

CHALLENGE REGISTRY

GUIDE TO ENTITY & FACILITY-BASED REPORTING



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CANADA'S CLIMATE CHANGE
voluntary challenge & registry

170 Laurier Ave West, Suite 600, Ottawa, Ontario K1P 5V5
Tel.: (613) 565-5151 ■ Fax: (613) 565-5743

www.vcr-mvr.ca

President's Message

This guideline is the second edition of our Registration Guide. It is intended as a generic handbook for submitting an Action Plan for posting in the Challenge Registry utilizing our Champion Level Reporting system.

Embodied within this guide is our judgement of current best practice in the measurement and reporting of Greenhouse Gas emissions. It reflects the evolutionary work of technical bodies throughout Canada and around the world in the development of standard measurement protocols. We have been deliberately conservative in the magnitude of estimated emission reductions in order to provide a default approach to calculation for those who do not have specific emissions data to support a more accurate methodology.

You will note that we are numbering the versions of this guide in order to allow us to modify its content on an on-going basis throughout the year. We are an active member of the *Canadian Advisory Committee* which is supporting the creation of ISO Guidelines for Measuring, Reporting and Verifying Entity- and Project-Level Greenhouse Gas Emissions and will be bringing identified "best practice" into this document as this study progresses. The re-draft of our Guide has already been influenced by the comprehensive work of the *World Business Council for Sustainable Development* and the *World Resource Institute* published in their GHG Protocol.

In order to provide a level playing field for those who are striving for one of our Leadership Awards, the grading template for our Champion Level Reporting system will only be modified annually to be effective November 1 of each year.

In addition to this document, there are guidelines and reporting templates developed for specific industry sectors and GHG management programs available on our website. These include sector-specific calculation methodologies and industry intensity values. For information concerning VCR Inc.'s project-based Reductions Registry, the Canadian Government's Baseline Protection Registry, and the Credit Registry, visit the VCR Inc. website at www.vcr-mvr.ca and click on [Register at VCR](#).

This living document will benefit greatly from your input and comment. Please contact our office by e-mail at info@vcr-mvr.ca with your suggestions for improvement.

Best regards,



Robert A. Flemington, P. Eng., President

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In order to foster consistency in the measurement, reporting and verification of GHG emissions, reductions, and avoidance we have adopted "best practice" text from a broad range of sources and have attempted to give due credit. If you feel you have a better source please bring it to our attention for review.

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Frequently Asked Questions (FAQs) About Action Plans

Below is a list of questions frequently asked by organizations preparing an Action Plan.

Q. Do I have to use 1990 as my Base Year?

A. No, you can use any year that is convenient for your entity or facility. 1990 is recommended because it coincides with the baseline used in the Kyoto Protocol. The choice of your Base Year will depend on many factors, including:

- Whether you have the energy consumption and other data for that period
- Whether that year included unusual activity such as a labour strike, acquisition or divestiture of businesses, disruption in schedules, etc.

You would likely choose a year that represents the 'normal' operation before you began significant activities designed to reduce GHG.

Q. Do my Base Year and reporting periods need to be calendar years?

A. No, many organizations collect information based on a fiscal period (April to March, for example). If you find this a more convenient reporting period, then by all means use that for your reporting.

Q. What is the difference between Direct and Indirect Emissions?

A. Direct emissions are those emissions that are directly released by your organization. This would include burning of fossil fuels in heating buildings, running plants and processes and operating vehicles. It would also include methane released from on-site landfills and fugitive emissions from natural gas pipelines.

Indirect emissions are those associated with an outside organization that supplies energy or services. Electricity generation is most common, but off-site steam generation and district heating systems may also be considered indirect emission sources. Other examples of indirect emissions are business-related air and rail travel, emissions related to transportation of goods, and emissions related to waste decomposition. For many manufacturing companies their biggest impact on GHG emissions may be through reducing these indirect emissions.

Q. Are emissions factors available?

A. Yes, please refer to Section [9. Emission Factors](#) of this guide, where nationally recognized emission factors are listed, especially for burning of fossil fuels. If the units or energy types used by your organization to measure fuel or energy are not included in our Emission Factors Tables, please contact our office. We may be able to help you to find or generate custom emissions factors.

Q. Where can I find standard reporting spreadsheets or tables for reporting?

A. Software applications such as spreadsheets may make data gathering and reporting easier. The same spreadsheet could also capture results, projections and Targets. VCR Inc. has modified a spreadsheet originally developed by NRCan Office of Energy Efficiency. It is intended to help small and medium-sized enterprises (SMEs) in developing their Action Plans based on electricity and fossil fuel consumption. It is available from www.vcr-mvr.ca/tools_e.cfm. You can also see how others in your industry are reporting data by viewing their Action Plans at the VCR Inc. website. As well, industry-specific spreadsheets may be shared through trade associations or government departments. VCR Inc. will post these spreadsheets and reporting templates, if they are available.

