesday, October 7th
7		CaribSupply Ltd	Q2_HC_SKN_2014	Tuesday, October 7th
8	Industry	Lutron Liamuiga Ltd	Q6_CIN2_SKN_2014	Tuesday, October 7th
9	Electricity	St. Kitts Electricity Company (SKELEC)	Q3_EE_SKN_2014	Wednesday, October 8th
10	Transport	Ministry of Tourism and International Transport (ST. Kitts)	Q4_CTR_SKN_2014 Q7_CCO_SKN_2014	Wednesday, October 8th
11	Agriculture, fishery,	Ministry of Agriculture, Marine Resources and Constituency Empowerment (ST. Kitts)	Q11_CRW_SKN_2014	Wednesday, October 8th
12	Transport	Licensing Authority (Traffic department) (ST. Kitts)	Q4_CTR_SKN_2014	Wednesday, October 8th
13	Industry	St. Kitts Bottling Co. Ltd	Q6_CIN2_SKN_2014	Wednesday, October 8th
14	Main Energy Supply Demand Variables	Nevis Island Administration	Q1_F03_SKN_2014 Q7_CCO_SKN_2014 Q4_CTR_SKN_2014 Q8_CCOH_SKN_2014 Q12_NV_SKN_2014	Thursday, October 9th
15	National Statistical Variables	Statistic office (Ministry of Finance Nevis Island Administration)	Q1_F03_SKN_2014 Q12_NV_SKN_2014 Q4_CTR_SKN_2015	Thursday, October 9th
16	Electricity	Nevis electricity company (NEVLEC)	Q3_EE_SKN_2014	Thursday, October 9th
17	Transport	Ministry of tourism (Nevis Island Administration)	Q7_CCO_SKN_2014	Thursday, October 9th
18	Hydrocarbons	Delta Petroleum	Q2_HC_SKN_2014	Friday, October 10th
19	Agriculture, fishery,	Agriculture Ministriy (Nevis Island Administration)	Q11_CRW_SKN_2014	Friday, October 10th
20	Hotels/Resorts	Claxtons Services	Q8_CCOH_SKN_2014	Friday, October 10th

 Table 12. Saint Kitts and Nevis First Technical Visit Agenda 2014

Second Technical Visit

	SAINT KITTS AND NEVIS TECHNICAL VISI MAY, 2015 (04-11)	r	40 aa	Organización Latinoumericana de Exergía Latin American Energy Organization Organización Latino-Americana de Energía Organização Latino-Americana de Energía	
Ν	SUB-SECTOR	I NSTI TUTI ON	SURVEY	VI SI T DATE	
1	Main Energy Supply Demand Variables	Ministry of Housing, Public Works, Energy and Public Utilities (ST. Kitts)		Monday 4th	
2		St. Christopher Air & Sea Ports Authority	Q2_HC_SKN_2014	Tuesday 5th	
3		Delta Petroleum	Q2_HC_SKN_2014	Wont participate	
4	Hydrocarbons	Rubis	Q2_HC_SKN_2014	No longer on Island	
5		Airport Storage tanks (St. Kitts)	Q2_HC_SKN_2014	Tuesday 5th	
6		Airport Storage tanks (Nevis)	Q2_HC_SKN_2014	Monday 4th	
7	National Statistical Variables	Department of Statistics (Ministry of Sustainable Development)(ST. Kitts)	Q1_F03_SKN_2014 Q4_CTR_SKN_2014 Q12_NV_SKN_2014	Wednesday 6th	
8		St. Kitts Bottling Co. Ltd	Q6_CIN2_SKN_2014	Tuesday 5th	
9	Industry	Lutron Liamuiga Ltd	Q6_CIN2_SKN_2014	Tuesday 5th	
10	inductiy	Sun Island Clothes	Q6_CIN2_SKN_2014	Tuesday 5th	
11		Sprat Net	Q6_CIN2_SKN_2014	Thursday 7th	
12	Agriculture, fishery,	Ministry of Agriculture, Marine Resources and Constituency Empowerment (ST. Kitts)	Q11_CRW_SKN_2014	Monday 4th	
13		Ministry of tourism (Nevis Island Administration)	Q7_CCO_SKN_2014	Monday 4th	
14 15	Hotels/Resorts	Four Seasons Resort	Q8_CCOH_SKN_2014	Friday 8th	
16		Marriott Royal St. Kitts Resort	Q8_CCOH_SKN_2014	Thursday 7th	
17	Ormation values 1	St. Kitts Masonry Products	Q6_CIN2_SKN_2014	Tuesday 5th	
18	Construction related	Williams Architectural	Q6_CIN2_SKN_2014	Tuesday 5th	
19		Ballahoo Restaurant	Q9_CCOR_SKN_2014	Thursday 7th	
20	Restaurants	Coral Grill at Four Seasons Nevis	Q9_CCOR_SKN_2014	Friday 8th	
21	Restaurants	Restaurants Colar Ghir at Four Seasons News I The Royal Palm Restaurant at Ottley's Plantation Inn		Q9_CCOR_SKN_2014	Tuesday 5th

Table 13. Saint Kitts and Nevis Second Technical Visit Agenda 2015

8.1. Developed Activities

- In every visit to each stakeholder, a brief explanation of the target of the project was presented, as well as the importance of the final results to Saint Kitts and Nevis.
- OLADE had the opportunity to visit the facilities of the most important stakeholders of the industry sector. In that sense, the production process and the characteristics of each facility was analysed.
- OLADE was invited to important public events, some related to energy, like the Bulb exchange program led by the Government; where OLADE had the chance to meet and explain the project to the most important decision makers in the country.

- Hydrocarbon, electricity and renewable energy sector institutions responsible for policies, regulations, prices, production, trade, distribution or supply, were visited.
- Both Statistic departments of Saint Kitts and Nevis were 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.
- In order to get information of the transport sector, together with both statistic departments, OLADE visited the licensing authority in order to get the number of vehicles and their characteristics for the years 2010-2012. OLADE also visited the Ferry 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 and manufacture data, wholesale and retail establishments, hotels, restaurants, among others.
- It is important to consider that a second technical visit was made, in which OLADE was able to get additional information from the International Airport storage and some other related to the industry and hotels consumption that was missing from the first Technical Visit.

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

											Upda	ated: August, 2015
			Benew	able Primary				Pet	roleum and N	atural Ga	s Product	s
			Firewood	Other Primaries Wind		Electricity	LPG	Gasolines	Kerosene & Jet Fuel	Diesel Oil	Charcoal	Non Energy Products
			Unit:	Unit:		Unit:	Unit:	Unit:	Unit:	Unit:	Unit:	Unit:
			Kt	GWh		KWh	Kbbl	Kbbl	Kbbl	Kbbl	Kt	Kboe
Production												
Imports	•											
Exports												
Unused												
Stock Change												
Transfers												
					_							
	Thermal											
Power Plants	Photovoltaic											
	Wind											
Self-producers												
Charcoal Plant												
Biodiesel Plant												
Gas Plant												
		_			_							
Transport sector												
Industrial sector												
Residential sector												
Commercial, Servi	ces and Public											
Farming, Forestry	and Fishing											
Mining and Quarri	ng											
Construction sector	or and Others											
Non Energy Consu	Ion Energy Consumption											
Own Consumption												
Losses	osses											

Preliminary Energy Flow of Saint Kitts and Nevis

Table 14. Parameterization of the Energy Balance Variables

The second energy flow matrix identifies the information units or data providers' relationship with the energy sources that they are involved with.

