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A Statistical Framework for Energy in Canada

by Statistics Canada and Natural Resources Canada

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Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Standard table symbols

The following symbols are used in Statistics Canada publications:

. not available for any reference period
.. not available for a specific reference period
... not applicable
0 true zero or a value rounded to zero
0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

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Foreword

The objective of this document is to provide a current overview of energy statistics in Canada. It introduces the first Statistical Framework for Energy in Canada and functions as a guide that will help facilitate the strategic plan outlined for addressing priority elements in Canadian energy statistics.

The Statistical Framework for Energy in Canada encompasses three components: 1) energy supply and demand information comprising of volumetric data on energy production, distribution and consumption; 2) economic information and accounts as it relates to the energy sector and its sub-industries; and 3) environmental statistics and accounts which measure the effects of energy on the environment.

Statistics Canada and Natural Resources Canada gratefully acknowledge the input from various government departments, an expert working group of academics and a selection of external organizations active in the collection and use of energy statistics which have informed the development of this framework. Previous work on the issue of energy statistics and energy information, including a 2012 Report to Energy and Mines Ministers on Improving Energy Information in Canada, has also been used in the preparation of this framework.

The framework is intended to apply to energy statistics in Canada in general, with application across a broad range of stakeholders involved in the collection, dissemination and use of energy statistics, including provincial and territorial administrative and statistical agencies. In contrast, the strategic plan is focused on the Government of Canada. Continued consultations and comments on this document from stakeholders will be used to inform the further development of this statistical framework and determine the mechanisms to best address priority elements.

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List of Abbreviations

AANDC	Aboriginal Affairs and Northern Development Canada
AER	Alberta Energy Regulator
APEC	Asia-Pacific Economic Cooperation
BoC	Bank of Canada
CANSIM	Canadian Socio-economic Information and Management
CAPP	Canadian Association of Petroleum Producers
CIF	Cost, Insurance and Freight
CPC	Central Product Classification
DFATD	Department of Foreign Affairs, Trade and Development
EC	Environment Canada
EIA	US Energy Information Administration
EMMC	Energy and Mines Ministers' Conference
ESP	Statistics Canada's Energy Statistics Program
FC	Finance Canada
FOB	Free on Board
GDP	Gross Domestic Product
GHG	Greenhouse gas
HS	The Harmonized Commodity Description and Coding System
IC	Industry Canada
IEA	The International Energy Agency
IEF	The International Energy Forum
IRES	International Recommendations for Energy Statistics
ISIC	The International Standard Industrial Classification of all Economic Activities
JODI	The Joint Organizations Data Initiative
LMDI	The Log-Mean Divisia Index I
LPG	Liquefied petroleum gases
NAICS	North American Industrial Classification System
NAPCS	North American Product Classification System
NEB	National Energy Board
NEUD	OEE National Energy Use Database
NGLs	Natural Gas Liquids
NRCan	Natural Resources Canada
OEB	Ontario Energy Board
OECD	The Organisation for Economic Co-operation and Development
OEE	The Office of Energy Efficiency at NRCan
PCO	The Privy Council Office
RESD	Report on Energy Supply and Demand in Canada
RPPs	Refined Petroleum Products
SEEA	The Systems of Environmental-Economic Accounting
SFEC	Statistical Framework for Energy in Canada
SIEC	The Standard International Energy Product Classification
SNA	The System of National Accounts
StatCan	Statistics Canada
TC	Transport Canada
UNECE	The United Nations Economic Commission for Europe
UNFCCC	The United Nations Framework Convention on Climate Change
UNSD	The United Nations Statistics Division
VAT	Value added tax
WGA	Working Group of Academics consulted in the development of ESF

Chapter 1. An Overview of Energy and Energy Statistics in Canada

1.1 Canada's Energy Sector

All economic activity requires energy to transform resources into goods and services with economic value. Energy therefore plays a fundamentally important role in the Canadian economy and in the daily lives of Canadians. Moreover, Canada is one of the very few countries of the Organisation for Economic Co-operation and Development (OECD) with the capacity to supply energy to other countries, further increasing the importance of Canada's energy sector.

Crucial to economic and social development, the various levels of governments in Canada receive substantial revenues from the energy sector in forms of direct and indirect taxes, crown royalties and land sales, providing resources to finance economic and social programs available to Canadians.

Key Facts on Canada's Economy and Energy (2013)

- Contributed 10% to nominal GDP
- Accounted for 27% of capital investments in Canada
- Represented close to 30% of total domestic exports
- Direct employment for nearly 300,000 people
- Government revenues averaging $25.1 billion annually over period 2008-2012
- Accounted for 7.9% of Canadians' household expenditures in 2012
- 79% of electricity generation in Canada are from non emitting sources in 2012
- Energy efficiency in Canada improved by 1.2% per year or 23.4% overall between 1990 and 2011

Canada benefits from a natural abundance of diverse energy resources, which includes oil and gas from conventional and unconventional sources, hydro, uranium, coal, wind, solar, biomass, geothermal, and marine. Approximately 79% of Canada's electricity is generated from non GHG emitting sources. Ranking in the top 5 on oil reserves and production, natural gas production and exports, hydro power generation, and uranium production, Canada is a major player in the global energy marketplace. A significant challenge for Canada's energy sector and related activities is the highly dynamic nature of the sector, both domestically and globally. While presenting new opportunities, this dynamism also generates new challenges to respond to issues such as responsible resource development and management, energy efficiency, environmental sustainability, emergency preparedness and response, and market development and diversification, with the associated energy transportation considerations.

Canada as a Global Energy Leader (2013)

- 3rd largest oil reserves and 5th largest producer of crude oil
- 5th largest producer and 4th largest net exporter of natural gas
- 3rd largest producer of hydro power
- 2nd largest producer of uranium
- 2nd in the improvement in energy efficiency among IEA countries

1.2 Energy Resources Management in Canada: A Shared Responsibility

Under Canada's Constitution Act, jurisdiction over energy is divided with clear identifications of responsibilities over most areas, but complicated at times by shared responsibilities in other areas. In most aspects, the provinces are principally responsible for energy and electricity, with the Constitution designating exclusive provincial power over energy resource management within provincial boundaries as well as trade and commerce within provincial borders. The federal government is responsible for the management of energy resources on frontier lands (Crown-owned lands in Canada's North and offshore areas). However, the federal government has entered into or is currently negotiating a number of devolution and shared management agreements transferring authority to territorial governments in the North and federal/provincial management boards for offshore resources. The federal government has

MANAGEMENT OF ENERGY RESOURCES IN CANADA

Federal responsibility

- Energy resources on federal Crown land, offshore and North of 60°
- International and interprovincial energy trade
- International and interprovincial energy infrastructure
- Regulation of nuclear energy and uranium

specific authority when it comes to uranium and nuclear safety. It also has responsibility for policies of national interest, and these may impact energy in the areas of environment, economic development, energy security, and science and technology. While provinces are responsible for trade and commerce within their borders, the federal government's authority extends to interprovincial and international trade and commerce.

The most significant area of shared responsibility between the federal and provincial governments is with respect to the environment. Provincial governments have jurisdiction over the impacts within their borders; however, environmental impacts can occur beyond provincial boundaries and the federal government is responsible for interprovincial and international impacts. Under specific legislation, Canada has responsibility where the implications affect federal lands or federal power, such as fisheries and navigable waters.

Provincial responsibility

- Ownership and management of energy resources, except those located on Aboriginal and federal lands
- Royalty design and collection
- Electricity production, distribution and regulation
- Land-use planning and allocation
- Laws and regulations on exploration, development, conservation and energy use

Shared responsibility

- Energy efficiency
- Environmental regulation of energy projects
- Scientific research and development
- Management of offshore resources under Accords

1.3 Canada's Energy Statistics System

Energy resources and energy use in a country as vast as Canada have obvious and significant regional characteristics. Depending on the major energy resources available and the main issues in resource management, the priorities for data collection vary across jurisdictions. The sources of energy data in Canada are reflective of this diversity. At the federal level, Statistics Canada (StatCan), Natural Resources Canada (NRCan), Environment Canada (EC), and the National Energy Board (NEB) are among the major data providers. Provincial and territorial regulatory agencies, such as the Alberta Energy Regulator (AER), the British Columbia Oil and Gas Commission, and the Ontario Energy Board (OEB), are also key sources of energy data in their respective jurisdictions. Non governmental organizations can also play an important role in data collection.

Statistical Agencies

Statistical agencies compile a wide range of primary data as part of their broad mandate to collect and publish statistics that involve economic, social and demographic issues, without which very little secondary analysis of energy use or supply could be undertaken. Through the Statistics Act, StatCan has been mandated to collect a wide range of statistical information, including energy information at the national and provincial/territorial levels.

StatCan collects energy data through several different program areas. StatCan's Energy Statistics Program (ESP) is the main source of primary volumetric energy data in Canada.[1] Other parts of StatCan also gather energy-related data, such as data on sales and consumption of fuel by transportation sectors, the transport of energy products, values and volumes of imports and exports of energy products, employment and investment in the energy sector. Energy data is also incorporated into several key economic indicators through the System of National Accounts, including the calculation of the Gross Domestic Product (GDP), input/output tables and environmental indicators.

STATISTICS CANADA'S ENERGY STATISTICS PROGRAM (ESP)

StatCan's ESP program has been in place for many years. The program covers various forms of energy such as oil, natural gas, natural gas liquids (NGLs), coal, coke, electricity and refined petroleum products. It provides information on the production, transformation, disposition, distribution and consumption of these various energy sources at the national and provincial/territorial levels.

The key product of the ESP is the annual Report on Energy Supply and Demand (RESD) which provides energy balances for Canada as well as supplementary energy data tables.

1. See Annex C for the RESD Flow Chart.

In addition to StatCan, there are provincial and territorial statistical offices that collect a variety of local data for their own research, statistical and information purposes. Data sharing agreements exist between various federal, provincial and territorial statistical agencies to allow multiple jurisdictions to benefit through improved efficiency, reduced costs and a reduction in the burden to their respondents. These agencies often provide descriptive summaries to help users understand the data.

Regulatory Agencies

Regulatory agencies produce primary data related to their regulatory activities, which are often specific to their core mandate such as the regulation of oil and gas production, overseeing of electricity supply, or energy exports. In addition, such regulatory bodies may publish analytical reports that support their regulatory activities. These could include resource assessments, supply-demand analyses, and market outlooks. The NEB is an example of a federal regulatory body that undertakes such work. The NEB is mandated to regulate international and interprovincial aspects of the oil, gas and electricity industries. In support of its core mandate, the NEB compiles data based on company reports that it collects. In particular, the Board publishes statistics on exports of crude oil and petroleum products, natural gas, natural gas liquids (NGLs) and electricity. The NEB also publishes studies on the energy market and a comprehensive market outlook on Canadian energy supply and demand.

Most provinces and territories also have energy regulating bodies with specific mandates and responsibilities for their jurisdictions. For instance, in Alberta, the AER has the mandate to report on and monitor the province's energy resource development. The AER produces an annual report which highlights the reserves, production, consumption and disposition of energy commodities. Some other examples of regulatory bodies are:

- Alberta Utilities Commission
- British Columbia Oil and Gas Commission
- Canadian Nuclear Safety Commission
- New Brunswick Energy and Utilities
- OEB, Canada-Newfoundland and Labrador Offshore Petroleum Board

Other Government Departments

There are other government departments at the federal, provincial and territorial levels which collect and disseminate energy-related data to serve their own mandates. The information generated by these departments is the result of data collection initiatives or the product of internal modelling and forecasting exercises. These departments interpret and organize data to support the development, implementation and evaluation of policies, regulations, projects and programs. Departments also provide information to meet the needs of the general public.

The Office of Energy Efficiency (OEE) at NRCan, for example, is responsible for the National Energy Use Database, which is a comprehensive source of data on energy consumption and efficiency at the end-use level in Canada. The OEE also publishes Energy Efficiency Trends in Canada and the Energy Use Data Handbook. These data help guide public decision making when it comes to choosing a fuel efficient vehicle, ENERGY STAR appliance, or other qualified products and equipment.

EC is responsible for developing, compiling, and reporting on Canada's greenhouse gas (GHG) inventory on an annual basis, with input from numerous experts and scientists across Canada. The inventory reports on emissions and removals for six sectors, including the energy sector.

Alberta publically reports the oil sands' share in global oil consumption - based on data from the AER and the International Energy Agency (IEA) - to demonstrate the effectiveness of its royalty regime.

Other Sources of Energy Information

There is a wide range of other institutions involved in the production of various products such as analytical reports related to energy issues in Canada. These institutions range from non governmental institutions to private sector organizations and associations. Products range from policy discussion papers to specific market analyses for Canada. Federal and provincial government officials rely extensively on a number of daily, weekly, monthly, quarterly and annual reports produced by these groups.

In addition, there are a number of important foreign and international organizations that also provide valuable energy information. For example, the IEA collects, processes, and publishes data and information on energy. The US Energy Information Administration (EIA), a statistical and analytical agency within the US Department of Energy, collects, analyzes, and disseminates independent information on regional and global energy trends, including country profiles. The EIA's work includes weekly status reports on specific commodities and markets, monthly reports on market trends, as well as an annual review and an annual outlook. Both the IEA and the EIA provide energy information on Canada.

1.4 The Importance of Energy Statistics in Canada

Energy statistics are widely used by government, industry, academics and others. High quality data provide the foundation for evidence based policy and regulatory decisions; for industrial stakeholders in energy and other sectors to make timely and effective investment and business decisions; for the general public to be better positioned to make energy use decisions and to engage in policy debates; and for non governmental organisations to better inform the public dialogue on energy.

Supporting Government Priorities

Energy is a priority for governments across Canada. It is a major driver of the Canadian economy and is central to addressing GHG emissions. Central to government commitments for science and evidence based, informed decision-making is the availability of credible, reliable and comprehensive data. Energy statistics make important, though often understated, contributions to the development of:

- Federal and provincial legislation and regulation, such as through statistics on energy production and transportation to inform recent changes to marine and pipeline safety regimes, polluter pay legislation, regulations to reduce GHG emissions at the federal level, and changes to provincial royalty and tax regimes;
- Policy, through information and analysis on Canada's energy situation and the contribution of the energy sector to the Canadian economy, and informing the provision of advice on Canadian positions for international affairs;
- Programs, through statistics on energy use and associated emissions to inform the development and implementation of investments by the Government of Canada to support green infrastructure, energy efficiency, clean energy technologies and the production of cleaner energy and fuels.