Q. Do Registrants have to Target 6% emissions reduction by 2008-2012?

A. No, VCR Inc. never recommends specific Targets for Challenge Registry participants. VCR Inc. is not directly linked to the Kyoto protocol, the proposed national Target, or the official Canadian GHG emissions inventory. Each registrant should set Targets based on their own best judgement.

Q. Are all reports eligible for VCR Inc. 's Annual Leadership Awards?

A. Virtually all reports registered are eligible for our annual Leadership Awards, with a few exceptions. Organizations that won a specific Leadership Award the previous year are not eligible. Organizations whose entire report has been designated confidential information or includes confidential information are also ineligible, since the Leadership Awards Judging Panel evaluates public documents only. VCR Inc. uses a reporting year of November 1 to October 31 to determine which submissions are considered for each year.

Q. What is the best way to use the electricity emission factors?

A. Because the electricity emission factors (Section [9. Emission Factors](#)) change each year, this will affect the indirect emissions from your electricity consumption. In order to show your total GHG inventory, you can use the factor for each year and apply it to the electricity consumption for that year. However, the factor may overstate or understate your success, depending on the difference between the emission factor for your Base Year compared to the year that you are reporting.

In addition, when plotting historical trend lines, the Champions in Action group recommends that the most recently available average grid electricity emission factor be applied to all previous years' data. This meets two important goals:

- For the current reporting year, it shows the most accurate emissions.
- For all reporting years, it shows the level of performance improvement over time.



You can gain points for describing what method you used in calculating your indirect electricity emissions.

Q. What are the differences between N₂O, NO, NO₂ and NO_x?

A. When fuels are burned in air, the nitrogen and oxygen are combined together. The products are commonly referred to as oxides of nitrogen - NO, NO₂ and are generally known as NO_x. These are pollutants that contribute to acid rain and smog, but are not considered greenhouse gases. Nitrous oxide, N₂O, also known as laughing gas, is a combustion by-product and is considered a greenhouse gas. Although produced in small quantities, it has a global warming potential about 310 times greater than CO₂.

Q. How accurately should I measure GHGs?

A. VCR Inc. does not recommend a specific accuracy level, either in the total amount of your organization's GHGs (e.g. 95% of all emissions from company operations) nor in the accuracy of the individual values (e.g. 250 tonnes ±10 tonnes). However, you may want to perform two calculations:

- A materiality test to estimate the amount of GHG emissions from each activity and compare with the total. This will give you some idea of the size of some of the smaller emission sources you may want to exclude.
- Uncertainty calculations to estimate the variation in the emissions numbers that you are reporting.

Q. How can I measure GHGs from company vehicles?

A. There are two different methods that have been used to measure vehicle emissions:

Fuel Consumption: You would sum up the amount of gasoline, diesel, etc. that is used by your vehicles, based on receipts or invoices, then apply the appropriate emission factor as listed in Section [9. Emission Factors](#) of this guideline.

Distance Traveled: If you don't have all the fuel invoices, but do know the amount of distance traveled, then add up the distance traveled for each vehicle (or vehicle type), apply a vehicle fuel consumption factor (litres per 100 km) and then multiply by the emission factor from the table in Section [9. Emission Factors](#).



Vehicle fuel consumption values for automobiles and light duty trucks can be found at the NRCAN website <http://oee.nrcan.gc.ca/autosmart/>. In addition, they have an on-line GHG calculation tool for vehicles.

Q. How can I measure GHGs from company air and train travel?

A. Factors are listed in Section [9. Emission Factors](#) that can be applied to the distances you travel on business.

Q. If I report indirect emissions, is there a possibility of double counting?

A. VCR Inc. encourages registrants to report both Direct and Indirect emissions separately where possible. While your organization does not bear full responsibility for indirect emissions (such as those from purchased electricity), it is useful to track these emissions as part of your organization's overall GHG profile. Because VCR Inc.'s Challenge Registry is not a basis for Canada's national greenhouse gas inventory, there is no difficulty in reporting indirect emissions. We do perform some analysis in our Annual Report for different sectors where we list the estimated Direct and Indirect emissions from various sectors. However, since almost all Canadian electrical utilities report to VCR Inc., we make sure that we don't double count their emissions when doing our summations.

Q. How do I include the emissions from acquisitions and/or divestitures?

A. If you purchase another company, take control of another facility or sell part of your company after your Base Year, the best way to incorporate these changes is by adjusting results or baseline information for each year affected. You would make changes to the data as if the current situation occurred in previous years. There may be some educated guesswork that you need to do in determining the GHG emissions from past actions, but the intent is to report emissions as if that acquisition or divestiture was there since the Base Year.