		UPDATED: AUGUST 2015									
		STAKEHOLDERS									
	FUELS	RUBIS	SOL	Petrocaribe	Delta						
1	LPG										
2	JET FUEL & KERO										
3	GASOLINE										
4	DIESEL OIL										
5	NON ENERGY PRODUCTS										

Preliminary Stakeholders' Mapping of Saint Kitts and Nevis

Table 15. Energy Sources Vs. Stakeholders Identification

8.2. Additional results of the technical visit:

- As OLADE introduced the project to the decision makers in the energy sector, the Government of Saint Kitts and Nevis recognizes the importance of the data gathering process and the benefits of having accurate Energy Balances and GHG Emissions inventory for the policy making in the energy sector.
- The visited contacts understood the importance of providing information and which type of information is needed to elaborate the Energy Balance.
- Twenty public and private institutions were visited and data collection surveys were applied to 56 contacts.
- Additional information and documentation related to the supply and demand of energy was obtained from other institutions.
- A technical inventory of the power plants and fuel storage facilities were obtained directly from the hydrocarbon importers as well as 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.
- The consumption of the sea transport sector was estimated with important information obtained directly from the Ferries and the Fisheries.
- The use of Charcoal and Firewood was estimated for the years 2010-2012, showing a constant reduction of the amount, due to the increasing participation of LGP and Electricity for cooking purposes.

9.2. 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 Saint Kitts and Nevis. The information available to calculate the EB was the following:

- Most of the major oil companies in the country who filled out specific hydrocarbons questionnaires: Petrocaribe and SOL, who import, distribute and store gasoline, diesel oil, LPG, jet fuel/kerosene and non-energy products. This information was contrasted with the questionnaires from the Ministry of Finance and Customs related to the official import values of both Saint Kitts and Nevis islands. 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 the National Energy Policy 2010 and also from the questionnaires related to the electricity information of the years 2010 – 2012 filled by the Saint Kitts Electricity Company and Nevis Electricity Company;
- Residential consumption of firewood and charcoal was calculated according to the information provided by the Statistics 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 the distance in annual basis.
- Using one of the OLADE's methodologies, the information related to the consumption of the transport sector, was used to estimate part of the data that was missing from some of the hydrocarbons importers, such as Delta and Rubis. The methodology basically consist in calculate the specific consumption of the transport sector, using individual surveys, which were filled by taxi drivers, government drivers and individual citizens, in order to determine the consumption of each transport subsector. These surveys contain information related to the type of vehicle, the fuel that it is used and the total mileage on a year basis. This information is contrasted with the number of vehicles and each type, for the three years.
- 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 interviewed about the energy consumption in terms of electricity consumption, fuels used and size of each location (hotels, restaurants, industries, and commercial businesses).

Chapter V. Energy Balance Processing

9. Energy Balance of Saint Kitts and Nevis

9.1. Energy Balance sheets

All the data that was gathered during the first technical visit, later on was processed per 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 16. Main Energy Balance Sheet

Main Supply Sheet

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



				ance years ance ane		
SOURCE	Diesel Oíl	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 17. 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 TRANSFORMATI ON	TOTAL PRODUCTION			
2005													
2006													
2007													
2008													
2009													
2010													
2011													
2012													
2013													

Table 18. 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.

			M	AIN FORM: FINAL CO	NSUMPTION			
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 19. 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 WORKS	SHEET:			
SOURCE	-	UNIT		COUNTRY	-			
YEAR	1	2	3	4	5	6	7	TOTAL
2005								
2006								
2007								
2008								
2009								
2010								
2011								
2012								
2013								
2014								

Table 20. Main Auxiliary Sheets

9.2. Results of Saint Kitts and Nevis Energy Balances (2010-2012)

The Energy Balances of Saint Kitts and Nevis allow the elaboration of a wide range of analyses, graphs and tables in which it is possible to appreciate the key inputs of energy in a consistent policy evaluation, designing and decision making processes in this specific sector.

As seen in the Energy Balance 2010 – 2012 (from page. 62-64), the country is a net importer of energy. Total energy supply was based on imports of oil products, especially diesel oil, gasoline / alcohol and LPG.

Supply

Energy Imports and total supply

According to the results obtained from the Energy Balance of Saint Kitts and Nevis (2010-2012), the country relies at an average of 99% basically on secondary sources and 1% on primary energy sources. The units of those secondary sources have been transformed into calorific units (kBoe), in order to do the analysis in a percentage basis, which concluded the following results:



GRAPH 2. SECONDARY ENERGY MATRIX Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

As Graph 2 shows, diesel oil had a major participation in the secondary energy matrix of the country, with an average of 56.11% of the supply and an average of 398.82 kBoe in the period 2010-2012. This energy source is followed, not so close, by Electricity with an average of 19.09% of participation with 135.65 kBoe and Gasoline, with an average of 16.8% and 119.6 kBoe. Then, followed by Kerosene/Jet fuel with an average of 5.04% and 35.83 kBoe along with LPG, with 2.32% and 16.51 kBoe, recorded an important participation in the same period of time. The rest of the participation is divided between Non Energy products and Charcoal.

Saint Kitts and Nevis also counts with primary energy sources. In this case, for the period 2010-2012 for other primaries, OLADE found only wind power, considering that the SCASPA Solar Farm was commissioned in 2013. As Graph 3 shows, wind power had a share of 98.6% and firewood with a participation of 1,4%.



With these considerations, we can determine that the country relies almost entirely on hydrocarbon imports, which represent an average of 80% of the total energy supply. As it is shown in Graph 4, diesel oil has a major participation in the imports matrix, with an average of 69.2% of the total, for the years 2010-2012. The second source in terms of imports is gasoline, with a participation of 20.9%. Then we can find Kerosene/Jet fuel (6.2%), LPG (2.8%) and Non Energy Products such as Lubricants and Asphalts (0.75%), for the same period of time.





Consumption

Final Consumption

According with the current results, as Graph 5 shows, electricity has the major share in terms of energy consumed from the total amount of energy documented in the country. As it is shown in the Graph 5, Electricity had an average share of 33.3% and it is followed very close by Gasoline with 35.2% for the years 2010-2012. Diesel Oil had an important share with 15.8% followed by Kerosene with 10.7%. The rest of the energy consumed is divided between LPG, Firewood and Charcoal.



Graph 5. Final Consumption Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

Despite that the results have been stable during the three years, there are some important variations in the LPG energy consumption, which was reduced from 2011 with 16.9 kBoe to 14.9 kBoe in 2012. The rest of the energy sources have remained with no significant changes.

According to the results of the Energy Balance of Saint Kitts and Nevis, the final consumption of each energy source varies depending on the specific activity. Therefore, there are some activities that we can determine as major players in the consumption matrix of the country, which will be explained in the next pages.