Meeting International Reporting Obligations

As a global energy leader, it is important for Canada to meet international standards for energy data reporting. Canada has made commitments to submit energy data to a number of international organizations on Canada's production, trade, stocks, domestic use and prices for all energy forms:

- Canada, as a member of the IEA, provides responses to monthly, quarterly and annual questionnaires. This reporting supports IEA products such as the monthly Oil Market Report and the annual World Energy Outlook.
- Data are supplied to, or shared by the IEA with organisations such as the Asia-Pacific Economic Cooperation (APEC), the International Energy Forum (IEF), and the United Nations Statistics Division (UNSD).
- Canada is also one of over 90 countries participating in the Joint Organizations Data Initiative (JODI), as part of an international effort to contribute to market transparency and stability. Launched in 2001, JODI is managed by six international organisations, including the IEA and APEC, and coordinated by the IEF. Initial efforts focused on oil with data on oil market supply and demand collected and disseminated on a monthly basis.
- The success of JODI Oil and the need for market transparency in the natural gas market led to the launch of JODI Gas in 2012, with the official release of the JODI Gas Database in May 2014.

In addition, complementary energy data is reported internationally on subjects such as GHG emissions and criteria air pollutant inventories through several initiatives, such as the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Economic Commission for Europe (UNECE).

Informing Canadians

Energy statistics are important for ensuring that Canadians are well-informed, particularly given the level of public attention around energy and environmental matters. In its 2012 report *Now or Never: Canada Must Act Urgently to Seize its Place in the New Energy World Order*, the Standing Senate Committee on Energy, the Environment and Natural Resources identified that increasing the energy awareness of Canadians was essential. In the same year, energy information and awareness was identified as a priority action area in a report on energy information in Canada prepared for the Energy and Mines Ministers' Conference (EMMC). In the 2013 report, *Capturing the Opportunity*, the EMMC identified resource literacy as one of nine priority areas for collaborative action between federal, provincial and territorial governments in Canada.

Access to timely and high quality energy data is critical to support public dialogue and help Canadians make informed choices in:

- Improving efficiency in energy use;
- Responsible development of Canada's energy resources, safe transportation of energy products, and the social licence to operate;
- Adoption of new and innovative energy technologies for homes and businesses; and
- Reducing GHG emissions.

1.5 The Foundation for an Effective Energy Statistics System

An effective energy statistics system requires the existence of a strong legal framework complemented by appropriate institutional arrangements between all relevant government agencies. The legal framework is a set of laws and regulations that specify the rights and responsibilities of organizations that collect, produce, disseminate or use statistics or statistical outputs.

In Canada, the *Statistics Act* gives StatCan the authority to:

- Collect, compile, analyse, abstract and publish statistical information;
- Collaborate with departments of government in the collection, compilation and publication of statistical information;
- Take the census of the population and the census of agriculture in Canada;
- Promote the avoidance of duplication in the information collected; and,
- Promote and develop integrated social and economic statistics, and coordinate plans for the integration of those statistics.

Through the Act, StatCan has access to records held by governments in Canada and, in certain cases, can compel businesses and individuals to respond. The Act also requires that collected information be published while guaranteeing the confidentiality of individually identifiable information. The legislation makes a formal commitment to respondents that the information StatCan provides will not be released to anyone in a form that will identify the respondent without their authorization.

Institutional arrangements are also important to complement the legal framework. Such arrangements allow for the collection, compilation, standardization and integration of information scattered among different entities. Institutional arrangements also promote harmonization of the applied concepts and methods with international standards and recommendations in order to enable collection of data necessary for the systematic production of high quality and internationally comparable official energy statistics. These arrangements also enable more streamlined, cost effective and efficient data collection through the avoidance of duplicative efforts, the sharing of good practices, and reduced response burdens on data respondents. A key element of institutional arrangements is the establishment of clear, efficient and sustainable governance. Effective institutional arrangements are usually characterized by a clear definition of the rights and responsibilities of all agencies involved in data collection and compilation and the establishment of formalized working arrangements between agencies.

1.6 Strengthening Canada's Energy Statistics System

Canada has a mature, comprehensive and effective energy statistics system which has, in general, been serving the requirements of energy data users well. However, with new developments in the energy sector, changing dynamics of the global market and rising demand for data, Canada's statistics system has been facing increasing challenges in meeting the needs of data users, in terms of timeliness, consistency, and coverage (see Annex D).

A number of initiatives have been launched in recent years which have consistently identified that improvements in Canada's energy statistics system are needed:

- A national energy statistics workshop organized by NRCan (2007);
- A "Blue Sky" report prepared by the ESP at StatCan (2008);
- Standing Senate Committee on Energy, the Environment and Natural Resources (2012);
- Energy and Mines Ministers' Conference (EMMC), (2012); and,
- A content review of the energy statistics surveys conducted by the ESP at StatCan (2012/13).

There have been a number of ongoing challenges for the improvement in quality, scope and relevance of Canada's energy statistics. The continually evolving nature of the energy sector; the diverse array of administrative, statistical and regulatory bodies across Canada; and the wide range of user needs to be met are just a few of them. Adding to these chronic obstacles are new challenges arising from the dynamic development in Canada's energy sector and in the global energy market.

It is important for data collection to keep pace with changes in the energy sector, especially in order to better understand and assess emerging issues and innovative technologies and approaches. A balance between the efficient use of resources and collecting what is necessary must be struck, recognising that what is necessary will depend on the needs of data users, that not all needs will be possible to meet, and that a lack of quality data could ultimately be far more costly than data collection and associated activities.

A Statistical Framework for Energy in Canada outlines a comprehensive and efficient approach to collecting, processing and disseminating energy and related statistics in Canada.

Chapter 2. Statistical Framework for Energy in Canada

2.1 Introduction

The framework encompasses three domains:

1) Energy statistics:

Energy Statistics are volumetric measures of energy supply and demand and the energy balances. The International Recommendations for Energy Statistics (IRES) lays out the framework for these data. Statistics Canada provides energy balances through its Report on Energy Supply and Demand in Canada (RESD). These data are obtained through a combination of energy surveys as well as administrative data provided by the National Energy Board or the provincial and territorial government departments. Natural Resources Canada also provides important information on the efficiency of energy consumption.

2) Economic statistics and accounts:

Economic Statistics can measure the effects that the energy sector has on the national economy. The Systems of National Accounts (SNA) framework has been adopted as the guideline for economic variables which pertain to this sector. The Industry Accounts Division at Statistics Canada provides the Gross Domestic Product for Canada and the National Economic Accounts Division provides information such as the Income and Expenditure Accounts, Provincial and Territorial Economic Accounts. Other federal and provincial/territorial government departments also provide economic variables pertaining to the energy sector.

3) Environmental statistics and accounts:

Environmental statistics can measure the effects of energy on the environment, while the more formalised presentations in the environmental accounts are used for linking those data to the System of National Accounts. The System of Environmental-Economic Accounting (SEEA) has recently been adopted as an international statistical standard by the United Nations to guide the inclusion of environmental data into the national accounting framework. StatCan currently produces physical flow accounts (energy, water, and GHG emissions), asset accounts (monetary and physical for selected energy, mineral, and biotic resources), and activity measures (environmental protection expenditures) following the SEEA guidelines. Environment Canada provides estimates of environmental contaminants resulting from the activities of the energy sector that could also be incorporated into this system.

An energy statistical framework is a basic organizing structure for energy statistics, providing guidance on the boundaries, concepts and methods for the collection, processing and dissemination of energy statistics. It supports comparability of energy statistics within the energy sector, across sectors, and across data sources and time. It also facilitates data comparability at the sub-national, national and international levels. Uniformity in international reporting of energy data is required for dealing with global challenges such as sustainable development, energy security or climate change. At the same time, it treats official energy statistics as a public good, ensuring that the public has convenient access to these statistics.

A statistical framework for energy is critical for the long-term planning and delivery of quality energy data in Canada. This framework is intended to:

- serve as a foundation for the establishment, maintenance and improvement of the energy statistical system in Canada;
- facilitate communication between data providers, data compilers, and major data users;
- support the identification and prioritization of data gaps and deficiencies in the current ESP; and
- guide the formulation of strategies to improve Canada's energy statistical system.

The statistical framework is organized around three major conceptual themes: Energy Products, Flows and Balances; Energy Industries; and Energy Consumers and Energy Use. In developing the framework, significant efforts have been made to define the scope, boundaries and categories of what is to be measured. The framework also deals with data sources, classifications, data compilation methods and data dissemination. Key concepts, definitions and links to other relevant conceptual and statistical frameworks are identified for energy-related data which fall under the SNA or the SEEA - Energy frameworks.

The IRES is the key reference document used to develop the Statistical Framework for Energy in Canada (SFEC). The IRES was developed by the Oslo Group on Energy Statistics and the Inter-Secretariat Working Group on Energy Statistics, and was adopted by the United Nations Statistical Commission in February 2011. Canada is an active participant in the Oslo and Inter-Secretariat groups. The IRES provides a common, yet flexible, framework for the collection, treatment and dissemination of volumetric energy statistics. It is intended to strengthen energy statistics and make them consistent with the economic and environmental statistics and frameworks.

A quality framework describes what an ideal statistics system should look like, or what characteristics an effective statistics system should have, in terms of data quality. The OECD *Quality Framework and Guidelines for OECD Statistical Activities* is identified as the quality framework which would accompany the implementation of this conceptual framework for energy statistics (see Annex A).

QUALITY FRAMEWORK

7 dimensions of quality:

- Relevance
- Accuracy
- Credibility
- Timeliness
- Accessibility
- Interpretability
- Coherence

2.1.1 Scope of the Statistical Framework for Energy in Canada (SFEC)

Energy is the capacity of a physical system to do work. While energy exists in different forms - such as light, heat and motion - energy can be classified into two categories: potential (e.g., energy “stored” in matter) and kinetic (energy of motion). Examples of potential energy include water stored in a reservoir above sea level, nuclear energy, and chemical energy. Examples of kinetic energy include wind and falling water. When the potential energy of water in a reservoir is released, it becomes kinetic energy which can be captured in a turbine and converted into electricity using a generator.

Not all energy is subject to statistical observation. Energy that exists in nature and does not have a direct impact on society is not measured or monitored. The scope of energy statistics is defined in terms of reference territory, energy products, energy flows, energy industries, energy consumers, energy resources and reserves.

The reference territory for Canada’s energy statistics is defined as the geographic territory under the effective economic control of the Canadian government, comprising the land area, airspace, territorial waters, and islands that are subject to Canadian jurisdiction. The national territory includes any free trade zones, bonded warehouses or factories operated by enterprises under customs control within the areas described above.

The Canadian energy statistical system will provide information on energy markets and industries within the Canadian national geographic boundaries, by both Canadian and foreign businesses or residents. It will also cover energy that enters or leaves Canada. The framework does not include information for energy transactions that occur outside of Canada regardless of whether a Canadian business or citizen is involved. This is different from the SNA and SEEA which are based on the residential principle, rather than the territory principle. Annex E shows the different reference territories.

The IRES promotes a multipurpose nature of energy statistics. It emphasises the idea of an energy data warehouse as an efficient way of meeting the data needs of energy policy makers and energy analysts, as well as more generally for the economic and environmental accounts. Such an energy data warehouse may store and provide convenient access to data on energy stocks and flows, as well as selected statistics on energy producers and users (e.g., on energy infrastructure, employment and capital formation), selected data about the energy market (e.g., energy prices), statistics on energy resources and reserves, etc.

2.1.2 Linkages to Other Statistical Frameworks

The IRES and the SEEA-Energy use virtually identical notions and classifications of energy products as set out in the Standard International Energy Product Classification (SIEC). This same classification system for energy products – SIEC - is adopted in the SFEC. However, in the SEEA-Energy and the SNA, the monetary estimates for energy products are in accordance with the Central Product Classification (CPC). CPC and the Harmonized Commodity Description and Coding System (HS) are extensively used throughout economic statistics.

Concordance between SIEC and other international product classifications, such as the Harmonized Commodity Description and Coding System (HS) and the Central Product Classification (CPC) are important. The SIEC–CPC and SIEC–HS concordances facilitate the integration of data based on different classification systems and energy

statistics with other economic statistics. The concordance with the HS is particularly useful as all international transactions in energy products are defined in terms of HS. The CPC aggregates the HS headings into product groupings which are of particular interest for economic statistics and for various users. The HS and CPC categories are often broader in scope and may contain more elements than the corresponding SIEC category.

There are three main differences between energy statistics and the SEEA-Energy that need to be taken into account. First, the reference territory for basic energy statistics is the national territory and data collected from all the economic units physically located on the territory (territory principle). The reference territory for the SEEA-Energy covers all economic units that are residents of a particular national economy – independent of where they are located (residential principle). This difference in principles leads to differences in the way certain statistics are recorded, such as energy imports, exports, and consumption.

Second, there are differences in the definition of certain energy flows and stocks between the frameworks. The term "supply" in the IRES is defined as primary production, plus imports of primary and secondary energy, minus exports of primary and secondary energy[2], minus international bunkers, minus stock changes; while the term "supply" in the SNA and SEEA-Energy is defined as production (output), plus imports. Therefore, the concept of supply is broader in the SEEA-Energy than in basic energy statistics. Accordingly, the concept of energy "use" in the SNA and the SEEA-Energy covers all final uses, including exports and inventory changes. The term "final consumption" in the IRES excludes the use of energy products in the energy industries and by other energy producers as input into transformation and energy industry own use. The term "final consumption" is not used in the SEEA-Energy to avoid confusion. Instead, the term "end use" is introduced to denote the concept of energy use, excluding the use for the transformation process. In addition, in basic energy statistics, an item titled "statistical difference" is included to capture the differences between supply and demand, while no such items are in SEEA-Energy.

Third, in certain cases, data are presented differently between energy balances and energy accounts. In energy accounts, data presentation strictly follows the International Standard Industrial Classification of all Economic Activities (ISIC); information on any specific enterprise/establishment is presented under the ISIC division/class of the principal activity of the unit, while the same principle is not always followed in energy balances. A typical example is use of energy for transportation. In energy accounts, energy use for transport, as well as for other use, are presented for each ISIC class, while in energy balances, a total aggregate for "transport" is introduced, showing the total energy use for transport purposes by all economic activities, not by individual ISIC industries.