There is a further discussion and good examples of this in the GHG Protocol at www.ghgprotocol.org.

Q. What is the difference between actuals, projections, and Targets?

A. The actual emissions refer to the annual GHG gases that were released by your organization, including Direct and Indirect emissions. Projections and forecasts are estimates of GHG emissions, usually in future years that you would have released if you had done nothing to reduce these gases. Projections are also referred to as 'Business as Usual', 'Reference Case', 'Without Emission Reductions' or 'Frozen Efficiency Forecast'. A Target usually refers to a future emission amount that you are aiming to release once you have implemented any reduction strategies.

Organizations often will define Targets using a performance indicator or intensity value (GHG per unit of output) as that may be a better measure of how well the organization is meeting its commitments.

Q. What does CO₂e stand for?

A. CO₂e means CO₂ equivalent units. Because different gases warm the atmosphere in different manners, they are expressed using a single unit of measurement - CO₂e. Section [8, Table 2](#) has a table of global warming potential (GWPs) for most greenhouse gases. The GWPs may be adjusted as the science of climate change is understood better. We encourage you to list the individual greenhouse gases separately, you can always adjust using the most current GWP factors.

Q. What things should I look out for when 'rolling-up' facility or project data into my Action Plan?

A. If your company has a number of facilities, departments or emission reduction projects, there are a few things you will want to check as you sum up the results into an entity-based report:

- Have consistent emission factors been used?
- Has the same time period been used in calculating emissions?
- Have consistent units and methodologies been used?

Q. What is an offset and how can I use it?

A. In spite of your company's best efforts, it can be difficult to meet the Targets you have set based on actions you can take within your own operations. In some cases you may want to use or purchase emission reductions that others have done and use that to 'offset' or reduce your own total emissions. VCR maintains that you can claim an offset if:

- You have spent money creating the emission reduction or removal and
- You can quantify the amount of emissions reduced/removed

Offsets would include such things as supporting tree planting, spending money for employees to telework or use bicycles, public transport or car pools, displacing grid based electricity by selling excess electricity from a cogeneration plant and purchasing registered emission reductions from a validated project.

1. What is the Registration Procedure?

When our office first receives an Action Plan, we begin by acknowledging its receipt and posting it in our Challenge Registry as received. All submissions are posted publicly on our Web site at www.vcr-mvr.ca. Anyone with access to the Internet may read them. Confidential elements may be registered, but not posted.



Should you choose to entrust us with confidential information, it is up to you to bring this requirement to our attention. It is our practice to post all reports in their entirety unless instructed to do otherwise.

Once the initial posting has been completed we compare the elements included in the report against the Checklist found in Section [5. Champion Reporting Checklist](#) of this guide. We assess whether or not the report qualifies to be awarded Bronze, Silver or Gold Champion Level Reporting status. If you earn Champion Level Reporter status, you will be notified of the results of our review through a letter and will have the opportunity to add new elements to your report at any time in an iterative process of continuous improvement. An on-line registration feature is available on our web site, which allows you to update your files electronically whenever new information becomes available. Champion Level Reporters are recognized in the Registry by including the appropriate logo on the front page of your electronic file.

You may provide us with new information to upgrade your reports at any time; however, only those reports that are received between November 1st of the previous year and October 31st of the current year will be considered by our judging panel for the VCR Inc. Leadership Award selection (see Section [6. Leadership Awards](#) for further details about the Leadership Awards selection process).

We register all entity and/or facility-based reports, whether they are from a single operation or from an integrated corporation. Several large organizations have chosen to delegate VCR Inc. reporting to individual subsidiaries, business units or facilities to create an internal challenge among them to 'Go for Gold!' and have provided appropriate internal incentives to those who achieve this level. We will recognize Bronze, Silver or Gold status reports regardless of the boundaries chosen for reporting.

Comprehensive Action Plans should include all of the following:

- A commitment to the VCR Inc. mission,
- A commitment to regular reporting,
- A baseline quantification,
- Business as Usual Projections,
- Targets, and
- Results achieved

Templates have been developed that will allow you to update contact information, as well as submissions in real-time, in a password-protected environment.

