



Energy Research & Development Expenditures by Area of Technology, 2007

Reporting unit name and address

Si vous préférez ce questionnaire en français, veuillez cocher

Please correct any mistakes in name or address.

INFORMATION FOR RESPONDENTS

Survey objective

This survey collects data which are essential to assure the availability of pertinent statistical information to monitor science and technology related activities in Canada and to support the development of science and technology policy. Your data will be used, for instance, by the Office of Energy Research and Development (OERD) at Natural Resources Canada to plan and evaluate energy research and development programs. The results of this survey will be published in "Industrial Research and Development" (Cat. No. 88-202-XIE).

Authority

This survey is conducted under the authority of the *Statistics Act*, Revised Statutes of Canada, 1985, Chapter S19.

Legal requirement

Completion of this questionnaire is a legal requirement under the *Statistics Act*.

Confidentiality

Statistics Canada is prohibited from publishing any statistics which would divulge information relating to any identifiable organization without the previous written consent of that organization. The data reported on this questionnaire will be treated in strict confidence, used for statistical purposes and published in aggregate form only. The *Access to Information Act* or any other legislation does not affect the confidentiality provisions of the *Statistics Act*.

Federal/Provincial Agreements

In order to avoid duplication of enquiry, to reduce the cost of data collection and to provide consistent statistics, Statistics Canada has entered into agreements with:

- the Institut de la statistique du Québec (ISQ), under Section 11 of the *Statistics Act*, to share data from organizations located or having research and development (R&D) activities in Québec. The *Act Respecting the Institut de la statistique du Québec* includes the same provisions for confidentiality and penalties for disclosure of information as the federal *Statistics Act*.
- the OERD, under Section 12 of the *Statistics Act*, for the joint collection and sharing of information. The OERD shall keep the information confidential and use it for statistical purposes only. Under Section 12, you may refuse to share your information with the OERD by writing a letter of objection to the Chief Statistician of Canada and returning it with your completed questionnaire.

Reporting period and coverage

This questionnaire should be completed for the **2007 fiscal year**. This report should exclude foreign operations. Please report all amounts in **Canadian currency**.

Planned Data Linkage

In order to enhance the analytic possibilities of this survey, Statistics Canada intends to combine the information from the Research and Development in Canadian Industry Survey with the information your organization provided on the Energy R&D Expenditures by Area of Technology Survey, if applicable, and with information from other surveys or from administrative records.

DEFINITION

For the purpose of this questionnaire, R&D is given the same definition as that provided on the **DEFINITION SHEET** with the following qualifications intended to restrict the response to energy:

- Energy R&D** is aimed at increasing conservation through efficiency of use (not through deprivation), increasing supply and improving the efficiency of conversion and transportation of energy.
- Excludes R&D** on socio-economics, environmental protection (except reduction of pollutants emitted by energy systems), safety and resource assessment.

In 2007, did this reporting unit perform or fund any energy R&D, as defined above?

- Yes ► Please estimate the approximate expenditures for the items 1 to 8, complete certification and return with the **completed** main "Research and Development in Canadian Industry" (blue) questionnaire. Include all current and capital expenditures.
- No ► Please complete certification (on page 2) and return this report along with the **completed** main "Research and Development in Canadian Industry" (blue) questionnaire.

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Energy R&D by area of technology (See definition sheet)	2007 Expenditures on energy R&D done within this reporting unit				2007 Energy R&D payments outside Canada
	Self-funded	Government funded	Funded by other sources	Total	
1. Renewable resources:	(CAN\$ thousands)				
a) Solar energy:					
(i) Photovoltaics					
(ii) Thermal					
b) Bioenergy					
c) Wind energy					
d) Hydro:					
(i) Small < 10 Mw					
(ii) Large >10 Mw					
e) Other renewable resources					
2. Transportation and transmission:					
a) Transportation of energy commodities					
b) Conversion, transmission and distribution of electricity					
3. Conservation:					
a) Residential and commercial buildings					
b) Transportation					
c) Industrial processes					
d) Other conservation					
4. Fossil fuels:					
a) Crude oils and natural gas:					
(i) Exploration and production (excluding enhanced recovery)					
(ii) Production by enhanced recovery					
b) Oil sands and heavy crude oils:					
(i) Production and separation of the bitumen, tailings disposal					
(ii) Upgrading					
c) Refining					
d) Coal					
e) CO ₂ capture and storage					
5. Nuclear:					
a) Fuel exploration, mining and preparation					
b) Energy generation					
6. Other cross-cutting techniques or researchn.					
a) Energy system analysis					
b) Others (R&D on environment, climate change)					
c) Energy storage (fuels, batteries)					
d) Alternative transportation fuels					
7. Non-energy R&D					
8. Total energy and non-energy R&D					

1. Should equal total federal and provincial funding.
2. Should equal the 2007 total expenditures of question 5 on main "Research and Development in Canadian Industry" (blue) questionnaire (question 3 if on a Non-profit Institute questionnaire).
3. Should equal the 2007 R&D payments **outside Canada** on main "Research and Development in Canadian Industry" (blue) questionnaire.