To account for these differences, data from energy statistics need to be adjusted in order to generate energy accounts. Data on imports and exports should be adjusted by relating them to transactions between resident and non-resident units independently of the location where transactions take place. Adjustments should also be made to data on energy use. For resident units in the national territory, energy use needs to be disaggregated into intermediate and final consumption. For non-residents, energy use should be recorded as exports. Data on energy use for residents abroad should be incorporated. Similar changes should also be made to international marine bunkering.

2. See Annex M for Types of Energy

The System of National Account (SNA) is the internationally agreed-upon standard set of recommendations on how to compile measures of economic activity, including the concepts, classifications, and accounting rules, and organizes a wide range of economic data into a structured set of accounts. It also provides an overarching framework for standards in other domains of economic statistics, including energy flows and balances, facilitating the integration of these statistical systems to achieve consistency with the national accounts. Consequently, the national accounts are some of the building blocks of macroeconomic statistics forming the basis for economic analysis and policy formulation, including analysis on the importance of the energy industries to the overall national economy.

The System of Environmental-Economic Accounting (SEEA) serves as the international statistical standard for environmental-economic accounting, adopted by the United Nations Statistics Commission in 2012. It is a framework for the compilation of statistics linking environmental data and economic data. The SEEA has its roots in and is an extension of the SNA. It adopts the same definition, guidelines, industrial and commodity classification systems, and practical approaches of the SNA. It extends the SNA by recording environmental data that are usually in volumetric terms in conjunction with the economic data in monetary terms from the SNA. The power of the SEEA comes from its capacity to present information in both physical and monetary terms in a coherent manner.

The SEEA-Energy is a subsystem of the SEEA, or more broadly, a satellite account of the System of National Accounts 2008 (SNA 2008). It is a multi-disciplinary, multi-purpose, conceptual framework for organizing energy-related statistical information. The SEEA-Energy follows the principles and structures set out in the SEEA, and the SNA is the primary basis for the concepts, definitions and accounting rules embodied in these frameworks. One of the roles the SEEA-Energy plays is the integration of environmental and economic information for energy. The SEEA-Energy supports analyses of the role of energy in the economy and of the relationship between energy-related activities and the environment.

Energy data produced according to the IRES are a key input to SEEA-Energy. Where a country has produced energy statistics and balances according to the IRES, the compilation of SEEA – Energy tables and accounts becomes an extension to the existing body of official energy statistics.

The SEEA-Energy framework consists of four main modules. (1) The physical asset accounts presenting the opening and closing stocks of energy resources such as oil, natural gas, coal and uranium. (2) The monetary asset accounts providing values of the physical stocks and their changes, based on market values or values estimated using net present value. (3) The physical flow accounts describing energy flows in the form of supply and use tables for natural inputs (e.g. natural gas), products (e.g. gasoline), and residuals (e.g. carbon dioxide (CO2) emissions). (4) Monetary and hybrid flow and related accounts showing the value of domestic production and imports, as well as taxes, subsidies, and trade and transport margins. SEEA energy also brings in the concept of resource depletion as a cost against income earned from extraction activities as well as a reduction in the value of resources.

The SNA and SEEA-Energy

The relationship between SEEA-Energy and the SNA is fundamental. The SEEA is, in general, consistent with the SNA, as it applies the same geographic scope, accounting concepts, structures, rules and principles of the SNA to environmental information, allowing for the integration of environmental information with economic information. However, there are some limited differences between the SEEA and the SNA, due mainly to the specific analytical focus of the SEEA: the environment and its linkages with the economy, and the measurement of stocks and flows in physical and monetary terms.

While the asset boundaries in the SEEA-Energy and SNA are the same in monetary terms, assets in SEEA-Energy are defined more broadly than in the SNA in physical terms; while SNA recognizes natural resources that have economic value as assets only. SEEA-Energy includes all known deposits, even parts of resources that have no present economic value. Similarly, the scope of the physical flows compared to monetary flows is somewhat broader. In addition, the depletion of resources is incorporated in SEEA-Energy as a cost against the income earned from the extraction of natural energy resources in addition to being a reduction in the value of these resources.

2.2 Energy Products, Flows and Balances

2.2.1 Products

The term "products," as is understood in economic statistics, refers to goods and services that are the result of a production process. Energy products are a subset of products that are exclusively or mainly used as a source of energy. They include energy in forms suitable for direct use and products which release energy while undergoing some chemical or other process (combustion, nuclear fission, etc.). By convention, energy products also include biomass and waste (solid or liquid) that are combusted for the production of electricity and/or heat.

Energy products can be obtained from both renewable (solar, biomass, wind, etc.) and non-renewable sources (coal, crude oil, natural gas, etc.). It is important to distinguish between renewable and non-renewable energy products, as well as to distinguish "infinite" renewable sources such as solar from cyclical renewable sources such as biomass. Since a number of energy products are transformed into other kinds of energy products prior to their consumption, a distinction is made between primary and secondary energy products. This distinction is necessary for various analytical purposes, including for avoiding the double counting of energy production in the energy balances. Crude oil, natural gas, coal, wind, and hydro are examples of primary energy products; while refined petroleum products and biofuels are examples of secondary energy products.

Volumetric data on energy products are mainly collected and/or compiled under the Energy Statistical Program at StatCan, and include the production, imports, exports, transmission, transformation, domestic use and stocks for energy products. They compose the bulk of Canada's energy data and serve as the most important foundation for the rest of the energy statistical system. Energy product statistics are also necessary for the compilation of some components of the SNA and for the construction of energy accounts in the SEEA-Energy.

To ensure inter-temporal and cross-country comparability of energy statistics, as well as their comparability with other statistics, the IRES recommends that the definitions, classifications and boundaries of energy products be internationally consistent in order to serve as basic tools or building blocks for energy statistics at both national and international levels.

2.2.2 Standard International Energy Product Classification (SIEC)

Purpose and Scope

The main purpose of the SIEC is to serve as a basis for developing or revising the existing national classification schemes for energy products in order to improve compatibility. It is designed to support the collection, compilation and dissemination of energy data by providing an internationally agreed upon set of definitions for energy products and a hierarchical coding system to ensure international comparability and to facilitate the linkage of data on energy stocks and flows with data on international trade and other economic statistics.

The SIEC aims to cover all products necessary to provide a comprehensive picture of the production, transformation and consumption of energy throughout an economy. Thus the scope of energy products as defined in the SIEC covers the following[3]:

- Fuels[4] that are produced/generated by an economic unit (including households), and are used or might be used as sources of energy, which are further defined as covering:
  a. All fossil fuels[5], whether or not they are used for energy purposes;
  b. Products derived from fossil fuels when they are used (or intended to be used) as fuels;
  c. Products derived from fossil fuels that are used (or intended to be used) for non-energy purposes, but are the output of energy industries (refineries, gas plants, coal mining, and coal manufacturing industries).[6]

3. The SIEC definition of energy products does not cover underground deposits of energy resources, i.e. "non-renewable energy resources of both inorganic and organic origin discovered in the earth's crust in solid, liquid and gaseous form."
4. The term "fuel" refers to energy sources, whether primary or secondary, that must be subjected to combustion or fission in order to release and use the energy stored up in them.
5. For the purposes of discussion on scope of SIEC, fossil fuels refer to coal, peat, oil and natural gas, even though the inclusion of peat in fossil fuels is not universally accepted.
6. They are included because they explain how much an apparent supply of energy is used for other purposes and allow for a complete assessment of the industries involved. One example is lubricants produced during the refinery of crude oil. Even though they are ordinarily used for non-energy purposes, their production (and consumption) is recorded in energy statistics as this allows for the monitoring of the different products obtained from the refinery intake of crude oil and the assessment of the part of crude oil used for non-energy purposes. On the other hand, plastics, even if derived from a fossil fuel such as crude oil, are not considered within the scope of SIEC, as they are not an output of the refinery but are obtained by further processing of refinery products by other industries.

- Electricity that is generated by an economic unit (including households) and heat that is generated and sold to third parties by an economic unit.

Some fuels such as waste, agricultural crops or other biomass are not of fossil origin. Such products are within the scope of the SIEC only when used for energy purposes. Thus, the inclusion of them in total energy production depends on their use.

Classification and Coding System

The categories of SIEC are designed to be exhaustive and mutually exclusive so that any product within the general scope belongs to one and only one SIEC category for any given application. At the highest level, SIEC provides ten sections for different fuels, electricity and heat. The eight fuel categories represent broad fuel types distinguished by their origin and characteristics. These ten sections are:

- Coal,
- Peat and peat products,
- Oil shale/oil sands,
- Natural gas,
- Oil,
- Biofuels,
- Waste,
- Nuclear fuels, and
- Other fuels.

Where applicable, these fuel categories are further disaggregated by physical characteristics (e.g. brown coal vs. hard coal) and stage of processing. For some of the fuel categories, reference to the use is made since the specifications of the product make it fit for certain uses. Some products in the SIEC, although physically similar, may be considered different products due to a different origin or intended use. The top-level categories representing electricity and heat are not further disaggregated in the classification, as these products are not physical substances that can be easily distinguished by origin, composition or intended purpose.

The hierarchy of SIEC consists of four levels, which are referred to as sections (the first level), divisions (the second level), groups (the third level), and classes (the fourth level). The coding system consists of a four-digit numerical code, where the first digit refers to the section, the first two digits to the division, and so on. Thus, all four digits, taken together, designate a particular class of the classification. The hierarchy groups base categories into higher-level aggregations to provide a set of levels suitable for various needs for statistical information.

The distinctions between primary and secondary energy products, as well as between renewable and non-renewable energy products are not explicit classification and coding criteria in SIEC, although in many cases a complete detailed SIEC category can clearly be assigned to one set or another. The list of energy products at the division level are categorized as primary or secondary and renewable or non-renewable. This is presented in Annex F.

The hierarchy of the SIEC coding system at the class level, together with the correspondences with the HS, NAPCS and CPC coding systems, as well as the cross-classification of primary or secondary and renewable or non-renewable products are presented in Annex G.

2.2.3 Energy Flows

In the context of basic energy statistics and energy balances, the term “energy flow” refers to the production, import, export, bunkering, stock changes, transformation, energy use by energy industries, losses during transformation, and final consumption of energy products within Canada.

The first appearance of an energy product in Canada’s energy flow is either through its production or importation. Whereas some energy products may be used directly in the form they were captured, many energy products undergo some form of transformation before final consumption. This is the case, for example, with the processing of crude oil in petroleum refineries, where the oil is transformed into a range of products which are useful for a variety of purposes.

Once produced and/or transformed, energy products can be: (a) exported to other territories; (b) stored for later use; (c) used for refuelling ships and airplanes engaged in international voyages (international bunkering); (d) used by the energy industries themselves; and/or (e) delivered for final consumption.

The final consumption of energy products consists of: (a) final energy consumption, or deliveries of energy products to users located in the territory of reference for their energy needs such as heating, transportation and electricity; and (b) non-energy use, or deliveries of energy products for use as chemical feedstocks or for use as raw materials. Final energy consumption is further disaggregated according to the type of economic activities and the type of transportation activities.

Production

Production is defined as the capture, extraction or manufacture of fuels or energy in forms which are ready for general use. In energy statistics, there are two distinct types of production: primary and secondary.

Primary production is the capture or extraction of fuels or energy from natural energy flows, which include the biosphere and natural reserves of fossil fuels within the national territory in a form suitable for use. Inert matter removed from the extracted fuels and quantities re-injected, flared or vented are not included in primary production. The resulting products are referred to as “primary” products.

Secondary production is the manufacture of energy products through the process of transformation of primary fuels or energy. The quantities of secondary fuels reported as production include quantities lost through venting and flaring during and after production. In this manner, the mass, energy and carbon within the primary source(s) from which the fuels are manufactured may be balanced against the secondary fuels produced. Fuels, electricity and heat produced are usually sold but may be partly or entirely consumed by the producer.

Imports

Imports of energy products comprise all fuel and other energy products entering the national territory. Goods simply being transported through a country (goods in transit) and goods temporarily admitted are excluded; but re-imports, which are domestic goods exported and subsequently readmitted are included. The bunkering of fuel outside the reference territory by national merchant ships and civil aircraft engaged in international travel should be excluded from imports, but classified as “International Marine” or “Aviation Bunkers”, respectively, in the country where such bunkering is carried out. Note that the “country of origin” of energy products should be recorded as a country from which goods were imported.

Exports

Exports of energy products comprise all fuel and other energy products leaving the national territory, excluding quantities of fuels delivered for use by merchant (including passenger) ships and civil aircraft of all nationalities during international transport of goods and passengers. Goods simply being transported through a country (goods in transit) and goods temporarily withdrawn are excluded but re-exports, foreign goods exported that were previously imported, are included. Fuels delivered to foreign merchant ships and civil aircraft engaged in international travel are classified as “International Marine” or “Aviation Bunkers”, respectively. Note that the “country of destination” of energy products (that is, the country of the last known destination as it is known at the time of exportation) should be recorded as a country to which these products are exported to.

It should also be noted that the definitions of imports and exports used in energy statistics are those adopted by international merchandise trade statistics for a system of recording known as the “general trade system”, which stipulates that all energy products entering and leaving the national territory of a country and add to or subtract from the stock of material resources of a country are recorded as energy imports and exports except for the bunkering of international fleet which is excluded from the trade figures. In the energy balances, imports and exports exclude nuclear fuels as these are not within the scope of energy balances.

International Marine Bunkers

International Marine Bunkers are quantities of fuels delivered to merchant (including passenger ships) of any nationality for consumption during international voyages transporting goods or passengers. International voyages take place when the ports of departure and arrival are in different national territories. Fuels delivered for consumption

by ships during domestic transportation, fishing or military uses are not included here. For the purposes of energy statistics, International Marine Bunkers are not included in exports.

International Aviation Bunkers

International Aviation Bunkers are quantities of fuels delivered to civil aircraft of any nationality for consumption during international flights transporting goods or passengers. International flights take place when the ports of departure and arrival are in different national territories. Fuels delivered for consumption by aircraft undertaking domestic or military flights are not included here. For the purposes of energy statistics International Aviation Bunkers are not included in exports.

Stock Changes

Stocks are quantities of energy products that can be held and used to: (a) maintain service under conditions where supply and demand are variable in their timing or amount due to normal market fluctuations, or (b) supplement supply in the case of a supply disruption. Stocks used to manage a supply disruption may be called ”strategic” or “emergency” stocks and are often held separately from stocks designed to meet normal market fluctuations. Stock changes are defined as an increase (stock build) or decrease (stock draw) in the quantity of stock over the reporting period. They are calculated as the difference between closing and opening stocks.