2. Building Your Action Plan

The three minimum reporting requirements to be considered a registered participant in the VCR Inc. Challenge Registry are:

1. A signed statement of endorsement
2. A commitment to regular reporting (preferably annual)
3. A Base Year quantification

When we receive your Action Plan, we grade the depth of it using our Champion Reporting Checklist (see Section [5. Champion Reporting Checklist](#)). This allows you to qualify your organization as a Bronze, Silver or Gold Champion Level Reporter. In addition to the minimal registration requirements listed above, Champion Level Registrants must include:

- A commitment to setting and quantifying Targets
- A listing of key activities and projects to achieve those Targets
- A reporting of results within one year of commitment

There are eight steps that you should follow in preparing your Action Plan:

1. Obtain senior management support
2. Develop an inventory
3. Establish Business as Usual Projections
4. Set Targets
5. Identify measures to achieve Targets
6. Record results achieved
7. Describe your education, training and awareness programs
8. Submit your action plan

VCR Inc.'s Standardized Reporting template (see [Appendix 2: VCR Inc. Challenge Registry Sample Reporting Template](#)) can assist you in developing your Action Plan to address these steps. As well, several other organizations and programs have drafted sector- or program-specific templates. All templates are posted on the VCR Inc. web site. For more information, visit www.vcr-mvr.ca and click on [Register at VCR](#).

2.1 Principles

As a general guide to the preparation of your Action Plan we would recommend the following principles found in the *World Council for Sustainable Development* and *World Resources Institute* (WBCSD/WRI) "Greenhouse Gas Protocol":

1. **Relevance:** Define boundaries that appropriately reflect the greenhouse gas emissions of your organization and the needs of your organization and others who will read your Action Plan.
2. **Completeness:** Account for all greenhouse gas emission sources and activities within the chosen organization and operational boundaries. Any specific exclusion should be stated and justified.

3. **Consistency:** Allow meaningful comparison of emissions performance over time. Any changes to the basis of reporting should be clearly stated and appropriately adjusted in order to facilitate continued valid comparison.
4. **Transparency:** Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Important assumptions should be disclosed and appropriate references made to the calculation methodologies used.
5. **Accuracy:** Exercise due diligence to ensure that greenhouse gas calculations have the precision needed for their intended use, and provide reasonable assurance on the integrity of the reported greenhouse gas information.

2.2 Reporting Baselines, Business as Usual Projections, Targets and Results

2.2.1 Boundaries

In order to properly define the data gathering required for completing your Action Plan it is essential to clearly establish boundaries around the operations being tracked. In addition, you need a consistent method of accounting for the dynamic changes in these boundaries that you may experience due to acquisitions, divestitures, shutdowns, and other substantive changes that occur over time.

Geographic Boundaries

Since VCR Inc. is the Canadian registry for actions that affect the national inventory; include only those GHGs emitted, reduced, sequestered or avoided that would impact the *Canada's Greenhouse Gas Inventory*. That is, any GHG emission activity inside Canadian borders should be captured in your Action Plan.

Organizational Boundaries

Coordination of reduction activities is being undertaken at both the Federal and Provincial levels in Canada. As a result, it is recommended that your data be gathered and reported by identifying the emissions from each facility within your corporate umbrella such that this information can then be 'rolled-up' into provincial, national and entity-based reporting formats.

Your organization may be structured with a variety of wholly owned, partially owned, joint ventured, and other entities. You will need to decide what will and will not be included in your Action Plan with respect to each of these situations.

We suggest that if you have majority control of the operation of a facility or another entity, you include 100% of the GHG emissions in your plan. If you have significant influence over another facility or entity, you should include a portion of these emissions based on your equity share. These methods are similar to current financial reporting structures. It is understood that this approach could result in more than one registered Action Plan reporting overlapping information. As long as the basis for your reporting is clearly outlined this "double counting" can be identified and rationalized, if required.



More detailed explanations and further examples can be found at the GHG Protocol website at www.ghgprotocol.org.

Operational Boundaries

GHG emissions can be broken down into two distinct groups – Direct and Indirect.

Direct emissions are those emissions that are directly released by your organization, usually from the burning of fossil fuels in heating buildings, running plants and processes and operating vehicles. It would also include such things as methane released from landfills owned by the organization and fugitive emissions from natural gas pipelines.

Indirect emissions are those emissions associated with an outside organization that supplies energy or services. Electricity generation is most common, but purchased steam, hot water and chilled water are considered indirect emission sources. Other indirect emissions could be from business travel or transportation of goods (airplanes, ships, rail, bus, taxi, etc.), commuting by employees, and waste composition. You are encouraged to include the indirect emissions associated with these outside sources because the actions you take will affect the amount of GHGs they generate.

We recommend that you report separately on those Direct and Indirect emissions that are significant for your organization. You can gain extra points in our Champion Level Reporting system for showing both types.

Temporal Boundaries

Boundaries can also be temporal (time-based) in nature. That is, emissions will change over time as your organization grows or shrinks or as you implement changes to reduce energy consumption and GHG emissions. We recommend that you report actual GHG emissions on an annual basis, starting with 1990 and that you forecast emissions into the future to at least the year 2005.

2.2.2 Measurement Techniques

Unlike criteria air contaminants/pollutants such as nitrous oxides (NO_x) and sulphur dioxide (SO₂), carbon dioxide (CO₂), the primary GHG, is seldom monitored directly. If direct measurements of CO₂ emissions are available, using these measurements is the most accurate way to determine your GHG emissions.

