

Adapted Goods paper

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Improving knowledge about the production and adoption of clean technology (CleanTech) has been identified as a priority by the federal government as a way to measure and track Canada's transition to a low-carbon economy. Statistics Canada (StatCan) has been working on the development of a Clean Technology Satellite Account (CTSA)¹ to provide Canadians with a broader economic picture of the Canadian clean technology sector.

Development of the satellite account is based on goods and services that are considered clean technologies and that fulfill Canadian government department's information needs. Clean technology refers to: *"any goods or services that reduce environmental impacts through environmental protection activities, through the sustainable use of natural resources, or through the use of goods that have been specifically modified or adapted to be significantly less energy or resource intensive than the industry standard."*

CHALLENGES

An important challenge we are currently facing is the identification and classification of "significantly less energy or resource intensive" or "game changing" adapted goods. This is in contrast to the relatively broad interpretation of adapted goods found in SEEA-CF 2012, which reads that adapted goods are, *"goods that have been specifically modified to be more 'environmentally friendly' or 'cleaner' and whose use is therefore beneficial for environmental protection or resource management"*.

What is a "significantly less energy or resources intensive" clean technology and, as importantly, what is the best way to identify these goods within the statistical system? For example, a particular turbine may be considered to be significantly improved compared to "the standard" based on one criteria but not another. Additionally, current goods classifications² do not distinguish between a more or less efficient or environmentally-friendly turbine. In fact, current classification systems do not identify goods are being 'standard' or 'non-standard', i.e. either below or above.

The purpose of this document is to share the outcomes of the study we conducted to evaluate how to measure adapted goods. Feedback from London Group members is welcome.

¹ Satellite accounts are based on the Canadian System of National Accounts (CSNA) and leverage some of the data produced within this system, most notably the supply and use tables (SUT). The CTSA will also incorporate other data sources such as existing commodity databases on exports and imports, as an example. 2007 to 2016 data will be released in December 2017.

² For example the North American Products Classification (NAPCS) and the Supply-Use Commodity Classification (SUCC).

OUTCOME

With the limited inclusion of adapted goods in the CTSA to those that are significantly less energy or resource intensive, it was determined that:

- Smaller-ticket items like recycled paper, biodegradable cleaning products, and energy-efficient home appliances would be excluded from the list.
- A list of energy-efficient products that fit the “significantly improved” goods description of adapted goods was determined to be the best approach.

But how do we define ‘energy-efficient’?

A RIGID DEFINITION approach (e.g. include all engines that use between 0 and 8 litres of gasoline per 100Km, for a given type of vehicle) was evaluated to be difficult to measure and would produce an unstable time series over time. An engine that uses 5 L of gas per 100 km may, in reality, progress from an advanced CleanTech product in year one, to a standard technology in year 5, and an energy-intensive technology in year 10; if this engine were not removed from the account by year 5 or 10, the account would no longer be a true representation of the CleanTech sector.

This idea that an adapted good could change from being classified as a CleanTech good to an energy-intensive technology over time (and therefore below the ‘standard’), raised the issue of modifying the list of adapted goods from year-to-year, to account for the continual improvement of certain adapted goods. High-level government and academic advisors raised concerns about frequent modification involving the deletion of (every 2-3 years) specific products from the account because this could cause artificial trends and/or breaks in the time series; rather, they advised that products should be left on the list in perpetuity because they would fall naturally out of the account (less and less supply) as they are replaced by cleaner products.

Standard definitions for each adapted good is one way to facilitate the natural movement of most types of products on and off the list without causing artificial peaks and valleys in the time series. A COMPARISON approach (e.g. engine that is at least 25% more efficient than the standard engine in its class) was assessed as preferable to the RIGID DEFINITION approach. Using a comparison to the normal good as a means of determining what is in and out of scope in the CTSA would allow for the natural drifting of items in and out of the account as today’s energy efficient goods become standardized and new technologies are developed that are even more efficient.

For this reason, wherever possible, **we recommend that the most efficient way to determine the threshold of what is in and out of scope in a given year would be to use a widely accepted pre-established program** such as ENERGY STAR³, or other eco-labeling program. Because ENERGY STAR updates its criteria over time as new products are invented, the definition of, for example, an ENERGY STAR gas boiler today applies to all boilers with an annual fuel utilization efficiency rating over 90%, but in 10 years this may be updated to include only boilers with efficiencies of 98% or greater. No matter the year, new gas boilers sold or purchased with the ENERGY STAR logo represent the “best (or most

³ ENERGY STAR is a labelling program administered and promoted in Canada by Natural Resources Canada and registered in Canada by the United States Environmental Protection Agency (EPA), identifies energy-efficient products in an attempt to help reduce greenhouse gas emissions.

efficient) in class,” so the definition would persist from year-to-year. Over time, the gas boilers that were only 90% efficient would naturally fall out of scope as they become the standard with technological advancement.