Transfers

Transfers are essentially statistical devices used to overcome practical classification and presentation issues resulting from changes in use or identity of a product. Transfers comprise product transferred and inter-product transfers. *Product transferred* refers to the reclassification of products that is necessary when finished oil products are used as feedstock in refineries. *Inter-product transfers* refer to the movements of fuels between product categories because of the reclassification of a product which no longer meets its original specification. The transferred product is often blended with its host.

Transformation

Transformation is the process wherein part or all of the energy content of a product changes into one or more different products (e.g., crude oil to petroleum products, and heavy fuel oil to electricity).

Losses

Losses occur during the transmission, distribution and transport of fuels, heat and electricity. Losses also include venting and flaring of manufactured gases, losses of geothermal heat after production and pilferage of fuels or electricity. Production of secondary gases includes quantities subsequently vented or flared. This ensures balance between the use of the primary fuels from which the gases are derived and the production of the gases.

Energy Industries Own Use

Energy Industries Own Use refers to consumption of fuels and energy for the direct support of the production and preparation for use of fuels and energy. Quantities of fuels that are transformed into other fuels or energy are not included here but within transformation. Neither are quantities which are used within parts of the energy industry not directly involved in energy production. These quantities are reported within final consumption.

Non-Energy Use

Non-Energy Use comprises fuels for chemical feed stocks and non-energy products. Chemical feedstocks are fuels used as raw materials for the manufacture of products which contain the hydrogen and/or carbon taken from the fuel. Non-energy products are fuel products used mainly for their physical and chemical properties. Examples are lubricants, paraffin waxes and coal tars and oils used as timber preservatives.

Final Consumption

Final Consumption refers to all fuel and energy that is delivered to users for both their energy and non-energy uses, not including the transformation process.

2.2.4 Energy Balances

An energy balance and its purpose

An overall energy balance is an accounting framework for compilation and reconciliation of data on all energy products entering, exiting and used within the national territory during a reference period. Such a balance expresses all forms of energy in a common accounting unit - be it the Joule, tons of oil equivalent, or other physical measurements - and shows the relationship between the inputs to and the outputs from the energy transformation processes.

The energy balance is a multipurpose tool used to provide comprehensive and reconciled data on energy situations. It also helps to understand the energy security situation and the functioning of energy markets, and to formulate energy policies. In addition, the energy balance serves as a quality assurance tool to ensure completeness, consistency and comparability of basic statistics. This multipurpose nature can be further enhanced by the development of supplementary tables of additional information on particular issues that are not explicitly reflected in the balance itself.

Energy balances can be presented in detailed and/or aggregated formats, depending on the policy concern, data and resource availability, and the underlying classifications used. The IRES recommends that countries collect data at the level of detail that allows for the compilation of a detailed energy balance, as presented in Annex I. When such level of detail is not available or practical, it is recommended that countries at minimum follow the template of the aggregate energy balance presented in Annex J.

The scope

The scope of an energy balance is determined by the territory as well as product and flow boundaries as they are defined in the IRES. The product and flow boundaries are fixed in the short term, but may expand as technology advances and new sources of energy become available. The scope of an energy balance does not include passive energy (such as the heat gain of buildings and solar energy falling on the land to grow crops), deposits of energy resources and reserves and extraction of any materials not covered in primary energy production, nor waste and biomass used for non-energy purposes. Annex J provides the scope of energy products in Canada's current energy balance.

The structure

An energy balance is a matrix showing the relationship between energy products (represented in columns) and flows (represented in rows). While the structure of an energy balance depends on the country's energy production and consumption patterns and the level of detail required, the IRES recommends that certain common approaches be followed to ensure international comparability and consistency.

Columns The cells of a column show the contribution of a given energy product to specific flows. Different columns (except "Total") represent various energy products which might be grouped and sequenced in a way to add to the analytical value of the balance. The number of columns depends on whether the balance is intended for use as the source of the most detailed data or is prepared for general dissemination.

Rows One of the main purposes of an energy balance is to reflect the relationships between the primary production of energy (and other energy flows entering/exiting national territory), transformation and final consumption. The number of rows and their sequencing in a balance are intended to make those relationships clear while keeping the balance compact, especially when presented in an aggregated format.

Sequencing of rows. An energy balance should contain three main blocks of rows.

The top block — energy supply – is intended to show flows representing energy entering the national territory for the first time, energy removed from the national territory and stock changes. Energy supply within the national territory during the reference period is calculated as:

Total energy supply =
+ Primary energy production
+ Import of primary and secondary energy
-Export of primary and secondary energy
-International (aviation and marine) bunkers
-Stock changes

The middle block — The main purpose of the middle block is to show transfers, energy transformation, energy industry own use and losses. It is recommended that countries show in their balances, to the extent possible and as applicable, energy transformation by plant category.

The bottom block — final consumption - covers flows that reflect energy consumption by energy consumers, as well as non-energy use of energy products. The final consumption is measured by the deliveries of energy products to all consumers, excluding deliveries for use in transformation and use for energy needs by the energy industries (both covered in the middle block). It is further recommended that energy consumers be grouped into three main categories: manufacturing, construction and non-fuel mining industries; transport; and other.

Statistical difference — In the energy balance, a separate row is reserved for a statistical difference that shows the difference between the total supply and the total use. It arises from various practical limitations and problems related to data collection. However, when statistical differences are abnormally large, the reasons should be examined.

2.2.5 The Overall Scope of Energy Commodity Statistics

This section presents the scope of energy commodity data that should be collected in an energy statistics system. It provides a reference list of all generally desirable data items for compilation and dissemination of energy market statistics, aiming to satisfy the basic needs of energy policy makers, the business community and the general public, and to ensure the international comparability of such statistics. The list consists of four parts: energy flows and stocks, energy balance, energy production and storage capacity, and reserves of underground resources.

Energy flows and stocks

Data on energy flows and stocks relate to statistics in physical units on energy flows such as production, conversion and consumption as well as on stock levels of different energy products. Such data are designed to produce consistent time-series which show both the current situation and changes in the supply and demand over time for various energy products. They also provide the basis for making comparisons and analysing the interrelationships between various energy products. When expressed in common units, such data make possible the regular monitoring of national energy patterns and the preparation of energy balances.

Data on energy flows and stocks can be classified into two sub-categories: data items common for all energy products and those applicable to specific energy products. A list of flows and stocks common to all energy products are presented as follows:

Energy Flows and Stocks Data Common for All Energy Products

Item number	Flows / Stocks
1.1	Production
1.2	Total Imports
1.2.1	Imports by origin
1.3	Total Exports
1.3.1	Exports by destination
1.4	International Marine Bunkers
1.5	International Aviation Bunkers
1.6	Stocks at the end of the period
1.7	Stock Changes
1.8	Transfers
1.9	Transformation (by transformation processes)
1.10	Losses
1.11	Energy use
1.11.1	of which: for transport (by type of transport)
1.12	Non-Energy Use

Energy balance

The IRES recommends that countries compile and disseminate an official annual energy balance on a regular basis that follows as much as possible the templates and levels of details as presented in Annex I. For illustrative purpose, the following figure presents a template for an aggregated energy balance, highlighting the major flows for the various energy products.

Template of an Aggregated Energy Balance

		Energy products												
		Primary Energy							Secondary Energy					Total primary and secondary energy
Item Code	Flows	Total coal	Crude oil	Natural gas	Gas plant natural gas liquids	Primary electricity	Steam	Subtotal	Coke	Coke oven gas	Refined petroleum products	Secondary electricity	Subtotal	
1.1	Primary production													
1.2	Imports													
1.3	Exports													
1.4	International Bunkers													
1.5	Stock changes (closing-opening stocks)													
1	**Total energy supply**													
2	**Statistical difference**													
3	**Transfers**													
4	**Transformation processes**													
5	**Energy Industries own use**													
6	**Losses**													
7	**Final consumption**													
7.1	Final energy consumption													
7.1.1	Manufacturing, const. and non-fuel mining industries, Total													
	Iron and Steel													
	Chemical and petrochemical													
	Other industries													
7.1.2	Transport, total													
7.1.2.1	Road													
7.1.2.2	Rail													
7.1.2.3	Domestic aviation													
7.1.2.4	Domestic navigation													
7.1.2.5	Pipeline transport													
7.1.2.6	Other transport													
7.2	Non energy use													

Production and storage capacity

Data on energy production and storage capacity are important for the assessment of the existing ability of a country to produce and store energy products.

Oil:	Refinery capacity;
Natural Gas:	Peak output, types of storage capacity, and working gas capacity;
Electricity and heat:	Net maximum electrical capacity (by type of technology); peak load demand, available capacity at time of peak, date and time of peak load occurrence;
Biofuels and waste:	Capacity for bio-gasoline, biodiesel and other liquid biofuels.

Reserves of energy resources

Energy resources refer to “all non-renewable energy resources of both inorganic and organic origin discovered in the earth’s crust in solid, liquid and gaseous form.” Energy reserves are part of the resources which, based on technical, economic and other relevant (e.g., environmental) considerations, could be recovered and for which extraction is justified to some extent. Even though data on energy resources, stocks and reserves are generally collected by other organizations, the IRES recommends that such data should be obtained and included in an energy data warehouse.

Data on deposits of underground resources are important for the assessment of the discovery and depletion levels of underground resources. The following is a list of energy resources for which deposit data are collected:

- **Petroleum resources:**
  - Natural gas (including NGL and condensate);
  - Crude Oil;
  - Natural bitumen, extra heavy oil, oil shale, oil sand; and
  - Others.
- **Non-metallic minerals and solid fossil energy resources:**
  - Coal; and
  - Peat.
- **Metallic minerals**
  - Uranium ores; and
  - Other metallic minerals.

The deposit of underground resources are further classified by characteristics reflecting the "quality of and knowledge about" the deposits, which describe the economic, geological and project feasibility status in relation to the deposit. By application of these characteristics deposits can be classified as: commercially recoverable; potentially commercially recoverable; and non-commercial and other known deposits.

2.3 Energy Industry

Energy industry statistics consist of data on the performance of the energy sector and its sub-industries. These statistics are widely used by industry and government to measure the energy sector's performance and its contribution to, and thus importance in, the overall economy in terms of GDP, employment, capital investment, government revenues, and more. The need for energy industry statistics has become increasingly important for Canada.

2.3.1 Energy Industries and other Producers

Energy Industries

Energy industries are defined as consisting of only those economic units whose principal activity is primary energy production, transformation of energy, and/or distribution of energy. This means that the value added generated by these activities exceeds that of any other activity carried out within the same economic unit.

The collection, compilation and dissemination of statistics describing the main characteristics and activities of energy industries should be considered as one of the key components of official energy statistics.

Other Energy Producers

Other energy producers are economic units (including households) which choose, or are forced by circumstances, to produce energy for their own consumption and /or to supply energy to other units - energy production is not their principal activity, but secondary or ancillary activity. Geographically remote economic units with no access to electricity; iron and steel works producing their own coke and electricity; sugar mills burning bagasse to generate steam, process heat and electricity; industrial establishments and commercial organizations with backup electricity generators; and households with solar panels for electricity generation are examples of other energy producers. It is recognized that the collection of energy data from this category of economic unit might be a challenge. However, where such producers play a significant role, the IRES recommends that corresponding efforts should be made to collect data and incorporate them into official energy statistics.

2.3.2 Industrial Classification Systems

The IRES recommends that energy statistics are produced with respect to the main characteristics and activities of energy industries and the main groups of energy consumers. The IRES further articulates a correspondence to the divisions/groups of ISIC for both energy industries and energy consumers.

ISIC is a classification of industries according to productive activities, rather than a classification of goods and services. It is built on a production-oriented or supply-based conceptual framework that groups producing units into detailed industries based on similarities in the economic activity, taking into account the inputs, the process and technology of production, the characteristics of the outputs and the use to which outputs are applied.

ISIC has a central position among existing classifications of economic activities as well as other economic classifications, such as those for products. Its use is standard throughout the SEEA-Energy, the SNA and economic statistics more generally. The IRES defines the energy industries, or energy sector, as consisting of 17 industries. These industries and their corresponding divisions/groups in the ISIC are presented in Annex K.

Currently, the collection, organization and release of energy statistics in Canada are based on the *North American Industrial Classification System (NAICS)*, which is not substantially different from the IRES recommendations corresponding to ISIC. NAICS is an industry classification system developed by Canada, Mexico and the United States, against the background of the North American Free Trade Agreement. It is a supply-side or production-oriented classification designated to provide common definitions of the industrial structure and a common statistical framework to facilitate the analysis for the three countries.

Under NAICS Canada 2012, the Canadian economy is disaggregated into 20 sectors, 102 sub-sectors, 323 industry groups, 711 industries and 922 Canadian industries. Canada's energy sector is not defined in the system as a standalone sector per se, but is made up by StatCan as consisting of the following three sub-sectors (SS), three industry groups (IG), one industry (I) and two national industries (NI):

- Oil and gas extraction (SS 211);
- Coal mining (IG 2121);
- Other metal ore (uranium) mining (I 21229);
- Support activities for oil and gas extraction (NI 213117 for contract drilling and NI 213118 for services);
- Electric power generation, transmission and distribution (IG 2211);
- Natural gas distribution (IG 2212);
- Petroleum refineries (SS 3241); and
- Pipeline transportation (SS 486).

Discrepancies exist between the definitions of the energy industries in the IRES recommendations (based on ISIC) and Canada's current practice (based on NAICS). The definition of the energy sector adopted by StatCan includes pipeline transportation (of crude oil, refined petroleum products, natural gas, and others) (SS 324) which is not included as part of the IRES recommendations. On the other hand, biogas production, heat and steam are explicitly included in the IRES, but not in the NAICS. The concordances between NAICS and ISIC are presented in Annex K.

To facilitate the collection of statistics on energy use and their integration with other economic statistics, it is recommended in the IRES that countries identify, as far as feasible and applicable, the groups of energy consumers as listed in Annex L. Energy consumers are categorized into six groups: manufacturing, construction and non-fuel mining industries; households; commercial and public services; agriculture and forestry; fishing; and defensive activities. For manufacturing, energy use is further disaggregated by product such as iron & steel, food & tobacco, machinery, etc. It should be noted that the economic units belonging to the energy industries – which use energy in order to produce other energy products – are excluded from this group, as their energy use is considered as energy industry own use, rather than final consumption.

Energy use for transportation occurs across consumer groups, as well as the energy industries. Energy use for transport can be further disaggregated by mode of transportation into domestic aviation, road, rail, domestic navigation, pipeline transport and transport not elsewhere specified.