However, since most emissions are from direct combustion of fossil fuels such as natural gas and fuel oil, using emission factors is the most common method of calculating emissions. [Table 5](#) of Section 9 has the emission factors for a variety of fuels. Multiplying the quantity of fuel of a specific type purchased in a given year by the appropriate emission factor will allow you to estimate the GHG emissions associated with consuming that fuel.

Some industry associations have developed guidelines to help companies calculate the GHG emissions from specific processes. You can find references to these guidelines by visiting the VCR Inc. website at www.vcr-mvr.ca and click on [Register at VCR](#).

2.2.3 Reporting Data

We recommend that you report your absolute Direct and Indirect GHG emissions for your chosen Base Year (see Section [5. Champion Reporting Checklist](#)) and subsequent years, by GHG gas type, in units of tonnes of CO₂e. You can also report on future emission estimates (projections) and emission Targets in the same manner (Direct and Indirect, by GHG gas type in tonnes CO₂e). Extra points are available in our Champion Level Reporting system for reporting each of the GHGs separately (CO₂, CH₄, N₂O, SF₆, PCFs, HFCs) as well as for breaking them down into Direct and Indirect emissions.

Some of the indirect emission factors (see Section [9. Emission Factors](#)) only list emissions data in CO₂e values and are not broken down into different greenhouse gases. In those cases, unless you can find more detailed data, reporting in tonnes CO₂e is adequate.

You may find it of value to also calculate, estimate and Target using a performance-based indicator or intensity value. Examples include GHG emission per unit of output or energy consumption per unit of output. Many institutional participants use building floor area and number of employees as units of output. For manufacturing companies, kg of product, number of units assembled or sales revenue have been used. You may also want to report on the percentage change in these values since the Base Year or from one year to the next. Some industry associations have developed specific intensity factors in their guidelines. You can find references to these guidelines by visiting the VCR Inc. website at www.vcr-mvr.ca and clicking on [Register at VCR](#).

2.2.4 Quality Control and Verification

Ensuring that your GHG emission calculations are accurate and complete will save you time in reporting your information in the future. If you have achieved an ISO 9001 or ISO 14001 designation, then you are already familiar with implementing quality control procedures. Including GHG emission measurement and reporting is a logical step in such a process. You may want to consider the following as you develop your procedures:

- Use a standard system for reporting GHG across different facilities/departments
- Use the same units of measurement across different facilities/departments
- Use an appropriate calculation method
- Design a robust data collection system
- Perform regular accuracy checks
- Organize regular training of personnel
- Perform uncertainty analysis



One of the Champion Level Checklist items (see item 6.12: [Which have been externally verified](#)) involves obtaining a third party verification of your Action Plan data and/or calculations. You may want to consider this to help ensure the accuracy of your information and methodology.

3. Transmittal Form

We recommend that you fill out and submit the VCR Inc. Transmittal Form (available by visiting the VCR Inc. website at www.vcr-mvr.ca and clicking on [Register at VCR](#) or the sample provided in [Appendix 1 — VCR Inc. Challenge Registry Transmittal Form](#), along with your Action Plan. This form streamlines the Champion Level Reporter evaluations, as well as ensures that our records accurately reflect your correct contact information. Your transmittal form will not be posted. It is against VCR Inc. policy to distribute the contact information of our registrants.

The first elements of the Transmittal Form are intended to assist us in ensuring that our database has recorded the most up-to-date contacts for your organization. Your executive contact should represent the most senior level of management responsible for the report – usually your President, Chief Executive Officer or an equivalent. You should also designate a primary technical contact for your company or organization – usually the person responsible for preparing your Action Plan. Other technical contacts should be included here in the form of an attachment (these may include junior executives and managers responsible for VCR Inc. reporting, as well as technical staff involved in the reporting process). You may also wish to include information about any outside contractors that may have helped you prepare your Action Plan.

After you have filled in the contact information, we ask you to verify that the three minimum entry requirements for registration – senior management endorsement, a commitment to report regularly, and quantification of a Base Year – are included in your report.

Next we ask you to specify how your Action Plan is being submitted (by e-mail, mail, courier or fax). If your Action Plan was produced in more than one language, we also ask you to include copies of all available versions (each will be posted on our Web site). And lastly, we ask you to identify the format of the electronic version of your Action Plan. Electronic copies of submissions are encouraged and current technology enables us to post all MS Word and Adobe Acrobat (PDF) files. If you wish to submit your Action Plan in another electronic format, please contact our office to verify your compatibility with our system.