Table 1 (named Table 3.2a in our study) presents our proposition of a prioritized list of adapted goods including definitions that could be provided to respondents of the StatCan *Survey on Environmental Goods and Services*. This survey measures the supply-side of EGS while a future survey will measure the demand-side. Not all adapted goods are subject to the ENERGY STAR or eco-logo programs. For example, electric vehicles and hybrid vehicles are considered to be adapted goods to be included in the CTSA.

QUESTIONS TO LG MEMBERS

- How does your NSO / Organisation determine what the ‘industry standard’ is?
- How does your NSO / Organisation define adapted goods, specifically the identification of the “significantly improved” adapted goods?
- What is the LG member’s vision of the “natural drifting of items in and out” the list of adapted goods in order to stay relevant in accounting for the “game changing” adapted goods?
- Do you have any suggestions on our proposed use of a “widely accepted pre-established program” to determine threshold of what is in and out of scope in a given year?

Answers can be provided at the LG meeting, or later to Cindy Lecavalier, cindy.lecavalier@canada.ca.

TABLE 1

Table 3.2a - Client list of prioritized adapted goods, with detailed definitions and notes from StatCan

Sub-Industry	Technology Area / Type of Service	Improved definition (StatCan)
Efficient Industrial Equipment	High efficiency burners and boilers	High efficiency boilers identified by the ENERGY STAR logo (have an annual fuel utilization efficiency of 87% or greater for oil boilers and 90% or greater for gas boilers) ^{1,2/} Commercial boilers identified by the ENERGY STAR logo (thermal efficiency of at least 94% and a turndown rate of 5:1). ¹
	High efficiency pumps and motors	High-efficiency heat pumps identified with the ENERGY STAR logo (differ by type, but use at least 5% less energy than traditional pumps). ^{1,2} / High-efficiency motors identified by the NEMA Premium™ label (product must exceed a set of minimum full-load efficiency levels, different for different sized motors). ^{3,4,5,6}
	High efficiency industrial HVAC ⁷	Light commercial HVACs identified with an ENERGY STAR logo. ^{1,8}
	High efficiency industrial lighting system	Commercial light fixtures identified by the ENERGY STAR logo (use at least 75% less energy and lasts 10-50 times longer than incandescent lighting and comes with a minimum three-year warranty) ¹
	Batteries for portable devices	It is recommended that this item be removed from the list for the CTSA since it does not meet the requirement of a "game changing" adapted good, as per the directives of the ad-hoc technical working group.
Efficient Commercial/ Residential Equipment	High efficiency commercial/residential HVAC	Light commercial HVACs identified with an ENERGY STAR logo. ^{1,8} (see above) / Central air conditioners identified with an ENERGY STAR logo (use 8% less energy than conventional new models) ^{1,2} / Furnaces identified with an ENERGY STAR logo (16% more efficient than baseline models for gas models and 4% more efficient for oil furnaces). ^{1,2} / Commercial refrigerators and freezers identified with an ENERGY STAR logo (20% more efficient than standard models). ^{1,2}
	High efficiency lighting system	Commercial light fixtures identified by the ENERGY STAR logo (use at least 75% less energy and lasts 10-50 times longer than incandescent lighting and comes with a minimum three-year warranty) ¹ (see above)
Fuel Efficient Automotive Equipment	Fuel efficient engines and components (including electrification and hybrids)	All electric and hybrid cars are to be included in the list of adapted goods. All components that go into the making on electric and hybrid cars would be intermediate inputs rather than adapted goods.
	Electric vehicle battery	Electric vehicles themselves would be categorized as adapted goods. EnerGuide labels are placed on battery-electric vehicles. ⁹ However, the battery itself would be in intermediate input, as would all other materials used to make the car.
	Electric vehicle other components	In theory, the electric vehicles themselves are the adapted good. The components that go into the making of the cars would be considered intermediate inputs. All electric vehicles are considered in scope in the CTSA.
	Fuel cell vehicle FC stack	(see above)
	Fuel cell vehicle other components	(see above)
	Automobile components using lightweight materials	Hybrid and electric vehicles are considered in scope in the CTSA at the present time. The components that go into the making of the cars would be considered intermediate inputs. Gasoline powered cars and car components are, for the most part, excluded from the list of adapted goods at this time.
	Electric vehicle infrastructure (charging stations)	Level 1 and Level 2 EV chargers identified with an ENERGY STAR logo. ¹ It is up for debate about whether or not all charging stations would fall under the category of adapted goods. Further research and discussion is required.
Alternative fuel (including hydrogen & natural gas) refuelling infrastructure	In theory, hydrogen vehicles should be considered as adapted good, as would hydrogen refuelling infrastructure. The components that go into the making of the cars would be considered intermediate inputs. Vehicles that burn natural gas burn cleaner than gasoline-burning vehicles, but they are not using renewable fuel nor are they as clean as electric cars. Further research and discussion is required on this product.	