2.3.2.1 The Scope of Energy Industry Statistics

Data on the economic performance of producers and users of energy are important economic indicators which allow for the formulation and monitoring of economic policies related to energy and the evaluation of the contribution of the energy industry to the national economy.

These data are closely linked with the concepts, definitions and methods of the system of national accounts and are generally collected as part of economic statistics. The following is a list of the major economic indicators (definitions follow in Section 2.3.2.2):

- **Gross output at constant and basic prices:**
  - By energy sub-industry;
  - Contribution to overall economy; and
  - Indirect economic benefits.
- **Employment:**
  - Total number of persons employed;
  - Hours worked;
  - Average wages;
  - Labour productivity; and
  - Aboriginal employment.
- **Taxes and other payments to governments:**
  - Taxes (by energy sub-industry);
  - Other indirect taxes on production (by energy sub-industry); and
  - Royalty payments and other levies (land sales).
- **Gross fixed capital formation**
- **Prices:**
  - Consumers prices (end-use) (by energy product);
  - Import energy prices (by energy product); and
  - Export energy prices (by energy product).
- **International merchandise trade:**
  - Merchandise exports (volume and value); and
  - Merchandise imports (volume and value).
- **International investment:**
  - Foreign direct investment in Canada; and
  - Canadian direct investment abroad.

2.3.2.2 Economic Indicators and Definitions

Data items described in this section measure certain aspects of the economic performance of producers in the energy industry and users of energy. They are important economic indicators for the monitoring and analysis of changes in the industry, for the assessment of the contribution of the energy industry to the overall economy, and for the development and implementation of energy related policies and programs. These data items are closely linked with the concepts, definitions and methods of SNA 2008 and are generally collected as part of economic statistics for which further reference and details are provided in the *IRES 2008*. The definitions of the key data items are summarized below.

Gross output at basic prices

Gross output at basic prices measures the result of the overall production activity of industrial units. The value of production corresponds to the sum of the value of all goods or services that are actually produced within an establishment and become available for use outside that establishment, plus any goods and services produced for own final use. In order to maintain consistency with valuation principles for output (production) of other international recommendations on business statistics and national accounts, it is recommended that countries compile the output of industrial establishments at basic prices. However, in circumstances where it is not possible to segregate "taxes and subsidies on products" and "other taxes on production", a valuation of output at factor cost can serve as a second best alternative. Data on the gross output of energy products (by product) refer to the output generated by the production of the energy products described in SIEC.

Employment

Total number of person employed, average number of persons employed, and hours worked by employees are important data items describing the contribution of the energy industry to total employment as well as allowing for the assessment of labour input in energy production.

Gross fixed capital formation

Gross fixed capital formation is measured by the total value of a producer's acquisitions, less disposals of fixed assets during the accounting period plus certain specified expenditures on services that add to the value of non-produced assets data. It should include the value of all durable goods expected to have a productive life of more than one year and intended for use by the establishment (land, mineral deposits, buildings, machinery, equipment and vehicles). This data item is a measure of the investments of an economic entity and should be disaggregated by type of asset to provide the basis for a more comprehensive evaluation of the performance of energy industries.

Prices

Prices refer to the actual market price paid for an energy product (or group of products). They correspond to what is commonly referred to as spot prices.

Consumer prices refer to "purchaser prices" which are the amounts paid by the purchaser. For analytical purposes, countries are encouraged to compile information on the components of the different prices:

Purchasers' prices
minus wholesale and retail distribution margins (trade margins),
minus transportation charges invoiced separately (transport margins),
minus non-deductible value added tax (VAT),
equals **producers' prices**;
minus taxes on products resulting from production excluding invoiced VAT,
plus subsidies on products resulting from production,
equals **basic prices**

Import prices generally include cost, insurance and freight (CIF) at the point of entry into the importing economy.

Export prices are valued free on board (FOB) at the point of exit from the exporter's economy. It includes the cost of transport from the exporter's premises to the border of the exporting economy.

Taxes

Taxes are compulsory unrequited payments in cash or in kind made to the government. Two main groups of taxes are identifiable: taxes on products and taxes on production. However, only other taxes on production are presented as a data item as these payments are recorded in the business accounts of units. It is recommended that, in statistical questionnaires, countries refer to the specific names or descriptions of taxes as they exist in their national fiscal systems.

Other taxes on production are taxes that units are liable to pay as a result of engaging in production. As such, they represent a part of production costs and should be included in the value of output. Units pay them irrespective of profitability of production. These taxes consist mainly of taxes on the ownership or use of land, buildings or other assets used in production, or on the labour employed or compensation of employees paid.

International trade and investment

In addition to volumetric data collected through regulators and others, trade data on energy products as a subset of the overall merchandise trade data are also compiled based on custom reporting by importers and exporters. These trade data are in both volumetric and monetary terms and usually are timelier than those collected from regulators. Data on foreign investment, particularly foreign direct investment into Canada's energy industries, are closely followed by the energy industries, government, and other concerned stakeholders.

2.4 Energy Consumption / Uses

Energy consumption has become increasingly important, driven mainly by rising profiles of energy security, energy efficiency, environmental protection, sustainable development, and multinational collaboration. In energy statistics, energy consumers consist of economic units in their capacity as final users of energy. They use energy products for energy purposes and/or non-energy purposes. The use for energy purposes is further broken down into use for transportation and non-transportation purposes.

Energy consumption statistics focus on energy used by final consumers (secondary energy use) and assesses trends in this category. The energy used to generate electricity is also included to allow the link of electricity emissions to the appropriate final users of electricity.

Unlike other end-use energy sources, electricity use does not produce any GHG emissions at the point of consumption. GHG emissions related to electricity are emitted at the point of generation. These are sometimes referred to as indirect emissions.

Therefore, it is a common practice in energy end-use analysis to allocate GHG emissions associated with electricity production to the sector that uses that electricity. This allocation is done by multiplying the amount of electricity used by a national average emission factor that reflects the average mix of fuels used to generate electricity in Canada.

End Use/Efficiency

Energy end-use measurement is important in informing Canadians of their energy use/savings at home, in business and in the public sector. Whether energy is used or saved, it has important implications, not only in terms of monetary benefits but also through the multiple benefits of energy savings in health, security and productivity of all Canadians. Energy end-use data enable the measurement of the progress in energy efficiency or savings and are the prime input into the measurement of GHGs and other pollutants from the combustion process. Energy end-use data is used not only by EC to produce the GHG Report, but also by other federal departments and agencies, the provinces, international organizations, the private sector and academia to produce various outlooks, reports, and end-use studies, and inter-/intra-sector/jurisdiction comparisons.

The National Energy Use Database (NEUD) initiative was launched in 1991. It plays a crucial role by providing detailed information on energy use by fuel-type across four sectors - residential, commercial and institutional, industrial and transportation. In producing NEUD, NRCan uses the Report on Energy Supply and Demand (RESD) in Canada for control totals. NEUD involves extensive modeling based on sectoral surveys and studies. Data is provided with, and without electricity consumed, to allow for flexibility in comparison with other data sets. The comprehensive NEUD provides energy use data by province or region. Key total and sector and sub-sector indicators where available include:

- Energy use/GDP;
- Energy use/Gross output;
- Energy use/Capita;
- Energy use/household;
- End-use prices by fuel and by sector (prices); and
- Shares of household expenditure on energy, by source of energy and income group.

Analysis is also provided by use of the Log Mean Divisia Index I (LMDI I) methodology – an internationally recognized factorization analysis technique which decomposes changes in energy use into the various drivers in each sector so

that energy efficiency can be assessed. Results are utilized in international reporting and the Report to Parliament on Energy Efficiency.

In addition to end-use and related energy efficiency analysis, other indicators should also be available to provide information of the supply-side and energy conversion process such as:

- Efficiency of energy conversion and distribution; and
- The share of non-carbon energy, in each fuel type (diversification).

Energy / Environment

Energy / Environment statistics also analyze energy-related GHG emissions, including CO2, methane (CH4) and nitrous oxide (N2O). CO2 represents almost 98 percent of Canada's energy-related GHG emissions.

EC's *National Inventory Report – GHG Sources and Links in Canada* has more information about total Canadian GHG emissions. This GHG inventory is prepared according to the specifications of the Intergovernmental Panel on Climate Change, accounting for all types of GHG emissions in Canada.

Energy-environment indicators include:

- GHG emission from energy production and use (total, per capital and per unit of GDP) (climate change);
- Ambient concentrations of air pollutants in urban areas (air quality);
- Air pollutant emissions from energy system (air quality);
- Contaminant discharges in liquid effluents from energy systems (water quality);
- Soil acidification (soil quality);
- Deforestation attributed to energy use (forest);
- Ratio of solid waste generated per unit of energy produced (solid waste);
- Percentage of solid waste properly disposed (solid waste);
- Ratio of solid radioactive waste per unit of energy produced (solid waste); and
- Percentage of solid radioactive awaiting disposal (solid waste).

Chapter 3. Strategic Priorities for Energy Statistics

The following is a list of the strategic priorities related to Canada's energy statistical system. These strategic priorities represent those subjects or policy files that stakeholders identified as being of critical importance, where quality energy statistics are necessary. These strategic priorities will guide future efforts related to Canada's energy statistics system, including the development of a Strategic Plan for StatCan's ESP.

1. **Energy and the Economy:** The energy sector is a large and important contributor to the Canadian economy from both a supply and demand perspective and impacts the competiveness and well-being of all Canadians. A number of key economic indicators (e.g., monthly GDP, input-output tables, prices, imports and exports, investment, employment, consumption, energy efficiency, etc.) are used to convey the economic importance of the energy sector to the Canadian economy. The energy data compiled and collected by the ESP at StatCan are key inputs used in the development of these economic indicators. These economic indicators are useful to a wide variety of federal departments (e.g., Finance Canada (FC), NRCan, EC, government agencies (e.g. Bank of Canada (BoC)), provincial departments and regulatory bodies, industry associations, business and academic institutions, international organizations, the media and the public at large. For example, FC uses these economic indicators for energy as measures of economic activities in Canada, as a determinant of government taxation and other fiscal policies, and in the formulation of tax sharing agreements between federal and provincial governments. They are also used to inform decisions on industry growth, business investment, and for the development and improvement of public policies, legislation, regulations, programs and other interventions.
2. **RESD for Canada:** The RESD is the flagship output of the ESP at StatCan, representing Canada's energy balances. It is compiled using data from multiple feeder surveys and administrative data sources, on both the production and consumption sides of the equation, for all energy types. Data from the RESD are used by a variety of stakeholders, including: NRCan for the production of energy efficiency indicators and for the submission of energy data to meet Canada's international energy reporting obligations; EC for the calculation of GHG emissions and international environmental reporting requirements; and the NEB in the preparation of their energy outlook forecasting reports.
3. **Energy and the Environment:** The energy sector has a major impact on the environment in Canada, in terms of GHG emissions, air pollutants, water use, and land use. Data is needed to monitor these impacts in Canada.
4. **Energy Efficiency:** Measuring and understanding the performance of energy efficiency in the economy is key to understanding Canadian competiveness and the economic well-being of Canadians.
5. **Energy Security:** Planning for a sustainable and secure supply of energy for the future is an important aspect of managing Canada's energy resources. Data are required on the following components:
   - Energy reserves: tracking the supply of energy to meet Canada's future needs.
   - Innovation: finding new and innovative ways to make resources economically viable, to increase production, reduce impacts on the environment, and reduce consumption.
   - Emergency preparedness: this relates to Canada's effective management of energy resources during times of global supply disruptions for whatever reason (e.g. natural disaster, act of terrorism, political instability, etc.).
6. **Energy Markets:** Ensuring access to and diversification of markets for Canada's energy products is critical for Canada's economy. Energy markets have become more dynamic as a result of a number of factors, including new and emerging demands for energy in the rapidly growing economies in Asia; the changing supply as a result of the emergence of shale oil and gas; growing production of the oil sands resulting in increased volumes for delivery to existing and new markets; and the volatility of energy prices.

   To secure stable markets for their energy products, Canadian energy industries are looking to diversifying their markets and take advantage of new opportunities to sell products. This requires an improved and flexible transportation infrastructure to respond to changing distribution patterns. Relevant and timely data are required to inform decision-making on the movement of energy products across different modes of transportation (pipelines, rail, ship, road, electricity transmission). In addition, the potential impacts on the environment relating to energy transportation have become an increasingly high profile concern (e.g. the

impacts of pipeline construction, the risks associated with rail transport). To inform these debates, more data are required on the types and volumes of energy being moved by mode of transportation, including destination of shipments, product movements, transportation of products by mode (e.g. rail, pipeline, ship, truck), and transportation infrastructure.

7. **International Reporting Requirements:** Canada has treaty obligations relating to global energy and environmental issues, which include the reporting of energy data on supply and consumption to international agencies such as the IEA. These data are critical at the international level for stabilizing energy prices in world markets by promoting market transparency; supporting and facilitating planning and decision-making on movements and investments; and informing contingency planning for emergency preparedness. In addition, as a member to the UNFCCC and the UNECE, Canada is required to report on an annual basis a GHG and a criteria air pollutant inventory to the respective bodies. Improving the timeliness, quality and responsiveness of Canada's international reporting will make a significant contribution to our efforts in this regard.
8. **Partnerships and Collaboration between Energy Stakeholders and Data Providers:** Across Canada, there are many data collectors and users (e.g. federal, provincial and territorial regulatory bodies, industry associations). It is important that partnerships for the sharing of data (i.e. to take advantage of administrative and big data sources) are forged to reduce costs, minimize burden on respondents, improve data confrontation and validation, etc. Establishing new partnerships could also facilitate the exchange of subject matter knowledge and industry expertise, which could enhance data quality and analysis. Furthermore, maintaining and establishing new mechanisms or networks will be important in determining data needs and identifying opportunities for collaboration based on new or emerging issues and priorities.

   Establishing better data sharing and collaboration amongst federal departments and within StatCan itself will also be important. For example, energy data are collected by a number of different divisions within StatCan to fulfill their respective mandates (e.g. transport, environment, international trade, etc.). These different data sources could be used more effectively for data validation and analysis within StatCan. Also, there may be opportunities to collaborate on data collection in order to reduce the burden on respondents, avoid duplication of effort and improve efficiencies. This collaboration will also help ensure StatCan data sets are harmonized and any multiple, conflicting data sets available from StatCan were reconciled. This collaboration within StatCan will also present opportunities to share industry knowledge, subject matter expertise, networks of contacts, and alternate sources of information to improve data validation, confrontation, analysis and quality.
9. **Informing the Public:** There have been increasing calls for energy data to improve the energy awareness and energy literacy of Canadians and thus enhance public understanding and contribute to decision making on Canada's energy future.