Graph 6. Consumption by Economic Activity Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

It is important to analyse what has happened with the energy consumption in each of the economic activities of Saint Kitts and Nevis. For instance, as Graph 6 shows, we can determine that the sector that consumed most of the energy documented in the country, was the transport sector, with an average of 57.2% of the total and 573.42 kBoe, for the years 2010-2012. This sector is followed by the commercial and public services sector which is related to the tourism sector with 20.67% and 207 kBoe.

The residential sector is the next economic sector that consumed an average of 12.62% of the total of the energy consumed in Saint Kitts and Nevis with 126.35 kBoe. The rest of the energy is consumed by the industry, construction and others (9.6%) sector along with the industry (5.4%) and construction (3.81%) sectors.

Transport sector

According to the results of the Energy Balance of Saint Kitts and Nevis, Transport sector represents the major consumption of energy. According to the Statistic Department of both islands, there were 22,208 vehicles registered in the country in 2010, 22,208 in 2011 and 22,226 in 2012. Regarding the data of 2012, from the total of vehicles, around 60% used Gasoline.

By 2010, Saint Kitts and Nevis had about 320 km of roads, of which 136 km were paved; the main roads circle each island. From the total of vehicles registered for 2012, 18,745 were in the category of motorcars, such as private cars, taxi cars, taxi suv, rental cars and pick-ups. The rest of the vehicle fleet comprises by two wheel vehicles (677), Mini buses and Vans (742), Trucks (908), Buses (932) and others (222). In Graph 7 we can appreciate the different use of each fuel in the transport sector.



As Graph 7 shows, gasoline is used in an average of 60% in the Transport sector for the years 2010-2012. Diesel oil follows this fuel with a share of 23% and kerosene/jet fuel with a share of 17%. Most of the vehicle fleet used gasoline during the years 2010-2012.

Residential Consumption

As Graph 8 shows, the Residential sector consumed mainly two sources of energy, being electricity the most important one, which is used mainly for lightning, however there is a small amount of this source that has been used for cooking. Electricity represents an average of 71.4% of the residential consumption matrix, followed by LPG with 26% for the years 2010-2012. The remaining energy consumed comes from Kerosene (2.5%) and Charcoal (0.02%).



Graph 8. Energy Source used in the Residential sector Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

It is important to highlight that Saint Kitts and Nevis in the year 2010 had a population of 46,391 inhabitants, with 17,242 households. According to the last Census Report, for the year 2011 the country had a population of 46,398 inhabitants with 17,425 households and finally for the year 2012 the country had a population of 46,405 inhabitants with 17,610 households. This stability regarding population growth has influenced the stability of the consumption energy matrix in the residential sector.

Commercial and Public Services

This sector is the second major energy consumer in the general matrix. It includes hotels, restaurant, small businesses and the consumption related to the public services. Graph 9 shows all the sources consumed



Graph 9. Sources used at the Commercial and Public services sector Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

Electricity represents an average of 91% of the total consumption of this sector. LPG is the third major energy source consumed with 8.8% followed by Gasoline with 0.13% for the years 2010-2012.

Industry

Compared with the rest of the OECS countries, Saint Kitts and Nevis has a small industrial sector. This sector basically consumes electricity and diesel oil. As Graph 10 shows, most of the energy consumption in the industry sector comes from electricity, which represented an average of 98% during the years 2010-2012. On the other hand, diesel oil, which is used in several types of machinery, transportation vehicles and in electricity self-generation power plants, comprises an average of 2% of the consumption matrix of the industry sector.





Agriculture, Fishing and Mining

Regarding the agriculture and fishing sector, according to the Agriculture institutions of the country, the consumption is divided between the use of diesel oil and electricity. However, due to the lack of information, OLADE was not able to determine the amount of electricity that this sector consumed during the period of time 2010-2012. Most of the Diesel consumed in the sector goes to the fishing vessels as well as the vehicles for the agriculture production.

It is important to highlight that the close the sugar industry in 2005 had led to several changes in the consumption matrix of this sector. As the Government had to diversify the economy of the country, most of the consumption probably shifted to other economic sectors, such as tourism and industry. However, the agricultural sector has been of significant economic, social, and environmental importance to the country, being an important source of employment as well.

Construction and Others

As Graph 11 shows, this sector basically consumed diesel oil for the years 2010-2012. There is a significant variation between the year 2010 with 8.03 kBoe and the year 2011 with 8.37 kBoe. This situation could respond to the Hurricanes, Omar and Earl that affected the country in 2008 and 2010, respectively, causing major damage to the Four Seasons Resort located at Nevis Island; which was re-opened in 2011. According to the National Energy Policy of Saint Kitts and Nevis, this resort is considered the largest in the island. This variation on the consumption between those years might respond to the construction activities that took place in the country.

It is important to notice that this sector also consumed asphalts, which are listed into the Non-Energy Products. As Graph 4 shows, this source had a share of 0.75% of the total

imports by Energy source. These products are classified by their non energy consumption.



Source: Saint Kitts and Nevis Energy Balances 2010 - 2012

Electricity consumption

In Saint Kitts and Nevis, the commercial and public services is the sector that consumed most of the electricity generated, followed very close by the residential sector. According to the results of the Energy Balance 2010-2012, the commercial and public services sector consumed 43.53% of the total electricity generated. As Graph 12 shows, the residential sector represented 22.18% of the total electricity consumption. The rest of the electricity generated was consumed by the Industry sector with an average of 13.14%.





It is interesting to highlight that there has been important variations between the years 2011 and 2012. Within those years the residential consumption experimented a decrease from 30.58 kBoe in 2011 to 29.93 kBoe in 2012 this situation may be led by several reasons including variations at the fuel surcharge to the introduction of led bulb light all around the country. A similar situation occurred with the Commercial and Public services sector with 60.03 kBoe in 2011 to 58.76 kBoe in 2012.

Non Energy Products consumption

Regarding the consumption of the non-energy products, which comprises lubricants and asphalts, there have been important changes in the country. For instance, the results of the Energy Balance 2010-2012 show that the consumption of non-energy products have decreased during this period of time. In 2010 the country consumed an amount of 5.3 kBoe and then in the year 2011 it was reduced to 4.4 kBoe. Finally for the year 2012 this figure was reduced by a consumption of 3.4 kBoe.

Transformation

Electricity Generation

Saint Kitts and Nevis used basically diesel oil and other primaries, such as wind power to generate electricity. It is important to highlight that the SCASPA Solar Farm at Saint Kitts is not counted for this study since it was commissioned in 2013 and this analysis comprises the years 2010-2012. The introduction in 2010 of wind power at Nevis has positively influenced the Electricity Generation matrix, reducing the consumption of Diesel Oil along this period of time.

In 2011 the country used 355.8 kBoe of Diesel Oil to generate electricity, by year 2012 this figure experimented a decrease to 339.9 kBoe. These data can be contrasted with the increase in the use of wind power, which augmented from 3.3 kBoe in 2011 to 4.7 kBoe in 2012.