CERTIFICATION

Name of person who completed this report (please print):		Business address:			
Official position:	Date:	Postal Code:	Telephone No.:	Extension:	
Email address:	GST Number (BN No.):		Fax.:		

The results of this survey will be published in "Industrial Research and Development" (Cat. No. 88-202-X1E)

THANK YOU FOR YOUR CO-OPERATION



Energy Research & Development Expenditures by Area of Technology, 2007

DEFINITIONS

(Definitions below correspond to the area of technology items listed on page 2 of this questionnaire.)

1. RENEWABLE RESOURCES

- a) **Solar energy** includes passive, active, photovoltaics, and daylighting.
 - (i) **Solar photovoltaics:** design, construction and operation, use in applications such as stand alone power systems, improving the architectural and technical quality of PV systems and their economic viability.
 - (ii) **Solar thermal and cooling:** includes solar thermal collectors, heat storage, and building daylighting.
- b) **Bioenergy** includes forest and agricultural biomass including plantations, harvesting and conversion. Includes production and combustion of biomaterials.
- e) **Other renewable resources** – Examples: geothermal; ocean.

2. TRANSPORTATION AND TRANSMISSION

- a) **Transportation of energy commodities** includes pipelines conveyors or vehicles (including ships and railways), and associated storage, and safety aspects of liquefied natural gas.
- b) **Conversion, transmission, and distribution of electricity** includes conversion of shaft energy to electricity, storage of electricity, and air pollution from power plants; excluding CO₂.

Typical examples:

- turbo-engines, multifuel gas turbines, conventional and combined cycles;
- super-conducting generating machines;
- magnetohydrodynamic conversion;
- heat/electricity combined production;
- electricity generators and components;
- dry cooling towers;
- re-powering, retrofitting, life extensions and upgrading of fossil fuel power plants;
- thermal pollution from power plants;
- air pollution from power plants;
- boiler R&D;
- solid state power electronics, load management and control systems, network problems, superconducting cables, AC and DC high voltage cables, HVDC transmissions;
- all high temperature superconducting research.

3. CONSERVATION

- a) **Residential and Commercial buildings** includes space heating and cooling, ventilation and lighting control systems other than solar technologies, low energy housing design and performance other than solar technologies, new insulation and building materials, thermal performance of buildings, and domestic appliances.
- b) **Transportation** includes analysis and optimization of energy consumption in the transportation sector, public transportation systems, engine-fuel optimisation, diesel engines, and Stirling motors.
- c) **Industrial processes** includes industrial technologies such as combustion, separation, end-use electrotechnologies, hybrid processes, sensors and controls, process integration, bio-processes (using micro organisms).
- d) **Other** includes waste heat utilization, district heating, heat pump development, recycling and user of urban and industrial wasters, and use of wastes and low-temperature heat in the agricultural sector (drying, glasshouses).

4. FOSSIL FUELS

- a) (i) **Exploration and production** excludes enhanced recovery; also excludes delivery to the refinery gate which is included as part of "Transportation of energy commodities" in this questionnaire.
- (ii) **Production by enhanced recovery** includes incremental recovery of crude oils and/or natural gas by any secondary or tertiary means as distinct from primary recovery by natural depletion processes only.
- c) **Refining** includes refining, processing and cleaning of crude oils and natural gases, and residual fuel upgrading; excludes bitumen upgrading.
- d) **Coal** includes supply (exploration, mining and beneficiation including slurry preparation); combustion (including environmental control and coal slurries); and conversion (to solids, liquids and gases, including coprocessing of coal and bitumen). Excludes transportation to point of use, which is included as part of "Transportation of energy commodities" in this questionnaire.
- e) **CO₂ capture and storage** includes purification of site specific anthropogenic CO₂ emissions, transport of a concentrated CO₂ waste stream and storage of the CO₂ by injection into deep geological media that could be active or depleted oil, gas and coalbed methane reservoirs, saline aquifers and salt caverns.

5. NUCLEAR – (Includes both fission and fusion energy)

- b) **Energy generation** includes generation of electricity and heat by nuclear reactors, and safety and waste management.

6. OTHER CROSS-CUTTING TECHNIQUES OR RESEARCH

- a) **Energy system analysis** includes system analysis related to energy R&D: sociological, economical and environmental impact of energy which are not specifically related to one technology area listed in the section above.
- b) **Others (R&D on environment, climate change)** includes science of climate change, energy technology information dissemination, and studies not related to a specific technology area listed above.
- c) **Energy storage (fuels, batteries)** includes all forms of energy storage; including superconducting, magnetic, hot or cool, and kinetic energy storage technologies.
- d) **Alternative transportation fuels** includes use of alternative fuel, fuel additives, hydrogen, electric cars, hybrid cars and biofuels use (includes for transportation purposes: bio-fuels properties and utilisation, distribution of ethanol; for power production: cofiring, direct combustion, gasification).