Annex A. Quality Framework for Canada's Energy Statistics

The usefulness of a Statistical Framework for Energy is heavily determined by the appropriate quality of the data it contains. Consequently ensuring high levels of data quality is essential in order that an energy statistics framework can meet the needs of its clients and provide high quality information upon which analytical work and policy decisions are undertaken.

A quality framework for energy statistics describes what an ideal energy statistics system should look like, or what characteristics an effective energy statistics system should have, in terms of data quality. The quality framework for Canada's energy statistics presented in this report is an adaption to the Canadian context of the OECD Quality Framework and Guidelines for OECD Statistical Activities.

Data Quality

Data Quality Assurance Framework

Most international organizations and countries have developed general definitions of data quality, outlining the various dimensions of quality and quality measurement, and integrating them into quality assurance frameworks. A quality assurance framework could be used to guide efforts towards strengthening and maintaining statistical systems and the reviews and assessment of energy statistics program.

Ensuring data quality is a core challenge for all statistical agencies. Energy data made available to users are the end product of a complex process comprising many stages: data collection from various sources, editing, imputation, estimation, formatting, and dissemination. Achieving overall data quality depends upon ensuring quality in all stages of the process. All institutional and organizational conditions have an impact on the quality of energy statistics. These elements include:

- The legal basis for the compilation of data;
- Adequacy of data-sharing and coordination among data-producing agencies;
- Assurance of confidentiality and security of information; and
- Quality awareness.

Quality Dimensions

1. Relevance

The relevance of energy statistics reflects the degree to which energy data are able to meet the needs of key users in government, business and the community. It depends upon both the coverage of the required topics and the use of appropriate concepts. Measuring relevance therefore requires the identification of user groups and their data needs. The responsible agencies should balance the different needs of current and potential users to satisfy the most important needs of key users in terms of the content, coverage, timeliness of energy data, given resource constraints.

Strategies to keep the relevance of energy data include tracking requests from users and the ability of the energy statistics program to respond; conducting users' satisfaction surveys; and consulting directly with key users about their interests, needs and priorities, and their views of the gaps and deficiencies in the energy statistics program. Furthermore, since needs evolve over time, ongoing statistical programs should be regularly reviewed to ensure relevance.

2. Accuracy

The accuracy of energy statistics refers to the degree to which the data correctly estimate or describe the quantities or characteristics that they are designed to measure. It has many facets and there is no single overall measure of accuracy. In general, it is characterized in terms of errors in statistical estimates and is decomposed into bias (systematic error) and variance (random error) components. However, it also encompasses the description of any processes undertaken by responsible agencies to reduce measurement errors. In the case of estimates based on data from sample surveys, the accuracy can be measured using indicators such as coverage rates, sampling errors, non-response errors, response errors, processing errors, and measuring and model errors. Regular monitoring of

the nature and extent of revisions to energy statistics are considered a gauge of reliability. Management of accuracy requires particular attention during design, implementation and assessment stages of a survey.

In regards to design, measures taken to promote accuracy include: ensuring that the project team includes the participation of staff with the necessary expertise in energy subject matter, methodology, operations and systems; ensuring specialized support for developing concepts and definitions, questionnaire design, survey frames, sampling and estimation; securing response and dealing with non-response; seasonal adjustment; dissemination; and evaluation. Consideration should also be taken into the ability respondents have to accurately answer particular questions.

Mechanisms for monitoring implementation are built into the survey processes at the design stage. Two types of information are required: first, to monitor and correct, in real time, any problems arising during survey implementation; and second, to assess whether the design was implemented as planned, whether some aspects were problematic, and what lessons were learned from the operational standpoint.

Assessment of accuracy is also an important consideration at the design stage since much of the information required must be recorded while the survey is taking place. As accuracy is multidimensional, choices have to be made regarding the most important indicators for each individual survey. Also, as each survey produces thousands of different estimates, either a generic method of indicating the accuracy of large numbers of estimates is used, or the indicators are confined to certain key estimates.

As many design issues are highly technical, independent review is vital. Options include the referral of technical issues to internal advisory committees, consulting with other statistical agencies, participation in working groups of international organizations, the presentation of technical issues and proposed solutions at professional meetings, etc.

3. Credibility

The credibility or integrity of energy statistics refers to the confidence that users place in those data based on the reputation of the responsible agencies producing the data. One aspect of credibility is trust in the objectivity of the data, which implies that the data are perceived to be produced professionally in accordance with accepted statistical standards, and that policies and practices are transparent. Data should not be manipulated, withheld or delayed, nor should their release be influenced by policy considerations. Data must be kept confidential and secure. Decisions surrounding the prioritization of statistical needs should be transparent.

4. Timeliness

Timeliness of information refers to the length of time between the end of the reference period to which the information relates and its availability to users. Timeliness targets are derived from relevance considerations, in particular the period for which the information remains useful for its main purposes. This varies with the rate of change of the phenomena being measured, with the frequency of measurement, and with the immediacy of user response to the latest data. On the other hand, burdens to respondents should be taken into consideration.

Timeliness is a design decision and often involves trade-offs with accuracy and cost. Thus, improved timeliness is not an unconditional objective. Rather, timeliness is an important characteristic that is monitored over time to provide a warning of deterioration. Furthermore, timeliness expectations are likely to heighten as users become accustomed to immediacy in all forms of service delivery, thanks to the pervasive impact of technology.

Timeliness is measured by the elapsed time between the identified release date and the effective dissemination date, or the extent to which the programme meets its target dates. Mechanisms for managing timeliness include announcing release dates well in advance, issuing preliminary estimates, adhering to release schedules and making best use of modern technology.

5. Accessibility

Accessibility of information refers to the ease with which users can learn of its existence, locate it, and import it into their own working environment. It includes the suitability of the form or medium through which the information can be accessed and its cost. Aspects of accessibility also include the availability of metadata and the existence of user support services. Accessibility requires development of an advance release calendar so that the users will be informed well in advance about when and where the data will be available and how to access them.

6. Interpretability

The interpretability of data products reflects the ease with which the user may understand and properly use and analyze the data. The adequacy of the definitions of concepts, target populations, variables and terminology, underlying the data, and information describing the limitations of the data, if any, largely determines the degree of interpretability.

The range of different users leads to such considerations as metadata presentation in layers of increasing detail. Definitional and procedural metadata assist in interpretability: thus, the coherence of these metadata is an aspect of interpretability.

7. Coherence

The coherence of energy statistics reflects the degree to which the data are logically connected and mutually consistent, and/or the degree to which data can be successfully brought together with other statistical information within a broad analytical framework and over time. The use of standard concepts, definitions, classifications and target populations promotes coherence, as does the use of a common methodology across surveys. Coherence has four sub-dimensions:

- Coherence within a data set. This implies that the elementary data items are based on compatible concepts, definitions and classifications and can be meaningfully combined. For energy statistics, this sub-dimension governs the need for all data items to be compiled in conformity with the methodological basis of the recommendations presented in IRES. Automated processes and methods, such as coding tools, can be used to identify issues and promote consistency;
- Coherence across data sets. The coherence between energy statistics and other statistics (e.g., economic, environmental) will be ensured if all data sets are based on common concepts, definitions, valuation principles, classifications , methodologies, modalities, business registers and frames, etc., and as long as any differences are explained and can be allowed for;
- Coherence over time. Data are based on common concepts, definitions and methodology over time and is compiled on the basis of the recommendations in IRES. If this is not the case, it is advisable that countries clearly note the divergences from the recommendations. From a perspective of coherence over time, changes in concepts, methodologies, etc. should be minimized.
- Coherence across countries. Data are based on common concepts, definitions, classifications and methods across countries. This coherence can be promoted through the adoption of the recommendations in IRES, through multilateral collaboration.

8. Cost-efficiency

The cost-efficiency with which a product is produced is a measure of the costs and respondent burden relative to the output. Respondent burden is a cost that happens to be borne by the data provider, but is a cost nevertheless. While cost-efficiency is not treated as a dimension of quality, it is a factor that must be taken into account in any analysis of quality as it can affect quality in all dimensions. If a product can be produced more efficiently with the same quality, then resources released can be used to improve the quality of that product or other products. Efforts must be made to reduce and manage respondent burden while ensuring the reporting of complete and quality data.

Trade-offs between Quality Dimensions

The dimensions of quality described above are overlapping and interconnected and as such, are involved in a complex relationship. Action taken to address or modify one aspect of quality may affect other aspects. A typical example is the trade-off between the accuracy and timeliness in data collection. It is recommended that statistical agencies be not in a position to meet the accuracy and timeliness requirements simultaneously. One possible solution often used is to produce a provisional estimate, available sooner but based on less comprehensive data, to meet the requirement of timeliness. Later, this estimate would be supplemented with further information based on more comprehensive data but less timely than its provisional version.

At times, other conflicting situations or trade-offs may emerge that require difficult decisions to be made. Ensuring the efficiency or cost-effectiveness of the statistical program may create challenges for ensuring relevance by limiting the flexibility of the program to address important gaps and deficiencies. There are also trade-offs between

relevance and timeliness, relevance and coherence etc. A comprehensive examination of all relevant factors and priorities will be required to make the necessary decisions relating to these types of trade-offs.

Other Elements of Quality

Certain aspects of quality are more dynamic, being intimately linked to the external environment in which statistical agencies operate, and are subject to quick changes as the environment evolves. As such, the statistical agency must have the capacity, flexibility, knowledge and expertise to respond accordingly. These elements include: non-response, coverage and sampling.

1. Non-response

One of the biggest challenges in maintaining quality is ensuring good response rates. In order to maintain the cooperation of data suppliers, statistical agencies must be responsive to their needs and issues, such as growing response burden, concerns over data confidentiality and security, the availability of other data reporting options, etc. In the long run, decreasing response rates and increasing costs of traditional data collection methods will require the development of more cost-effective methods for data collection and follow-up, such as electronic reporting, greater use of administrative data sources, operational metadata (paradata) to improve frames, support imputation or to adjust for non-responses errors at the aggregate level.

2. Coverage

Coverage is determined by the quality of survey frames. The use of administrative data sources to establish frames can place surveys at risk, should the administrative programs be cancelled or changed, or if they do not adhere to classification standards. Businesses are constantly forming and disappearing, merging and divesting, entering and exiting industries, and adding and dropping products and services. There is often a time lag in detecting these changes from administrative data. Thus the agency must be prepared to supplement administrative data by investing in its own maintenance mechanisms.

3. Sampling

Over time a survey design could deteriorate in the sense that the data used to stratify and select units become out of date and the sample becomes less efficient. Furthermore, demand for data on specific subpopulations may emerge, while the sample was not designed to support. Thus, ongoing surveys require periodic redesign.

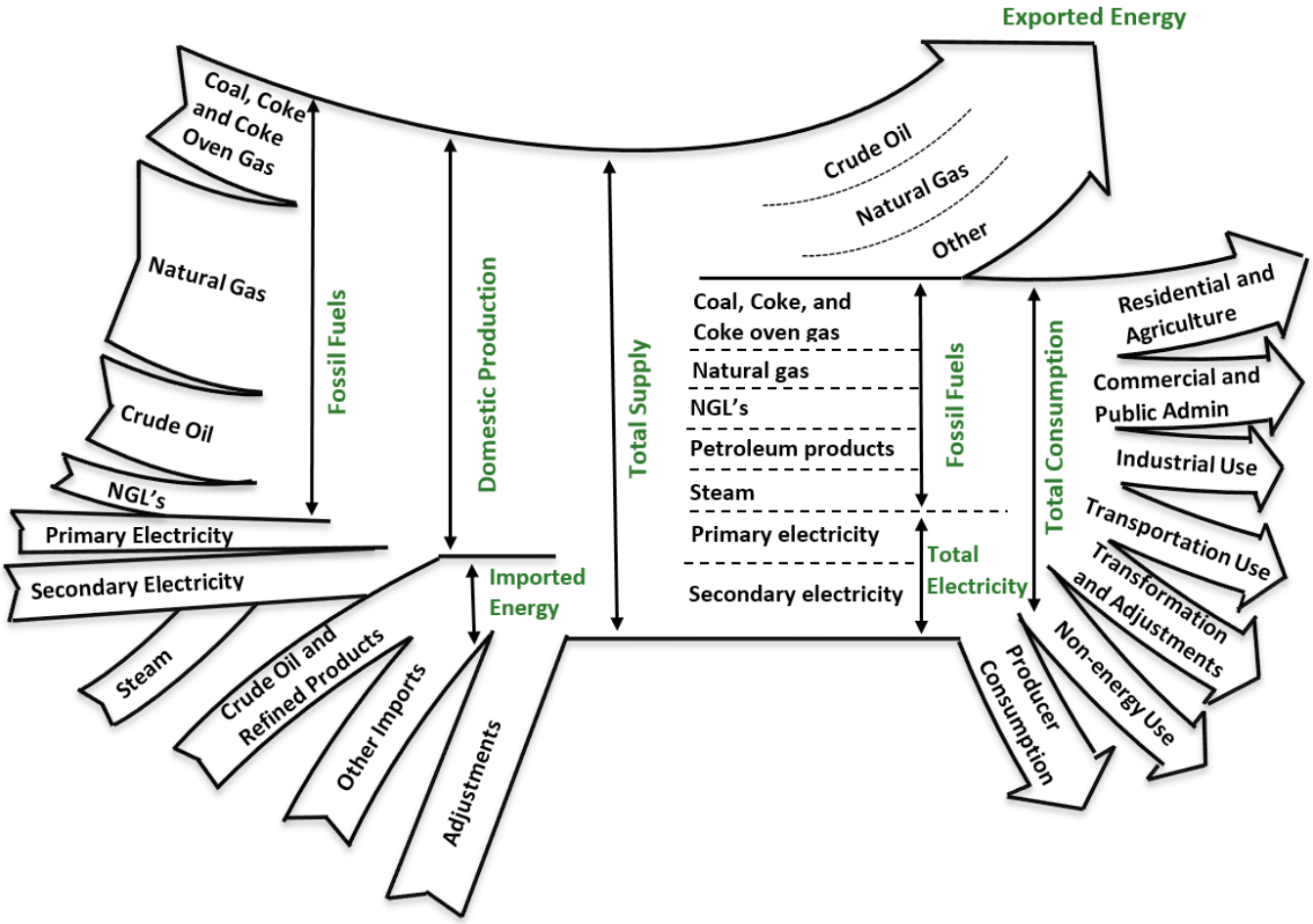
Redesigns of business surveys are more frequent, to keep up with changes in the business universe. Sample redesign is an opportunity to introduce new techniques, for example, multiple frames, adaptive sampling and to spread respondent burden more evenly. One challenge could be the funding of these redesigns, which often include the redesign project itself and a parallel run of the old and new samples in order to ensure that the redesign itself does not introduce breaks in the statistical series. Inter-temporal comparisons between old and new data should be considered in survey redesign.