Energy Balance 2012 Physical units

				SECONDARY									
	ACTIVITY	FIREWOOD	Others Prim	ELECTRICITY	LPG	GASOLINE/	KEROSENE	DIESEL OIL	CHARCOAL	NON-			
						ALCOHOL				ENERGY			
		1.1	Kle e e	Chille	LLL	1.6.6.1	1.6.6.1	1.6.6.1	1.1	PRODUCTS			
		Kt 0.000	KDOe	Gwn	KDDI	KDDI	KDDI	KDDI	Kt 0.000	KDOE			
	PRODUCTION	0,022	4,751	217,844				000.460	0,002	0.400			
PLY	IMPORT				22,330	145,154	37,750	392,460		3,430			
٩U	EXPORT												
s	INVENTORIES					-4,000							
TOTAL NOLEWNOSUNOTAL	UNUSED												
TOTAL	SUPPLY	0,022	4,751	217,844	22,330	141,154	37,750	392,460	0,002	3,430			
_	REFINERY												
NO	POWER PLANTS		-4,751	217,009				-331,941					
RMATI	SELF PRODUCERS			0,835				-7,455					
	GAS TREATM.PLANT												
P.O.	CHARCOAL PLANT	-0,009							0,002				
SNE	COKE/BLAST FURNAC												
TR	DISTILLERY												
	OTHER CENTERS												
TOTAL	TRANSFORMATION	-0,009	-4,751					-339,396					
	OWN CONSUMPTION			0,141									
Z	LOSSES			38,782		2,903							
DE	ADJUSTMENT	0,000			-0,005	4,537	0,004	-0,002		0,002			
M	TRANSPORTATION					133,608	36,614	39,663					
Isu	INDUSTRY			28,627				0,293					
Ő	RESIDENTIAL	0,013		48,309	16,319		1,132		0,002				
DO	COMMERC.,SERV.PUB			94,828	6,017	0,106		4,040					
EN	AGRIC.,FISH.MIN.							0,667					
	CONSTRUCTION, OTH.			7,157				8,404					
CONSUMPTION	ENERGY SOURCE	0,013		178,921	22,335	133,714	37,746	53,066	0,002				
	NON ENERGY CONSUM									3,428			
CONSUMPTION	FINAL	0,013		178,921	22,335	133,714	37,746	53,066	0,002	3,428			

 Table 21. Saint Kitts and Nevis Energy Balance 2012 (Physical units)

Calorific units (kBoe)

	ACTIVITY	FIREWOOD	Others Prim	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	TOTAL SECONDARY	TOTAL
	PRODUCTION	0,057	4,751	4,808	134,976					0,012		134,988	4,808
≥	IMPORT					14,963	129,681	36,176	393,049		3,43	577,298	577,298
ЧРР	EXPORT												
s	INVENTORIES						-3,574					-3,574	-3,574
	UNUSED												
TOTAL	SUPPLY	0,057	4,751	4,808	134,976	14,963	126,107	36,176	393,049	0,012	3,43	708,713	578,533
	REFINERY												
z	POWER PLANTS		-4,751	-4,751	134,459				-332,438			134,459	-202,73
IOITA	SELF PRODUCERS				0,518				-7,466			0,518	-6,949
RMA	GAS TREATM.PLANT												
	CHARCOAL PLANT	-0,024		-0,024						0,012		0,012	-0,013
	COKE/BLAST FURNAC												
	DISTILLERY												
	OTHER CENTERS												
TOTAL	TRANSFORMATION	-0,024	-4,751	-4,775					-339,905			-339,905	-209,691
	OWN CONSUMPTION				0,087							0,087	0,087
	LOSSES				24,029		2,594					26,623	26,623
NO	ADJUSTMENT	0,		0,	0,	-0,004	4,054	0,004	-0,002		0,002	4,054	4,054
TdM	TRANSPORTATION						119,365	35,087	39,723			194,175	194,175
NSU	INDUSTRY				17,738				0,293			18,03	18,03
8	RESIDENTIAL	0,033		0,033	29,932	10,935		1,085		0,012		41,964	41,997
ENI	COMMERC.,SERV.PUB				58,755	4,032	0,095		4,046			66,928	66,928
	AGRIC., FISH. MIN.								0,668			0,668	0,668
	CONSTRUCTION, OTH.				4,434				8,416			12,851	12,851
CONSUMPTION	ENERGY SOURCE	0,033		0,033	110,859	14,967	119,46	36,172	53,146	0,012		334,615	334,648
	NON ENERGY CONSUM										3,428	3,428	3,428
CONSUMPTION	FINAL	0,033		0,033	110,859	14,967	119,46	36,172	53,146	0,012	3,428	338,043	338,076

 Table 22. Saint Kitts and Nevis Energy Balance 2012 (Calorific units)

Energy Balance – 2011

Physical units

							SECONDARY			
		FIREWOOD	Others Prim	ELECTRICITY	LPG	GASOLINE/	KEROSENE	DIESEL OIL	CHARCOAL	NON-
	ACIIVITI					ALCOHOL				ENERGY
										PRODUCTS
		kt	Kboe	GWh	kbbl	kbbl	kbbl	kbbl	kt	kboe
	PRODUCTION	0,022	3,347	222,511					0,002	
7	IMPORT				24,320	132,980	38,140	408,590		4,220
ddf	EXPORT									
SI	STOCK CHANGE				1,000					
CONSCIENCE OR CONSCIENCE	UNUSED									
TOTAL	SUPPLY	0,022	3,347	222,511	25,320	132,980	38,140	408,590	0,002	4,220
	REFINERY									
NO	POWER PLANTS		-3,347	221,739				-343,992		
ATI	SELF PRODUCERS			0,773				-11,292		
RM	GAS TREATM.PLANT									
6	CHARCOAL PLANT	-0,009							0,002	
SNA	COKE/BLAST FURNAC									
TR/	DISTILLERY									
	OTHER CENTERS									
TOTAL	TRANSFORMATION	-0,009	-3,347					-355,284		
	OWN CONSUMPTION			0,147						
	LOSSES			39,554						
NO	ADJUSTMENT	0,000			0,002	0,000	-0,003	0,000		-0,004
ILLd	TRANSPORTATION					132,874	36,999	39,446		
M	INDUSTRY			29,250				0,270		
SNo	RESIDENTIAL	0,013		49,359	16,302		1,144		0,002	
8	COMMERC.,SERV.PUB			96,889	9,016	0,105		4,567		
	AGRIC.,FISH.MIN.							0,667		
	CONSTRUCTION, OTH.			7,312				8,358		
CONSUMPTION	ENERGY SOURCE	0,013		182,810	25,318	132,980	38,143	53,306	0,002	
	NON ENERGY CONSUM									4,224
CONSUMPTION	FINAL	0,013		182,810	25,318	132,980	38,143	53,306	0,002	4,224

 Table 23. Saint Kitts and Nevis Energy Balance 2011 (Physical units)

Calorific units (kboe)