Since we work with hundreds of companies operating in virtually every sector of the Canadian economy, we also ask you to specify the sector that you believe best classifies your operations so as to ensure fair evaluation of your report by our Leadership Awards judging panel. As well, please indicate if you are submitting an Action Plan to us for the first time, and if your organization should be classified as a small- or medium-sized enterprise. We plan to use this information to ensure that all VCR Inc. leaders are recognized, taking into account significant differences in the scale of operations.

Lastly, we ask you to check off the Champion Reporting categories that are documented within your Action Plan. We use this checklist as a cross-reference when we are in the process of determining whether your organization has achieved Bronze, Silver or Gold status.

4. Submitting Your Action Plan

All documents (electronic and hard-copies) submitted to VCR Inc. will be treated as public documents unless they are clearly identified as confidential. Confidential documents may be registered upon request. If necessary, an entire report can be classified confidential¹. However, if only one or two portions of an Action Plan (such as tables or appendices) are confidential, VCR Inc. prefers to make available the balance of the Action Plan with the classified information removed. Confidential reporting will not affect Champion Level Reporter (Bronze, Silver or Gold) evaluations, but only non-confidential reporting can be considered for the VCR Inc. Annual Leadership Awards.

As indicated on the VCR Inc. Transmittal Form, you may submit your Action Plan in a variety of electronic forms, as well as by mail or courier. Electronic submissions are preferred since they can be posted much quicker than hard copies (days versus weeks). You may also post your own documents through the [On-line Registry](#), using your company's username and password.

On-line Registry:	www.vcr-mvr.ca/challenge/cr_login_e.cfm
E-mail reports to:	reports@vcr-mvr.ca
Fax reports to:	(613) 565-5743
Mail or deliver CD-ROMs, floppy disks or hard copies to:	Canada's Climate Change Voluntary Challenge & Registry Inc. (VCR Inc.) 170 Laurier Avenue West, Suite 600 Ottawa, Ontario K1P 5V5

¹ To ensure document security, VCR Inc. maintains confidential documents in hard copy only – all confidential electronic documents are destroyed immediately after hard copies are produced.

5. Champion Reporting Checklist

In order to provide us with an objective way to award a Bronze, Silver or Gold Champion Level Reporter status to your Action Plan, we have developed the Champion Reporting Checklist. Within this Checklist, we use a point system to quantify the depth of your Action Plan. Points are awarded for each element on an 'all or nothing basis' — meaning that if you have included a given element in your Action Plan, you will be assigned all of the points indicated for that element. You must attain 50 points to reach the Bronze level, 70 points to reach the Silver level, and 90 points to reach the Gold level.



The elements marked with a '✓' in the Checklist are minimum requirements for that level of reporting and must be included in your Action Plan in order to attain the indicated reporting level. Each checklist element is explained in detail in section [5.1: Checklist Element Detail Descriptions](#) of this guide.



The [Champion Reporting Checklist](#) will be reviewed annually by VCR Inc.'s Technical Advisory Committee and any changes will be implemented November 1st, coinciding with our Leadership Award process.

Table 1 — Champion Reporting Checklist

Components	Required Elements Identified with a ✓			
	Points Earned	Bronze	Silver	Gold
1. Senior Management Support				
1.1 Signed statement of endorsement	N/A	✓	✓	✓
1.2 Commitment to regular reporting	N/A	✓	✓	✓
1.3 Internal practices on climate change	2			
1.4 Management system description	3			
2. Base Year Quantification				
2.1 Any quantification that can be used in Target setting	N/A	✓	✓	✓
2.2 Provide methodology for the calculation of the Base Year quantification	2		✓	✓
2.3 Include GHG emissions inventory by gas type	4			
2.4 Provide methodology for the calculation of the Base Year quantification by gas type	4			
2.5 Include Indirect Emissions	2			✓

Components	Required Elements Identified with a ✓			
	Points Earned	Bronze	Silver	Gold
3. Business as Usual Projection				
3.1 Basis for Projection clearly defined	2		✓	✓
3.2 Projection Expressed in tonnes of GHG Emissions to at least 5 years in future	2			✓
3.3 Identify Major Sources of GHG Emissions	1			
3.4 Include Indirect Emissions	1			
3.5 Specified by GHG Type	1			
4. Target Setting				
4.1 Commit to Target Setting	N/A	✓	✓	✓
4.2 Quantify a Target within one year of commitment	3			✓
4.3 Include a Timeframe	2			✓
4.4 Target projected to at least 5 years in future	2			
4.5 Process for Target Review and Update	2			
5. Measures to Achieve Targets				
5.1 List Key Activities/Projects	N/A	✓	✓	✓
5.2 Quantify the Potential Aggregate Impact Using Any Reporting Format	4			
5.3 Quantify the Impact of Individual Activities Using Any Reporting Format	3			
5.4 Quantify the Potential Aggregate Impact in Absolute Quantity of GHG Emissions	4			
5.5 Quantify the Impact of Individual Activities in Absolute Quantity of GHG Emissions	4			
5.6 Categorize the Measures	4			
6. Results Achieved				
6.1 Results reported within one year of commitment	N/A	✓	✓	✓
6.2 In all years since Base Year quantification	2			
6.3 Tonnage inventory of emissions	2		✓	✓
6.4 Tonnage inventory of emissions since Base Year quantification	2			
6.5 As an aggregate of identified key activities	2			
6.6 For individual key activities/projects	2			
6.7 Aggregated impact of key activities/projects in tonnes of GHG emissions	2			