Annex B. StatCan Energy Statistics Program Surveys and Reports

			SURVEYS
Energy Subject	**Acronyms**	**RESD**	**Survey Name**
Coal and Coke	MCOL	✓	Monthly Coal
	MCOK	✓	Monthly Coke
	ACM		Annual Coal Mines
Electricity	MELE		Monthly Electricity
	QELERS		Quarterly Electricity Disposition- Residential Sector
	AELE	✓	Annual Supply and Disposition of Electricity
	EPTG		Annual Thermal Power Generating Stations
	EPGS		Annual Thermal Generating Stations
	AEUFR		Annual Electricity Utility Final Report
Oil and Gas	MOILP		Monthly Oil Pipeline Survey
	MNGAS	✓	Monthly Gas Utilities/Transport and Distribution Systems
	ANGASD		Annual Natural Gas Disposition
	AOILPT		Annual Oil Pipeline Transport
	OGEX		Annual Oil and Gas Extraction
	ANGF		Annual Natural Gas Transport and Distribution
Refined Petroleum Products	MRPP	✓	Monthly refined petroleum products
	AEND	✓	Annual End Use
	SRPP	✓	Annual Secondary Distributors of Petroleum Products
Manufacturing Consumption	ICES	✓	Annual Industrial Consumption of Energy
			REPORTS
	MCONG	✓	Monthly Crude Oil and Natural Gas Production – MOILP, MNGAS, MRPP, provincial and National Energy Board (NEB) data
	MOILS	✓	Monthly Oil Sands Project – Alberta Energy Regulator (AER) administrative data
	RESD		Report on Energy Supply and Demand- above checked survey data and NEB data

Annex C. RESD Flow Chart

Canadian energy flows from supply to consumption provided for in the Report on Energy Supply and Demand (RESD).



Annex D. Status of Statistics Canada's Volumetric Data

(green=good, orange= improvements required, purple= not collected[1], grey= NA[2])

Supply	Primary Energy						
	Coal	Crude Oil	Conventional crude oil	Non Conventional, other hydro carbons	Natural Gas	NGLs	Primary electricity
Primary Production							
Imports/Exports							
International Bunkers							
Stock Variation							
Inter-Product Transfers							
Total Energy Supply							
Statistical Difference							
Transfers							
Electricity plants (utilities)							
CHP plants (industries)							
Coke oven & coal liquefaction plants, blast furnaces							
Oil refineries, petrochemical plants							
Steam Gen/ Heat Plants							
Patent fuel							
Brown coal							
Gas works & other conversions to gases							
Peat briquette							
NG blending plants							
Gas to liquid plants							
Charcoal plants							
Other processes							
Producer Consumption							
Losses							

Supply	Primary Energy (concluded)						
	Nuclear Fuels	Steam (Heat)	Biomass peat	Solid Bio fuels	Liquid Bio fuels	Biogases	Waste
Primary Production							
Imports/Exports							
International Bunkers							
Stock Variation							
Inter-Product Transfers							
Total Energy Supply							
Statistical Difference							
Transfers							
Electricity plants (utilities)							
CHP plants (industries)							
Coke oven & coal liquefaction plants, blast furnaces							
Oil refineries, petrochemical plants							
Steam Gen/ Heat Plants							
Patent fuel							
Brown coal							
Gas works & other conversions to gases							
Peat briquette							
NG blending plants							
Gas to liquid plants							
Charcoal plants							
Other processes							
Producer Consumption							
Losses							

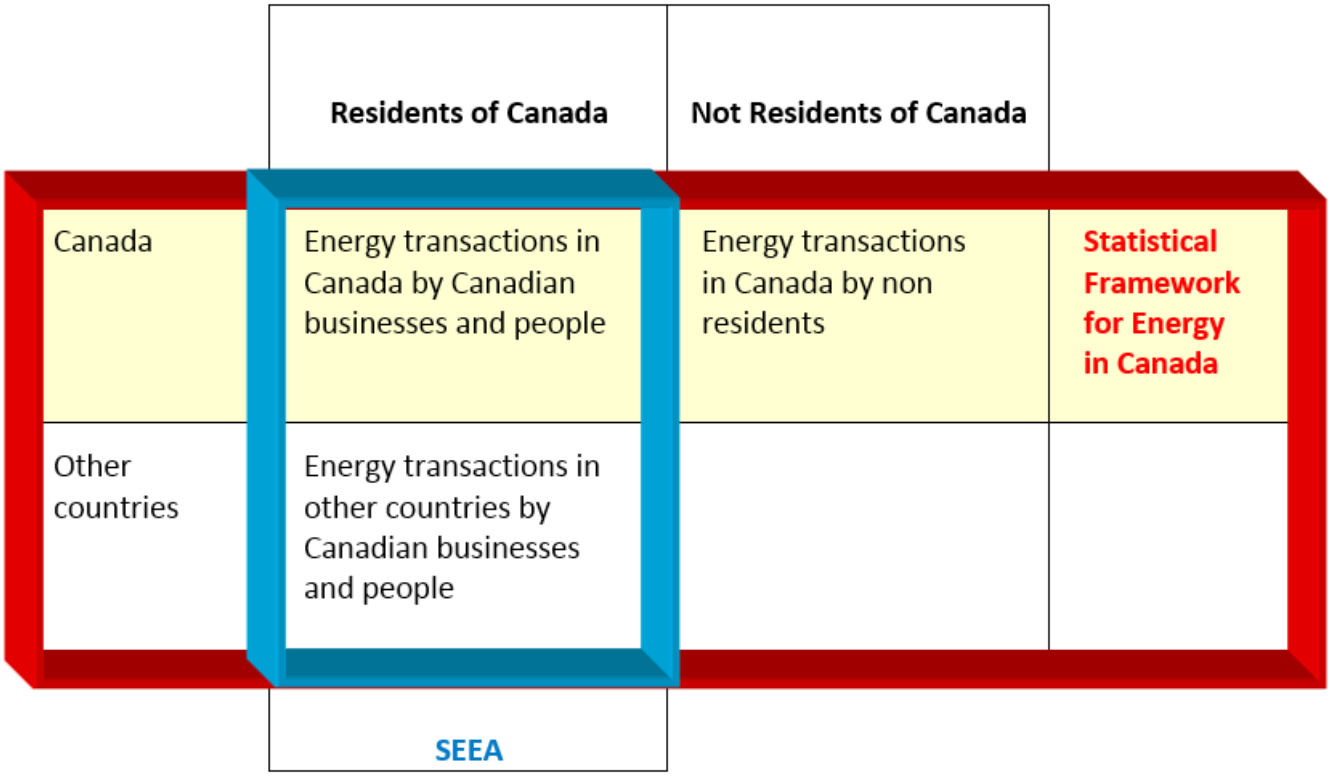
(green=good, orange= improvements required, purple= not collected[1], grey= NA[2])

Supply	Secondary Energy						
	Secondary electricity	Coal Products	Bio fuels	Oil Products (Motor gas, diesel)	Refinery Feed stock	Additives and oxygenates	Peat products
Primary Production							
Imports/Exports							
International Bunkers							
Stock Variation							
Inter-Product Transfers							
Total Energy Supply							
Statistical Difference							
Transfers							
Electricity plants (utilities)							
CHP plants (industries)							
Coke oven &coal liquefaction plants, blast furnaces							
Oil refineries, petrochemical plants							
Steam Gen/ Heat Plants							
Patent fuel							
Brown coal							
Gas works & other conversions to gases							
Peat briquette							
NG blending plants							
Gas to liquid plants							
Charcoal plants							
Other processes							
Producer Consumption							
Losses							

1. Not collected: It is feasible that the data could be collected/available based on the nature of the cross tabulated reference but it is not currently collected by StatCan. Example: Electricity Plants may produce waste but StatCan does not collect that data in its energy surveys.

2. NA: The nature of the cross tabulated reference is not feasible based and as such, data collection is not possible. Example: Waste cannot be transferred to another product (inter-product transfer).

Annex E. Reference Territories: The Statistical Framework and the SEEA



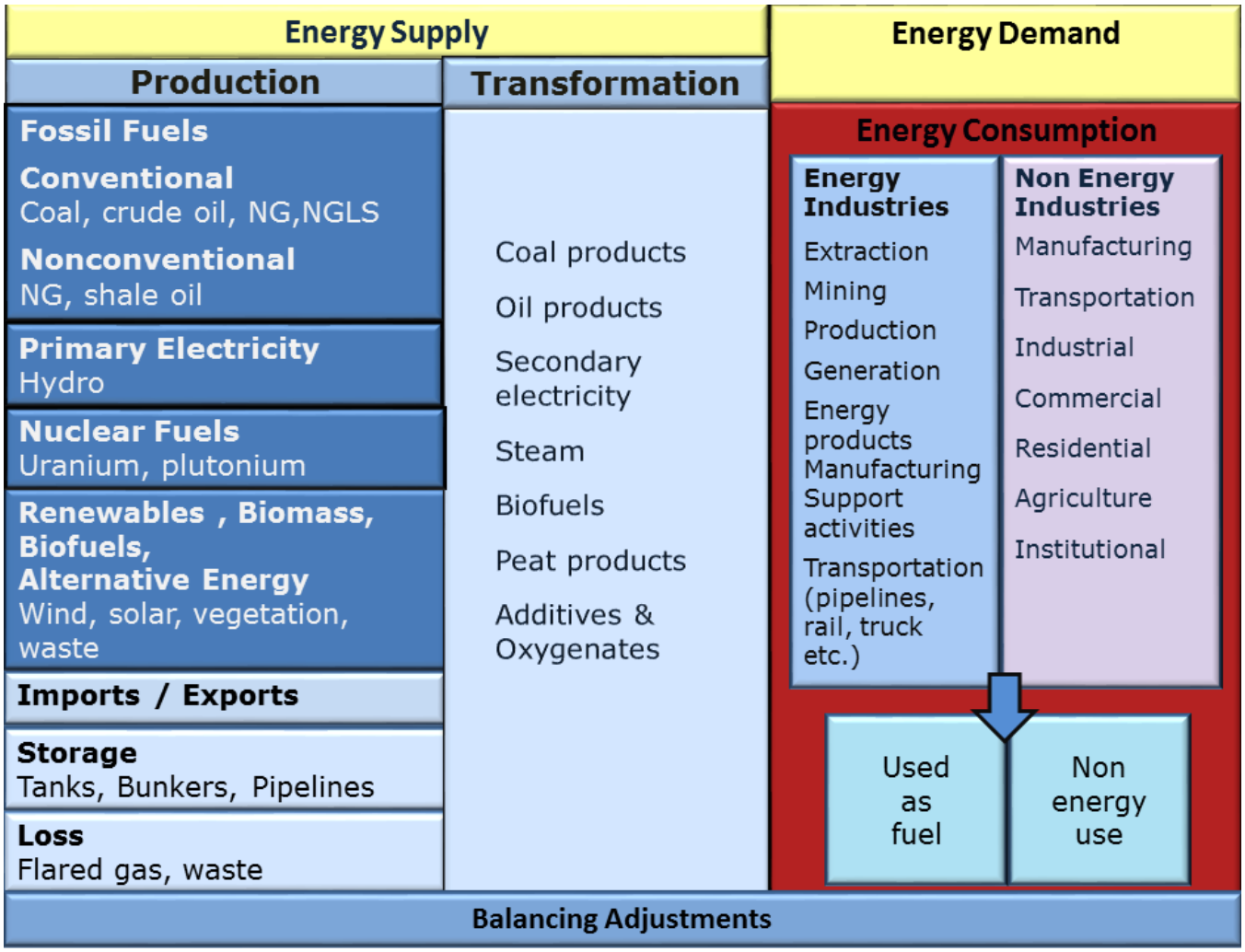
Annex F. Primary/Secondary and Renewable / Non renewable Cross-classification

	Primary products	Secondary products
Non-renewables	01 - Hard coal	03 - Coal products
	02 - Brown coal	12 - Peat products
	11 - Peat	43 - Refinery feedstocks
	20 - Oil shale	46 - Oil products
	30 - Natural gas	Electricity from combusted fuels and nuclear fuels
	41 - Conventional crude oil	Any other product derived from primary/secondary products
	42 - NGLs	
	44 - Additives and oxygenates	
	61 - Industrial waste	
	part of	
	62 - Municipal waste	
	Nuclear Heat	
Renewables	5 - Biofuels and waste (except charcoal, industrial waste, and part of Municipal waste)	516 - Charcoal
	Electricity and heat from renewable sources	Any other product derived from primary/secondary products

Annex G. Standard International Energy Product Classification (SIEC)