	ACTIVITY	FIREWOOD	Others Prim	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	TOTAL SECONDARY	TOTAL
	PRODUCTION	0,056	3,347	3,404	137,868					0,012		137,88	3,404
≥	IMPORT					16,297	118,804	36,55	409,203		4,22	585,073	585,073
ЧРР	EXPORT												
s	INVENTORIES					0,67						0,67	0,67
	UNUSED												
TOTAL	SUPPLY	0,056	3,347	3,404	137,868	16,967	118,804	36,55	409,203	0,012	4,22	723,623	589,147
	REFINERY												
z	POWER PLANTS		-3,347	-3,347	137,389				-344,508			137,389	-210,466
OITA	SELF PRODUCERS				0,479				-11,309			0,479	-10,83
RM	GAS TREATM.PLANT												
ISFO	CHARCOAL PLANT	-0,024		-0,024						0,012		0,012	-0,013
TRAN	COKE/BLAST FURNAC												
	DISTILLERY												
	OTHER CENTERS												
TOTAL	TRANSFORMATION	-0,024	-3,347	-3,371					-355,817			-355,817	-221,309
	OWN CONSUMPTION				0,091							0,091	0,091
	LOSSES				24,508							24,508	24,508
NOL	ADJUSTMENT	0,		0,		0,001	0,	-0,003	0,		-0,004	-0,006	-0,006
LdΜ	TRANSPORTATION						118,71	35,456	39,505			193,67	193,67
NSU	INDUSTRY				18,123				0,27			18,393	18,393
8	RESIDENTIAL	0,032		0,032	30,583	10,924		1,097		0,012		42,615	42,647
ENG	COMMERC.,SERV.PUB				60,033	6,042	0,094		4,574			70,742	70,742
	AGRIC.,FISH.MIN.								0,668			0,668	0,668
	CONSTRUCTION, OTH.				4,531				8,37			12,901	12,901
CONSUMPTION	ENERGY SOURCE	0,032		0,032	113,269	16,966	118,804	36,552	53,386	0,012		338,989	339,021
	NON ENERGY CONSUM										4,224	4,224	4,224
CONSUMPTION	FINAL	0,032		0,032	113,269	16,966	118,804	36,552	53,386	0,012	4,224	343,213	343,246

 Table 24. Saint Kitts and Nevis Energy Balance 2011 (Calorific units)

Energy Balance – 2010

Physical units

						SECONDARY	(
	ACTIVITY	FIREWOOD	OTHER PRIMARIES	ELECTRICITY	LPG	GASOLINE/ ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON-ENERGY PRODUCTS
		kt	Kboe	GWh	kbbl	kbbl	kbbl	kbbl	kt	kboe
	PRODUCTION	0,021	3,455	216,452					0,002	
≿	IMPORT				26,280	127,488	36,240	393,620		5,300
ddr	EXPORT									
SL	INVENTORIES									
	UNUSED									
TOTAL	SUPPLY	0,021	3,455	216,452	26,280	127,488	36,240	393,620	0,002	5,300
_	REFINERY									
õ	POWER PLANTS		-3,455	215,788				-336,144		
ATI	SELF PRODUCERS			0,664				-5,776		
RM	GAS TREATM.PLANT									
6	CHARCOAL PLANT	-0,009							0,002	
N	COKE/BLAST FURNAC									
TRA	DISTILLERY									
	OTHER CENTERS									
TOTAL	TRANSFORMATION	-0,009	-3,455					-341,920		
	OWN CONSUMPTION			0,158						
NO	LOSSES			38,454						
ŬĔ	ADJUSTMENT			0,000	0,996	0,000	-0,060	-0,001		-0,002
N N	TRANSPORTATION					127,488	35,243	37,847		
NSL	INDUSTRY			28,454				0,287		
lo I	RESIDENTIAL	0,012		48,017	16,270		1,057		0,002	
DC	COMMERC.,SERV.PUB			94,255	9,014			4,882		
E	AGRIC., FISH. MIN.							0,667		
	CONSTRUCTION, OTH.			7,114				8,019		
CONSUMPTION	ENERGY SOURCE	0,012		177,839	25,284	127,488	36,300	51,701	0,002	
	NON ENERGY CONSUM									5,302
CONSUMPTION	FINAL	0,012		177,839	25,284	127,488	36,300	51,701	0,002	5,302

 Table 25. Saint Kitts and Nevis Energy Balance 2010 (Physical units)

Calorific units (kboe)

	ACTIVITY	FIREWOOD	Others Prim	TOTAL PRIMARY	ELECTRICITY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	TOTAL SECONDARY	TOTAL
	PRODUCTION	0,056	3,455	3,511	134,114					0,011		134,125	3,511
≿	IMPORT					17,61	113,898	34,729	394,21		5,3	565,747	565,747
Iddu	EXPORT												
s	INVENTORIES												
	UNUSED												
TOTAL	SUPPLY	0,056	3,455	3,511	134,114	17,61	113,898	34,729	394,21	0,011	5,3	699,872	569,258
	REFINERY												
7	POWER PLANTS		-3,455	-3,455	133,702				-336,648			133,702	-206,401
10L	SELF PRODUCERS				0,411				-5,785			0,411	-5,374
MA	GAS TREATM.PLANT												
ISFOI	CHARCOAL PLANT	-0,024		-0,024						0,011		0,011	-0,012
RAN	COKE/BLAST FURNAC												
-	DISTILLERY												
	OTHER CENTERS												
TOTAL	TRANSFORMATION	-0,024	-3,455	-3,479					-342,433			-342,433	-211,787
	OWN CONSUMPTION				0,098							0,098	0,098
	LOSSES				23,826							23,826	23,826
NO	ADJUSTMENT	0,		0,	0,	0,668	0,	-0,057	-0,001		-0,002	0,607	0,607
MPT	TRANSPORTATION						113,898	33,773	37,903			185,574	185,574
NSU	INDUSTRY				17,63				0,287			17,917	17,917
00	RESIDENTIAL	0,032		0,032	29,751	10,902		1,013		0,011		41,678	41,71
ENC	COMMERC.,SERV.PUB				58,4	6,04			4,89			69,33	69,33
	AGRIC., FISH.MIN.								0,668			0,668	0,668
	CONSTRUCTION, OTH.				4,408				8,031			12,439	12,439
CONSUMPTION	ENERGY SOURCE	0,032		0,032	110,189	16,943	113,898	34,786	51,779	0,011		327,606	327,638
	NON ENERGY CONSUM										5,302	5,302	5,302
CONSUMPTION	FINAL	0,032		0,032	110,189	16,943	113,898	34,786	51,779	0,011	5,302	332,908	332,94

 Table 26. Saint Kitts and Nevis 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 IPCC⁷ 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 68-69 for the years 2010-2012.

The methodology of technologies uses the values reported by the countries, on the fundamental data, according to the energy source used in the energy activities. Those are operated with the factors of contamination of a given technology and applied according to the pollutant in mention, this way we can get the emissions by source.

This report will consider the CO_2 emissions. In that sense, the results of the Energy Balance of Saint Kitts and Nevis 2010-2012 and the Graph 13 show that electricity generation is the activity that produces the most representative part of the emissions, with a participation of 58.5% as an average for the three years. Is followed very close by the Transport sector with 34.9% of the emissions for the same period of time.