Components	Required Elements Identified with a ✓			
	Points Earned	Bronze	Silver	Gold
6.8 Individual impact of key activities/projects in tonnes of GHG emissions	2			
6.9 In comparison with Targets	4		✓	✓
6.10 Which are below Base Year quantification levels of CO₂e or energy intensity per unit of output	6			✓
6.11 Which are verifiable	2			✓
6.12 Which have been externally verified	3			
6.13 Document emission reduction offsets	2			
7. Education, Training and Awareness				
7.1 Climate change issue explained to employees	3		✓	✓
7.2 Communicate response to climate change	3			✓
7.3 Identify opportunities for individual action	3			✓
7.4 Create incentives for emission reductions by employees outside of work	2			
7.5 Create incentives for emissions reductions through supply-side management	2			
7.6 Create incentives for emissions reductions through demand side management	2			
7.7 Participate in life-cycle analysis or other activities to influence external contacts	1			
7.8 Undertake public education	1			
Maximum Total	100			

5.1 Checklist Element Detail Descriptions

Section 1. Senior Management Support

Checklist Item 1.1 — Signed statement of endorsement

All registrants are required to submit a statement signed by a representative of senior management that endorses registration at VCR Inc. Typical signatories include executives such as Presidents, CEOs, Vice Presidents, and Deputy Ministers. For registering a facility (as opposed to an entire corporate entity), the facility manager would be the preferred signatory. The commitment itself may be documented in either a cover letter, or inside the report, in a section usually called 'Message from the President'.

Points Awarded: N/A

Mandatory Element for: Bronze, Silver, Gold

Checklist Item 1.2 — Commitment to regular reporting

All registrants are required to commit to regular reporting. A statement committing the organization to report on an annual or biennial basis is preferred. This commitment is usually documented within the senior management endorsement.

Points Awarded: N/A

Mandatory Element for: Bronze, Silver, Gold

Checklist Item 1.3 — Internal practices on climate change

To earn this checklist element, an organization must have documented policies and/or practices with respect to climate change. If your organization does not have a climate change-specific policy, a description of emissions management systems, energy management systems and/or ISO 14001 registration is sufficient provided the description specifically addresses the climate change aspects of these management systems.

Points Awarded: 2

Checklist Item 1.4 — Management system description

To earn this checklist element, your organization should document how business decisions are made, specifically those business decisions relating to GHG emissions (and energy consumption) as well as GHG emissions reductions, offsets and education.

Points Awarded: 3

Section 2. Base Year Quantification

Checklist Item 2.1 — Any quantification that can be used in Target setting

All registrants are required to document a Base Year quantification that could be used for Target setting. The Base Year quantification can be any performance measure that has an impact on GHG emissions, including emissions intensity or energy intensity. GHG emissions for a calendar or fiscal year are preferred, and 1990 is the preferred Base Year.

These emissions may be actual or adjusted to take into account changes in operations. However, any quantification related to GHG emissions is acceptable. An estimate of energy consumption or utility costs for a recent calendar or fiscal year is generally considered the absolute minimum for this required element.

Points Awarded: N/A

Mandatory Element for: Bronze, Silver, Gold

Checklist Item 2.2 — Provide methodology for the calculation of the Base Year quantification

To earn this checklist element, you should describe how you determined your Base Year quantification. All guidelines and third-party reference materials should be cited. As well, if a unique calculation methodology is used, sample calculations should be included in the body of the report or in an appendix.

Points Awarded: 2

Mandatory Element for: Silver, Gold

Checklist Item 2.3 — Include GHG emissions inventory by gas type

To earn this checklist element, your Base Year quantification must be presented in a specific way. It must account for the material mass emissions (tonnes) by the organization of each of the GHG gas types. For the vast majority of organizations, these emissions are CO₂, CH₄ and N₂O – primarily the products of combustion of fossil fuels such as natural gas and heating oil. Other relevant gas types that may be documented include SF₆ as well as gases from the HFC and PFC families. (These gases are typically emitted from specialized manufacturing processes and are not relevant to the vast majority of registrants.) In some rare instances, an emission estimation methodology used for calculating GHG emissions does not break out emissions by gas type, or produces only CO₂ estimates. An organization that finds they cannot estimate their CH₄ or N₂O emissions can earn this checklist element by explaining the limitations of their calculation methodology and declaring that the non-CO₂ GHG emissions from their operations are negligible (not material).