IRES Energy Products	SIEC Classification
COAL	**0**
Hard Coal	**001**
Anthracite	0010110110
Bituminous coal	001012
- Coking coal	0010120121
- Other bituminous coal	0010120129
Brown coal	**002**
Sub-bituminous coal	0020210210
Lignite	0020220220
Coal Products	**003**
Coal coke	003031
- Coke oven coke	0030310311
- Gas coke	0030310312
- Coke breeze	0030310313
- Semi cokes	0030310314
Patent fuel	0030320320
Brown coal briquettes (BKB)	0030330330
Coal tar	0030340340
Coke oven gas	0030350350
Gas works gas (and other manufactured gases for distribution)	0030360360
Recovered gases	003037
- Blast Furnace Gas	0030370371
- Basic oxygen steel furnace gas	0030370372
- Other recovered gases	0030370379
Other coal products	0030390390
PEAT AND PEAT PRODUCTS	**1**
Peat	**111**
Sod Peat	1111111110
Milled Peat	1111121120
Peat Products	**112**
Peat Briquettes	1121211210
Other peat products	1121291290
OIL SHALE/ OIL SANDS	**2**
Oil shale/ oil sands	**2202002000**
NATUAL GAS	**3**
Natural Gas	**3303003000**
OIL	**4**
Conventional crude oil	**4414104100**
Natural Gas Liquids (NGL)	**4424204200**
Refinery Feedstocks	**4434304300**
Additives and oxygenates	**4444404400**
Other hydrocarbons	**4454504500**
Oil Products	**446**
Refinery gas	4464614610
Ethane	4464624620
Liquefied petroleum gases (LPG)	4464634630
Naphtha	4464644640
Gasolines	446465
Aviation gasoline	4464654651
Motor gasoline	4464654652
Gasoline-type jet fuel	4464654653
Kerosenes	**446466**
Kerosene-type jet fuel	4464664661
Other Kerosene	4464664669
Gas oil/diesel oil and Heavy gas oil	**446467**
Gas oil/Diesel oil	4464674671
Heavy gas oil	4464674672
Fuel oil	4464684680
Other oil products	446469
White spirit and special boiling point industrial spirits	4464694691
Lubricants	4464694692
Paraffin waxes	4464694693
Petroleum coke	4464694694
Bitumen	4464694695
Other oil products n.e.c.	4464694699
Biofuels	**5**
Solid Biofuels	**551**
Fuelwood, wood residues and by-products	551511
Wood pellets	5515115111
Other Fuelwood, wood residues and by-products	5515115119
Bagasse	5515125120
Animal waste	5515135130
Black liquor	5515145140
Other vegetal material and residues	5515155150
Charcoal	5515165160
Liquid Biofuels	**552**
Biogasoline	5525215210
Biodiesels	5525225220
Bio jet kerosene	5525235230
Other liquid Biofuels	5525295290
Biogases	**553**
Biogases from anaerobic fermentation	553531
Landfill gas	5535315311
Sewage sludge gas	5535315312
Other biogases from anaerobic fermentation	5535315319
Biogases from thermal processes	5535325320
Waste	**6**
Industrial Waste	**6616106100**
Municipal waste	**6626206200**
Electricity	**7**
Electricity	7707007000
Heat	**8**
Heat	8808008000
Nuclear Fuels and other fuels n.e.c.	**9**
Uranium and Plutonium	**9919109100**
Other Nuclear Fuels	**9929209200**
Other Fuels n.e.c	**9999909900**

Annex H. Energy Balance: Scope of Products



Annex I. Template of a Detailed Energy Balance

Template of a Detailed Energy Balance

		Energy products				
Item code	**Flows**	**E1**	**E2**	**E3 …**	**Total**	**of which: Renewables**
1.1	Primary production					
1.2	Imports					
1.3	Exports					
1.4	International Bunkers					
	International Marine Bunkers					
	International Aviation Bunkers					
1.5	Stock changes (closing-opening stocks)					
1	**Total energy supply**					
2	**Statistical difference**					
3	**Transfers**					
4	**Transformation processes**					
4.1	Electricity plants					
4.2	CHP plants					
4.3	Heat plants					
4.4	Coke ovens					
4.5	Paten fuel plants					
4.6	Brown coal briquette plants					
4.7	Coal liquefaction plants					
4.8	Gas works (and other conversion to gases)					
4.9	Blast furnaces					
4.10	Peat briquette plants					
4.11	Natural gas blending plants					
4.12	Gas to liquid (GTL) plants					
4.13	Oil refineries					
4.14	Petrochemical plants					
4.15	Charcoal plants					
4.16	Other transformation processes					
5	**Energy Industries own use**					
6	**Losses**					
7	**Final consumption**					
7.1	**Final energy consumption**					
7.1.1	Manufacturing, construction and non-fuel mining industries, Total					
7.1.1.1	Iron and Steel					
7.1.1.2	Chemical and petrochemical					
7.1.1.3	Non-ferrous metal					
7.1.1.4	Non-metallic minerals					
7.1.1.5	Transport equipment					
7.1.1.6	Machinery					
7.1.1.7	Mining and quarrying					
7.1.1.8	Food and tobacco					
7.1.1.9	Paper, pulp and print					
7.1.1.10	Wood and wood products (Other than pulp and paper)					
7.1.1.11	Textile and leather					
7.1.1.12	Construction					
7.1.1.13	Industries not elsewhere specified					
7.1.2	Transport, total					
7.1.2.1	Road					
7.1.2.2	Rail					
7.1.2.3	Domestic aviation					
7.1.2.4	Domestic navigation					
7.1.2.5	Pipeline transport					
7.1.2.6	Transport not elsewhere specified					
7.1.3	Other, total					
7.1.3.1	Agriculture and Forestry					
7.1.3.2	Fishing					
7.1.3.3	Commerce and public services					
7.1.3.4	Households					
7.1.3.5	Not elsewhere -specified					
7.2	**Non energy use**					

Annex J. Template of an Aggregated Energy Balance

Template of an Aggregated Energy Balance

		Energy products				
Item code	**Flows**	**E1**	**E2**	**E3 …**	**Total**	**of which: Renewables**
1.1	Primary production					
1.2	Imports					
1.3	Exports					
1.4	International Bunkers					
1.5	Stock changes (closing-opening stocks)					
1	**Total energy supply**					
2	**Statistical difference**					
3	**Transfers**					
4	**Transformation processes**					
5	**Energy Industries own use**					
6	**Losses**					
7	**Final consumption**					
7.1	**Final energy consumption**					
7.1.1	Manufacturing, construction and non-fuel mining industries, Total					
	Iron and Steel					
	Chemical and petrochemical					
	Other industries					
7.1.2	Transport, total					
7.1.2.1	Road					
7.1.2.2	Rail					
7.1.2.3	Domestic aviation					
7.1.2.4	Domestic navigation					
7.1.2.5	Pipeline transport					
7.1.2.6	Other transport					
7.2	**Non energy use**					

Annex K. Energy Industries and ISIC Correspondences

Energy industry (IRES)	ISIC Rev. 4	StatCan Energy Aggregate (NAICS – T016 (Y)es/(N)o
Electricity and heat plants[1]	Division: 35 — Electricity, gas, steam and air conditioning supply	Y – 2211, 2212
Pumped storage plants		Y – 2211
Coal mines	Division: 05 — Mining of coal and lignite	Y – 2121
Coke ovens	Group: 191 — Manufacture of coke oven products	N – 324190
Coal liquefaction plants	Group: 192 — Manufacture of refined petroleum products	N – 324190
Patent fuel plants	Group: 192 — Manufacture of refined petroleum products	Y – 32411
Brown coal briquette plants	Group: 192 — Manufacture of refined petroleum products	N – 2121
Gas works[2] (and other conversion to gases)	Group: 3520 — Manufacture of gas: distribution of gaseous fuels through mains	Y – 2212, 486
Gas separation plants	Division: 06 — Extraction of crude petroleum and natural gas	Y – 211
Gas to liquid (GTL) plants	Group: 192 — Manufacture of refined petroleum products	Y – 211
LNG plants / regasification plants	Group: 091 — Support activities for petroleum and natural gas extraction Class: 5221 — Service activities incidental to land transportation	Y – 21311A Y – 486, 48899
Blast furnaces	Group: 241 — Manufacture of basic iron and steel	N – 3311/ 236210
Oil and gas extraction	Division: 06 — Extraction of crude petroleum and natural gas Group: 0910 — Support activities for petroleum and natural gas extraction	Y – 211 Y – 21311A
Oil refineries	Division: 19 — Manufacture of coke and refined petroleum products	Y – 32411
Charcoal plants[3]	Class: 2011 — Manufacture of basic chemicals	N – 335229
Biogas production plants[4]	Group: 352 — Manufacture of gas; distribution of gaseous fuels through mains	N
Nuclear fuel extraction and fuel processing	Class 0721 — Mining of uranium and thorium ores Class: 2011 — Manufacture of basic chemicals	Y – 21229 N – 325189
Other energy industry not elsewhere specified[5]	Class: 0892 — Extraction of peat Class: 3520 — Biofuels processing facilities Class: 4661— Wholesale of solid, liquid and gaseous fuels and related products ….	N – 212397 N – possible NAICS in 2017 proposal N – 4121 possible addition to aggregate

1. Also including the distribution of electricity and heat to consumers.
2. Also including the distribution of these gases.
3. The provided ISIC link refers to the production of charcoal through distillation of wood. If charcoal is produced in the forest using traditional methods, the activity would be classified in ISIC 0220 – “Logging”.
4. Plants having the production of biogases as their main activity would be classified in ISIC class 3520, as indicated in the table above. However, biogases may also be produced as by -products of other activities, such as those classified in ISIC 3700 - “Sewerage” and 3821 – “Treatment and disposal of non-hazardous waste”.
5. The given ISIC link provides an example, namely the extraction of peat, but is not exhaustive.

Annex L. Categories of Energy Consumers and their ISIC and NAICS Correspondence

Energy consumers	Correspondence to ISIC Rev. 4	Correspondence to NAICS
Manufacturing, construction and non-fuel mining industries		
Iron and steel	ISIC Group 241 and Class 2431. Note that the consumption in coke ovens and blast furnaces are defined as part of Transformation Processes and Energy Industry Own Use.	3311
Chemical and petrochemical	SIC Divisions 20 and 21, excluding ISIC 2011. Note that the consumption by plants manufacturing charcoal or enrichment/ production of nuclear fuels (found in ISIC 2011) is excluded, as these plants are considered part of the energy industries.	237120
Non-ferrous metals	ISIC Group 242 and Class 2432	331410
Non-metallic minerals	ISIC Division 23.	327
Transport equipment	ISIC Divisions 29 and 30	336
Machinery	ISIC Divisions 25, 26, 27 and 28. Fabricated metal products, machinery and equipment other than transport equipment.	333
Mining and quarrying	ISIC Divisions 07 and 08 and Group 099, excluding the mining of uranium and thorium ores (Class 0721) and the extraction of peat (Class 0892).	212
Food and tobacco	ISIC Divisions 10, 11 and 12	311 and 312
Paper, pulp and print	ISIC Divisions 17 and 18. Includes production of recorded media.	3221
Wood and wood products (Other than pulp and paper)	ISIC Division 16	321
Textile and leather	ISIC Divisions 13, 14 and 15	313 and 31611
Construction	ISIC Divisions 41, 42 and 43	33312 and 4172
Industries not elsewhere specified	ISIC Divisions 22, 31, 32	?
Household	ISIC Divisions 97 and 98	3371 and 414
Commerce and public services	ISIC divisions: 33, 36-39, 45-96 and 99, excluding ISIC 8422	911910, 912910, 813910, 454110
Agriculture, Forestry	ISIC Divisions 01 and 02	11, 113
Fishing	ISIC Division 03	114
Defence activities	ISIC Class 8422	9111

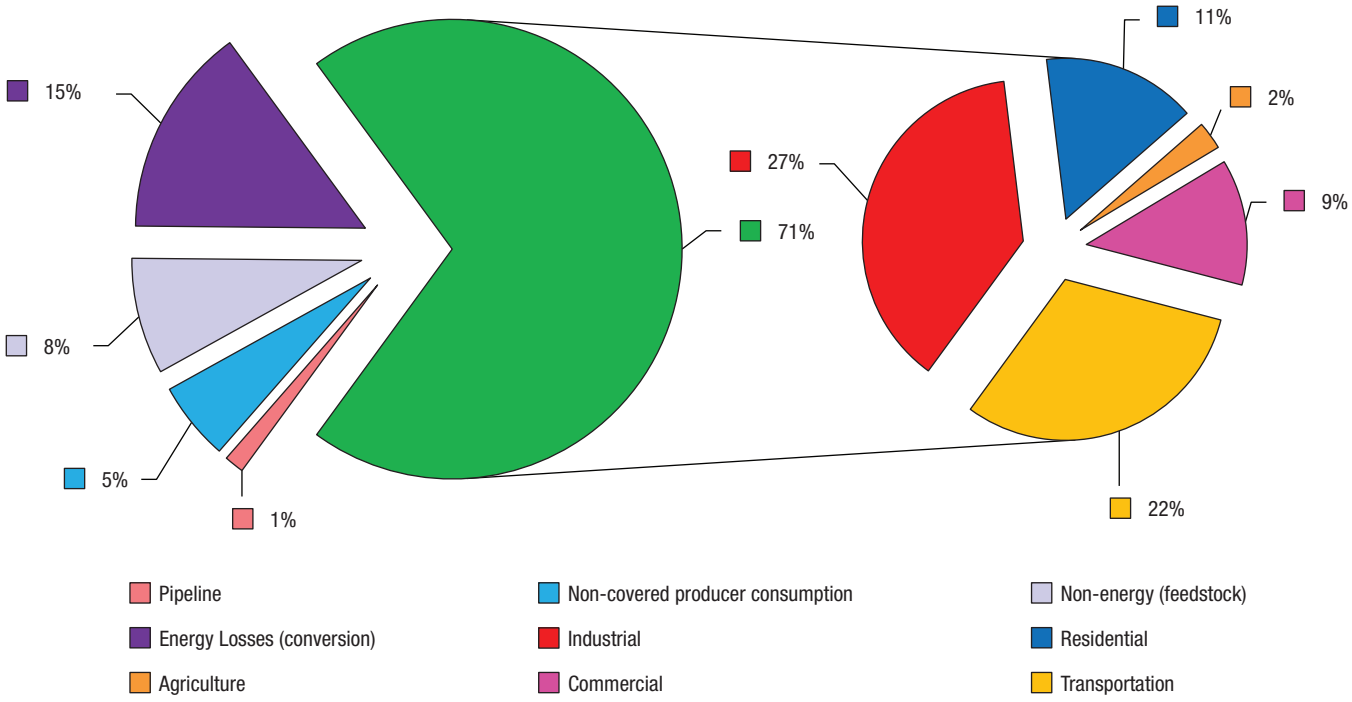
Annex M. Types of Energy Use

There are two general types of energy use: primary and secondary. Primary energy use encompasses the total requirements for all users of energy. This includes secondary energy use. Additionally, primary energy use refers to the energy required to transform one form of energy to another (e.g., coal to electricity).

It also includes the energy used to bring energy supplies to the consumer (e.g., pipeline). Further, it entails the energy used to feed industrial production processes (e.g., the natural gas used as feedstock by the chemical industries). In 2010, the total amount of primary energy consumed was estimated at 11,959.6 PJ.

Secondary energy use is the energy used by final consumers in various sectors of the economy. This includes, for example, the energy used by vehicles in the transportation sector. Secondary energy use also encompasses energy required to heat and cool homes or businesses in the residential and commercial/institutional sectors. In addition, it comprises energy required to run machinery in the industrial and agricultural sectors. Secondary energy use accounted for almost 71 percent of the primary energy use in 2010, or 8,479.1 PJ.

Primary and Secondary Energy Use by Sector, 2010 (percent)



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