⁷Intergovernmental 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 know ledge 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 13. CO₂ Emissions by Economic Activity Source: Saint Kitts and Nevis Energy Balances 2010 – 2012

On the other hand, Graph 14 shows the emissions by energy source. In line with the previous analysis of power plants being the most pollutant activity, diesel oil is the source that generates most of the CO_2 emissions. During the years 2010-2012 diesel oil had a share of 69.2% mainly due to electricity generation. This source is followed by gasoline with a share of 20% for the same period of time.

The rest of the emissions are split among Kerosene/Jet fuel with a share of 6.4% and LPG with a share of 2.4% in the same period of time. The use of charcoal and firewood is very small.



Graph 14. CO₂ Emissions by Energy Source Source: Saint Kitts and Nevis 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 118).

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 118

ENERGY SOURCE		FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	SECONDARY	TOTAL
	PRODUCTION			0,00							0,00	0,00
~	IMPORT			0,00							0,00	0,00
Idd	EXPORT			0,00							0,00	0,00
Ñ	INVENTORIES			0,00							0,00	0,00
	UNUSED			0,00							0,00	0,00
TOTAL	SUPPLY	0,00		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	REFINERY			0,00							0,00	0,00
	POWER PLANTS		0,90	0,00				135,12			135,12	135,12
NOL	SELF PRODUCERS			0,00				2,99			2,99	2,99
[WA]	GAS TREATM.PLANT			0,00							0,00	0,00
SF01	CHARCOAL PLANT			0,00					0,003		0,00	0,00
RAN	COKE/BLAST FURNAC			0,00							0,00	0,00
+	DISTILLERY			0,00							0,00	0,00
	OTHER CENTERS			0,00							0,00	0,00
TOTAL	TRANSFORMATION	0,00		0,00	0,00	0,00	0,00	138,11	0,00	0,00	138,12	138,12
	OWN CONSUMPTION			0,00							0,00	0,00
NO	TRANSPORTATION			0,00		50,5	15,0	17,7			83,25	83,25
MPT	INDUSTRY			0,00				0,1			0,12	0,12
NSU	RESIDENTIAL	0,018		0,02	3,7		0,4		0,01		4,18	4,20
FINAL CON	COMMERC.,SERV.PUB			0,00	1,6	0,03		1,8			3,37	3,37
	AGRIC.,FISH.MIN.			0,00				0,3			0,30	0,30
	CONSTRUCTION,OTH.			0,00				3,7			3,75	3,75
CONSUMPTION	ENERGY	0,02	0,00	0,02	5,31	50,56	15,47	23,62	0,01	0,00	94,97	94,98
	NON-ENERGY			0,00						0,73	0,73	0,73
CONSUMPTION	FINAL	0,02	0,00	0,02	5,31	50,56	15,47	23,62	0,01	0,73	95,69	95,71
IUUIAI	I FIVILID DI UN S	0.02	0.00	0.02	5.31	50.56	15.4/	161./3	0.01	0.73	233.81	/11.81

10.3. CO₂ Emissions According to Technology approach

 Table 27. Saint Kitts and Nevis Gas Inventory 2012 (Technology Approach)

ENERGY SOURCE		FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	SECONDARY	TOTAL
	PRODUCTION			0,00							0,00	0,00
>:	IMPORT			0,00							0,00	0,00
Iddr	EXPORT			0,00							0,00	0,00
5	INVENTORIES			0,00							0,00	0,00
	UNUSED			0,00							0,00	0,00
TOTAL	SUPPLY	0,00		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	REFINERY			0,00							0,00	0,00
_	POWER PLANTS		0,90	0,00				140,03			140,03	140,03
TION	SELF PRODUCERS			0,00				4,54			4,54	4,54
3MA	GAS TREATM.PLANT			0,00							0,00	0,00
SFOI	CHARCOAL PLANT			0,00					0,0033		0,00	0,00
RAN	COKE/BLAST FURNAC			0,00							0,00	0,00
-	DISTILLERY			0,00							0,00	0,00
	OTHER CENTERS			0,00							0,00	0,00
TOTAL	TRANSFORMATION	0,00		0,00	0,00	0,00	0,00	144,56	0,00	0,00	144,56	144,56
	OWN CONSUMPTION			0,00							0,00	0,00
NOI	TRANSPORTATION			0,00		50,3	15,2	17,6			83,04	83,04
THM	INDUSTRY			0,00				0,1			0,11	0,11
NSN	RESIDENTIAL	0,02		0,02	3,7		0,4		0,01		4,18	4,20
L CO	COMMERC.,SERV.PUB			0,00	2,4	0,03		2,0			4,38	4,38
FINAL	AGRIC.,FISH.MIN.			0,00				0,3			0,30	0,30
	CONSTRUCTION, OTH.			0,00				3,7			3,73	3,73
CONSUMPTION	ENERGY	0,02	0,00	0,02	6,09	50,28	15,63	23,72	0,01	0,00	95,74	95,75
	NON-ENERGY			0,00						0,73	0,73	0,73
CONSUMPTION	FINAL	0,02	0,00	0,02	6,09	50,28	15,63	23,72	0,01	0,73	96,46	96,48
IOIAI	IEMISSIONS	0.02	r 0.00	0.02	6.09	50.28	15.63	168.28	0.01	0.73	241.02	241.04

 Table 28. Saint Kitts and Nevis Gas Inventory 2011 (Technology Approach)

ENERGY SOURCE		FIREWOOD	OTHER PRIMARIES	TOTAL PRIMARY	LPG	GASOLINE / ALCOHOL	KEROSENE	DIESEL OIL	CHARCOAL	NON- ENERGY PRODUCTS	SECONDARY	TOTAL
	PRODUCTION			0,00							0,00	0,00
2	IMPORT			0,00							0,00	0,00
IddN	EXPORT			0,00							0,00	0,00
s	INVENTORIES			0,00							0,00	0,00
	UNUSED			0,00							0,00	0,00
TOTAL	SUPPLY	0,00		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	REFINERY			0,00							0,00	0,00
7	POWER PLANTS		0,93	0,00				136,83			136,83	136,83
101	SELF PRODUCERS			0,00				2,32			2,32	2,32
RMA	GAS TREATM.PLANT			0,00							0,00	0,00
ISFO	CHARCOAL PLANT			0,00					0,003		0,00	0,00
IRAN	COKE/BLAST FURNAC			0,00							0,00	0,00
-	DISTILLERY			0,00							0,00	0,00
	OTHER CENTERS			0,00							0,00	0,00
TOTAL	TRANSFORMATION	0,00		0,00	0,00	0,00	0,00	139,15	0,00	0,00	139,15	139,15
	OWN CONSUMPTION			0,00							0,00	0,00
NOL	TRANSPORTATION			0,00		48,2	14,5	16,9			79,57	79,57
LdWI	INDUSTRY			0,00				0,1			0,12	0,12
NSNO	RESIDENTIAL	0,017		0,02	3,7		0,4		0,0		4,14	4,16
	COMMERC.,SERV.PUB			0,00	2,4			2,1			4,49	4,49
FINA	AGRIC.,FISH.MIN.			0,00				0,3			0,30	0,30
	CONSTRUCTION,OTH.			0,00				3,6			3,58	3,58
CONSUMPTION	ENERGY	0,02	0,00	0,02	6,08	48,22	14,88	23,00	0,01	0,00	92,19	92,21
	NON-ENERGY			0,00						0,73	0,73	0,73
CONSUMPTION	FINAL	0,02	0,00	0,02	6,08	48,22	14,88	23,00	0,01	0,73	92,92	92,93
TOTAL	EMISSIONS	0,02	0,00	0,02	6,08	48,22	14,88	162,15	0,01	0,73	232,07	232,09

 Table 29. Saint Kitts and Nevis Gas Inventory 2010 (Technology Approach)

Chapter VII. Energy and Economic Indicators

In table 30 there is a comparison between different economic indicators from the average of Latin American and Caribbean countries and also with some OECS countries that OLADE has already processed for the period 2010-2012.