1- Energy Star. 2017. Certified products (online). <https://www.energystar.gov/products?s=mega>. Accessed 2017, July 4-27.

2 - Natural Resources Canada. 2017. Searchable product list

3 - National Electrical Manufacturers Association

4 - After conducting a feasibility study, the EPA decided not to pursue an ENERGY STAR label for integral horsepower electric motors.

5 - NEMA (National Electrical Manufacturers Association). No date. NEMA premium motors (online). <https://www.nema.org/Policy/Energy/Efficiency/Pages/NEMA-Premium-Motors.aspx>. Accessed 2017, July 18.

6 - U.S. Department of Energy Efficiency and Renewable Energy Advance Manufacturing Office. 2014. Premium efficiency motor selection and application guide - a handbook for industry (online). https://energy.gov/sites/prod/files/2014/04/f15/amo_motors_handbook_web.pdf. Accessed 2017, July 18.

7 - heating, ventilation, air conditioning and refrigeration

8 - The NRCAN webpage on HVAC and Energy Systems does not include any additional information on how to identify energy efficient HVAC systems. NRCAN, 2016. HVAC & energy systems (online). www.nrcan.gc.ca/energy/efficiency/housing/research/3937. Accessed 2017, July 19.

9 - NRCAN. 2017. EnerGuide label for battery-electric vehicles (online). www.nrcan.gc.ca/energy/efficiency/transportation/cars-light-trucks/buying/19414. Accessed 2017, July 19.

Table 3.2a (cont.) - Client list of prioritized adapted good, with detailed definitions and notes from StatCan

Sub-Industry	Technology Area / Type of Service	Improved definition
Fuel Efficient Automotive Equipment (cont.)	LNG/CNG engine	In theory, hydrogen vehicles should be considered as adapted good, as would hydrogen refuelling infrastructure. The components that go into the making of the cars would be considered intermediate inputs. / Natural gas, while cleaner than gasoline, is not a renewable resource. Therefore, the inclusion of natural gas buring cars and the associated infrastructure on the list of adapted goods is up for debate.
	LNG/CNG tank	In theory, hydrogen vehicles should be considered as adapted good, as would hydrogen refuelling infrastructure. The components that go into the making of the cars would be considered intermediate inputs. / Natural gas, while cleaner than gasoline, is not a renewable resource. Therefore, the inclusion of natural gas buring cars and the associated infrastructure on the list of adapted goods is up for debate.
	LNG/CNG control system	Only hybrid and electric vehicles are considered in scope in the CTSA at the present time. Gasoline powered cars and car components are, for the most part, excluded from the list of adapted goods at this time.
	Aerodynamic device	Only hybrid and electric vehicles are considered in scope in the CTSA at the present time. Gasoline powered cars and car components are, for the most part, excluded from the list of adapted goods at this time.
	Auxiliary power unit	Hybrid and electric vehicles are considered in scope in the CTSA at the present time. Gasoline powered cars and car components are, for the most part, excluded from the list of adapted goods at this time.
	Engine control module	Hybrid and electric vehicles are considered in scope in the CTSA at the present time. Gasoline powered cars and car components are, for the most part, excluded from the list of adapted goods at this time.
	Low rolling resistance tire	In theory, all low rolling resistance tires should be included in the list of adapted goods.
Fuel Efficient Aerospace Equipment	Efficient turbine	There is continuing development in order to design more efficient turbines for a variety of fuels (hydrogen, syngas, natural gas, and other liquids.) However, there are currently there are no set efficiency standards put in place. It is recommended that NRCan and/or ISED provide more detail on what specific types of turbines to include in the list of adapted goods.
	Fuel efficient engines (including electrification and other alternative fuels)	There are continued developments but there isn't set efficiency standards put in place. It is recommended that NRCan and/or ISED provide more detail on what specific types of fuel-efficient engines to include in the list of adapted goods or remove this item from the list.
	Additive composite	There are a growing number of aircraft parts that are made from composite materials. These parts are made by laying down materials in layers. Parts made of composite materials are lighter thus resulting in greater aircraft fuel efficiency. It is suggested that this item be removed from the list.
	Aircraft components using lightweight materials	Aircraft components using lightweight materials can result in fuel efficiency. More research would be required to determine a list of acceptable products. It is recommended to remove this item from the list of adapted goods.
	Powder metallurgy, coatings, polishing, anodizing for fuel efficiency	Aircraft coatings can result in increased fuel efficiency and slow weathering and corrosion. ¹⁰ This item does not seem to fall under the heading of adapted good. If the main purpose of the product is to increase fuel efficiency, the product would simply be an environmental good (but perhaps a plane that has the coating would be an adapted good.) It is recommended to remove this item from the list of adapted goods.

10 - American Chemistry Council. 2017. Aliphatic diisocyanates - Did you know? Aircraft coatings (online). <https://adi.americanchemistry.com/Did-You-Know/Aircraft-Coatings.html>. Accessed 2017, July 19.