In terms of the final consumption per capita, Saint Kitts and Nevis has the highest indicator comparing with the rest of the countries that OLADE has already researched. Despite that this indicator has been reduced from 7.31 in 2011 to 7.19 in 2012, the final consumption per capita remains very high for a country that in 2012 had less than 50.000 inhabitants. Actually the average of the consumption per capita is very close to the average indicator for the Latin America and the Caribbean countries, which is 7,38. This situation may be caused by the big amounts of Diesel Oil that were consumed in the country, among other possible reasons that might be analysed as well. For instance, the total electricity consumption per capita is very high (3.88) due to the affluence of tourist to the Islands, which increases the population twice per year. According to the country arrivals statistics, during 2010 and 2012, tourists visiting the country were about 90 thousand to 110 thousand per year.

In terms of the Total Energy Consumption per capita the results of the Energy Balance were able to determine that the figures are very high if we consider the amount of GWh and the population of the country. As Table 30 shows, the figures are higher than the ones from the Latin-American Countries. This situation is caused mainly by the big amounts of electricity that were consumed during those three years. At the present, this situation might have change, reducing these figures, considering the introduction of the SCASPA solar farm, as well as the led bulb exchange program.

In terms of the Total Energy Consumption, in the Residential sector per capita, it is remarkable that Saint Kitts and Nevis has higher average energy consumption per capita than Dominica, Saint Lucia, Saint Vincent and the Grenadines and the rest of the Latin American and the Caribbean countries, separately. These figures can be influenced, in a part, by the Total Electricity consumption in the Residential sector per capita, that has an average of 1.05 (kWh/inhab.), which is higher, compared with the rest of the countries, for the three years.

On the other hand, the Energy Intensity has an average of 0,19 (boe/10(3) EC\$). This value is very close to the figures from Saint Vincent and the Grenadines and Dominica. The Industrial Energy intensity present an average of 0.18 (boe/10(3) EC\$), but it is important to consider the small amount of big industries that the country had during 2010-2012. This figure is close to Santa Lucia's Industrial Intensity with 0.12 (boe/10(3) EC\$). The Energy Intensity indicator of the country is similar to the average of the rest of the OECS because, both, the GDP and the Energy Consumption values are modest, if we compare with Saint Lucia, and the Latin American and the Caribbean Countries.

Saint Kitts and Nevis had an important amount of emissions according the results of the Energy Balance 2010-2012. The emissions per capita are higher than the average from the Latin-American countries. This situation is caused by the high rates of electricity consumption per capita that the country experimented during those three years and the amount of diesel oil that has been used in this transformation process, which had high emission rates. The average of the Latin-American countries was 2,7 (Gg CO₂ /boe/10(3)inhab) and Saint Kitts and Nevis had an average of 5.08 (Gg CO₂ /boe/10(3)inhab). However, the Intensity of CO₂ Emissions in the Electricity sector is very close to the rest of the OECS countries.

	Final Energy	Total	Total Energy Consumption in	Total	Energy	Industrial	Total CO2	Intensity of				
	Consumption	Electricity	Residential Sector per capita	Electricity	Intensity	Energy	Emissions per	CO2 Emissions				
	per capita	Consumption		Consumption in		Intensity	capita	in Electricity				
		per capita		Residential				Sector /				
				Sector per				Generation				
				capita								
Year	(kboe/10(3)inhab)	(GWh/10(3)inhab)	(kboe/10(3)inhab)	(kWh/inhab)	(boe/10(3) EC\$)	(boe/10(3) EC\$)	(Gg CO2 /boe/10(3)inhab)	(GgCO2/GWh)				
Saint Kitt	s and Nevis											
2010	7,06	3,83	0,90	1,04	0,19	0,17	5,00	0,78				
2011	7,31	3,94	0,92	1,06	0,19	0,20	5,20	0,79				
2012	7,21	3,86	0,91	1,04	0,19	0,18	5,04	0,77				
Average	7,19	3,88	0,91	1,05	0,19	0,18	5,08	0,78				
Saint Vin	cent and the G	renadines										
Average	3,20	1,19	0,63	0,55	0,19	0,43	1,79	0,62				
Dominica	L											
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				
Latin Am	Latin America and Caribbean											
2011	7,38	1,21	1,14	0,52	1,29	2,82	2,7	0,22				

 Table 30. Energy and Economic Indicators (2010 – 2012)

Chapter VIII. Conclusions and recommendations

• When OLADE, along with the Ministry of Public Works, was gathering all the information and data from the hydrocarbon importers, there was limited access to reliable information related to each sector in terms of the final consumption and the supply. Not all the importers were willing to collaborate with the project, situation that presented several difficulties in order to elaborate the Energy Balance. For example, regarding the hydrocarbon sector, Delta and Rubis decided not to participate with their data for the project. With this consideration, estimation processes were implemented to calculate the consumption of the energy sources, classified by economic subsectors, based on the structural characteristics of the country and also the consumers.

For this purpose, OLADE gathered information such as the size of the vehicle fleet, type of vehicle, number of vessels, cruise ships and ferries, and their type of engines, by year. Also gathered information related to the residential sector, such as the number of dwellings, number of households, total population, type of fuel used for cooking and for lighting, among others for the period 2010-2012.

For the industrial, commercial, and agriculture, sectors, variables such as production, added value, number of employees, electricity bills, purchased fuels and their specific use, among others, were gathered to elaborate these calculations. Therefore, thanks to all the above-mentioned information, the results of the Saint Kitts and Nevis Energy Balance (2010-2012) can be considered as adequate and reliable, mainly taking into account the statistical adjustment by source and for total energy.

• To elaborate the Energy Balance of the country, OLADE needed to gather information from several institutions. There was remarkable and important data that was found all over the country, with which, important calculations and analyses can be done. For instance, the number of fishing vessels and the type of their engines, also the number of vehicles for each year, with the characteristics of their size and engines. OLADE was able to determine the hydrocarbon consumption of the transport sector based on these values.

It is important to highlight that public and private institutions manage their own information, depending on each subsector. For example, private importers (SOL, Rubis, Petrocaribe and Delta) have their own data, in terms of the total sales for each economic sector; which is vital information to elaborate the Energy Balance. Therefore, the elaboration of the Energy Balance constitutes a first step in order to centralize all the information related to energy as well as an instrument for energy planning and energy policy. By centralising the energy sector information, regarding the supply, demand and transformation activities, accurate analysis and research can be done since it relies in accurate data within the country

 Following the elaboration of the Energy Balance, it is important the country considers capacity building and institutional arrangements needed in order to strength the local capabilities to conduct further studies on energy diagnosis, energy planning and also implement a consistent elaboration of energy balances and introduce energy forecast for the future.

- Furthermore, it is important to highlight that hydrocarbons have a strong influence on the economy of the country, therefore, the introduction of renewable energy sources such as wind and solar power is positive not only to reduce the CO₂ emissions, but also to do important savings at the national economy level and increasing energy security in the country. In order to achieve this technical targets as well as policy arrangement, OLADE offers the country the experience on information management, training and the all the studies that have been developed along this years in Latin America and the Caribbean to conduct further studies that benefits the country and all the OECS members.
- Besides the hydrocarbon sector, the electricity consumption per capita seems to be very high respecting to the other OECS islands. This fact can be explained by the importance of the tourism in the economy, producing a direct impact in the electricity consumption. According to the country tourism statistics, every year about 90,000 to 110,000 tourists arrive to the island, which doubles the total population of the country.
- Finally, considering that the results of the Energy Balance shows really high indicators, compared with some of the other OECS countries, it is very important for the country to optimize the energy use and also to keep promoting the energy efficiency and diversifying the energy matrix in all economic activities and subsectors. A remarkable fact about Saint Kitts and Nevis is its high amounts of hydrocarbons imports and a small population. This situation needs to be analysed in a further research, especially in the power generation activities, where very high amounts of diesel oil are being used, comparing with the rest of the OECS countries.

ANNEX

Forms Saint Kitts and Nevis Contact List

ST. KITTSAND NEVIS CONTACT LIST - OCTOBER 2014

N	SUB-SECTOR	I NSTI TUTI ON	SURVEY			
1		Ministry of Housing, Public Works, Energy and Public Utilities (ST. Kitts)	Q1_F03_SKN_2014 Q4_CTR_SKN_2014 Q12_NV_SKN_2014			
2	Main Energy Supply Demand Variables	Ministry of Comunication and Works				
3		Nevis Island Administration	Q1_F03_SKN_2014 Q7_CCO_SKN_2014 Q4_CTR_SKN_2014 Q8_CCOH_SKN_2014 Q12_NV_SKN_2014			
4		CaribSupply Ltd	Q2_HC_SKN_2014			
5		Delta Petroleum	Q2_HC_SKN_2014			
6	Hydrocarbons	SOL EC Ltd.	Q2_HC_SKN_2014			
7		Rubis	Q2_HC_SKN_2014			
8		Petrocaribe	Q2_HC_SKN_2014			
9		Nevis Electricity Company (NEVLEC)	Q3_EE_SKN_2014			
10	Electricity	St. Kitts Electricity Company (SKELEC)	Q3_EE_SKN_2014			
11		Chamber of commerce				
12		Ministry of International Trade, Industry, Commerce and Consumer Affairs (ST. Kitts)				
13		St. Kitts Bottling Co. Ltd				
14	Industry	Kajola Kristada Ltd	Q6_CIN2_SKN_2014			
15		Lutron Liamuiga Ltd	Q6_CIN2_SKN_2014			
16		Harowe Servo Controls	Q6_CIN2_SKN_2014			
17		Jaro Electronics Ltd	Q6_CIN2_SKN_2014			
18		Sun Island Clothes	Q6_CIN2_SKN_2014			
19		Sprat Net	Q6_CIN2_SKN_2014			
20		Ministry of Agriculture, Marine Resources and Constituency Empowerment (ST. Kitts)	Q11_CRW_SKN_2014			
21	Agriculture, fishery,	Fisheries (St. Kitts)	Q11_CRW_SKN_2014			
22		Agriculture Ministriy (Nevis Island Administration)	Q11_CRW_SKN_2014			
23	Transport	Ministry of Tourism and International Transport (ST. Kitts)	Q4_CTR_SKN_2014 Q7_CCO_SKN_2014			
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29	mansport	Licensing Authority (Traffic department) (ST. Kitts)	Q4_CTR_SKN_2014			
31		Ministry of tourism (Nevis Island Administration)	Q7_CCO_SKN_2014			
33		Four Seasons Resort	Q8_CCOH_SKN_2014			
34	Hotels/ Resorts	Marriott Royal St. Kitts Resort	Q8_CCOH_SKN_2014			
35		Ocean Terrace Inn	Q8_CCOH_SKN_2014			
36		Claxtons Services	Q8_CCOH_SKN_2014			
37		Aiyana Ltd	Q8_CCOH_SKN_2014			
38		O.D. Brisbane & Sons	Q10_CCOSC_SKN_2014			
39		TDC Ltd	Q10_CCOSC_SKN_2014			
40	Supermarkets	Harper's Office Depot	Q10_CCOSC_SKN_2014			
41		Courts (St. Kitts-Nevis) Ltd	Q10_CCOSC_SKN_2014			
42		Super Foods Ltd	Q10_CCOSC_SKN_2014			
43		St. Kitts Masonry Products	Q6_CIN2_SKN_2014			
44	Construction related	Williams Architectural	Q6_CIN2_SKN_2014			
45		Edwin Glasford Associates	Q6_CIN2_SKN_2014			
46		Ballahoo Restaurant	Q9_CCOR_SKN_2014			
47		Coral Grill at Four Seasons Nevis	Q9_CCOR_SKN_2014			
48		The Royal Palm Restaurant at Ottley's Plantation Inn	Q9_CCOR_SKN_2014			
49	Restaurants	The Fisherman's Wharf	Q9_CCOR_SKN_2014			
50		Oualie beach	Q9_CCOR_SKN_2014			
51		Bananas Restaurant	Q9_CCOR_SKN_2014			
52		Montpelier Plantation and Beach	Q9_CCOR_SKN_2014			
53		The Pavilion	Q9_CCOR_SKN_2014			
54		Department of Statistics (Ministry of Sustainable Development)(ST. Kitts)	Q1_F03_SKN_2014 Q4_CTR_SKN_2014 Q12_NV_SKN_2014			
55	National Statistical Variables	Statistic office (Ministry of Finance Nevis Island Administration)	Q1_F03_SKN_2014 Q4_CTR_SKN_2014 Q12_NV_SKN_2014			
56		St. Kitts-Nevis-Anguilla National Bank Limited (National)(ST. Kitts)	Q12_NV_SKN_2014			

 Table 31. Saint Kitts and Nevis Contact List 2014

 Note: Personal information was deleted due to a confidential agreement

Greenhouse Gas Emissions calculated by Reference approach

Gg CO2	Diesel Oil	LPG	Gasoline/Alcohol	Kerosene/Jet Fuel	Firewood	Non energy	Other Prim	Total Energy
2010	167,9	6,4	45,4	14,3	0,0	0,8	1,5	234,9
2011	174,3	6,2	47,4	15,0	0,0	0,7	1,4	243,5
2012	167,4	5,4	50,3	14,9	0,0	0,5	2,1	238,6

 Table 32. Greenhouse Gas Emissions by Technology Approach 2010-2012

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