Points Awarded: 4

Checklist Item 2.4 — Provide methodology for the calculation of the Base Year quantification by gas type

To earn this checklist element, you should describe how you estimated the tonnes of CO₂, CH₄, N₂O and other GHG emission types emitted by your organization. All guidelines and third-party reference materials should be cited. As well, if a unique calculation methodology is used, sample calculations should be included in the body of the report or in an appendix.

Points Awarded: 4

Checklist Item 2.5 — Include indirect emissions

To earn this checklist element, you must estimate the GHG emissions impact your organization has beyond its own operations. While you are not directly responsible for the emissions, the actions of your organization may affect the emissions of others. Indirect emissions may result from a variety of sources including purchased electricity, purchased steam, business travel, waste disposal, and employee commuting.

To earn this checklist element, you must estimate the emissions impact of at least one indirect emissions source. The most commonly reported source is purchased electricity.

Points Awarded: 2 Mandatory Element for: Gold

Section 3. Business as Usual Projection

Checklist Item 3.1 — Basis for projection clearly defined

To earn this checklist element, you need to estimate future performance as if no emission reduction activities had taken place and to define how that was determined. This is also called a 'Reference Case', 'Without Emission Reductions' or 'Frozen Efficiency Forecast'. We prefer that this measure be in GHG emissions by gas type, but any performance measure is acceptable. Other commonly reported projections include business-as-usual GHG emissions, emissions intensity, energy intensity, energy consumption and energy cost.

Points Awarded: 2 Mandatory Element for: Silver, Gold



While both are estimates of future performance, a business as usual (BAU) projection is not the same as a Target. A Business as Usual Projection typically estimates the performance where the impact of future GHG emissions reduction activities are not included. It represents the emission you would have had if you had done nothing to reduce them. A Target reflects a management goal. Depending on senior management requirements, a Target could be more or less challenging than a projected performance measure.

Checklist Item 3.2 — Projection expressed in tonnes of GHG emissions to at least 5 years in future

To earn this checklist element, you need to estimate future GHG emissions (tonnes CO₂ equivalent) or emissions intensity (tonnes CO₂ equivalent per unit production or per facility area).

Points Awarded: 2 Mandatory Element for: Gold

Checklist Item 3.3 — Identify major sources of GHG emissions

To earn this checklist element, you should tabulate your projected GHG emissions (or emissions intensity) for each business unit, facility or energy source. Typically, registrants list three to six major sources of emissions.

Points Awarded: 1

Checklist Item 3.4 — Include indirect emissions

To earn this checklist element, you should project your GHG emissions (or emissions intensity) from indirect sources such as purchased electricity, purchased steam, or other sources. Special consideration will be given to those registrants who have no indirect emissions because they consume no electricity from the grid, or generate more electricity than they consume. These registrants may be credited for this checklist element if their report documents that they create no measurable indirect emissions.

Points Awarded: 1

Checklist Item 3.5 — Specified by GHG type

To earn this checklist element, you should project your GHG emissions (or emissions intensity) for each gas type (CO₂, CH₄, N₂O, plus any other GHG gas types emitted). Special consideration will be given for this checklist element if the registrant's methodology prevents breaking out GHG emissions by gas type. A registrant may be credited for this checklist element if their report explains their emissions estimation methodology limitations and states that their non-CO₂ GHG emissions are negligible.

Points Awarded: 1

Section 4. Target Setting

Checklist Item 4.1 — Commit to Target setting

To earn this checklist element, you must report a Target relevant to GHG emissions (see item 4.2 below) or report a commitment to set a Target in the future.

Points Awarded: N/A Mandatory Element for: Bronze, Silver, Gold



VCR Inc. never recommends specific Targets for participants. Each registrant should set Targets based on their own best judgement.

Checklist Item 4.2 — Quantify a Target within one year of commitment

To earn this checklist element, you must quantify a Target relevant to GHG emissions and do so within one year of submitting the Action Plan. We prefer Targets that are quantified in terms of total emissions (tonnes CO₂ equivalent) or emissions intensity (tonnes CO₂ equivalent per unit production or per facility area). Other acceptable Targets include emissions reductions, energy consumption, energy savings, energy intensity, energy cost, or energy cost savings. Targets that are expressed as a percentage of the Base Year quantification are also acceptable. First time participants can earn the points for this element if the Target is quantified in their next Action Plan, which is submitted within one year.

Points Awarded: 3 Mandatory Element for: Gold



This checklist element itself is not required to earn Silver or Gold Champion Level Reporter status. However, a Target must be quantified and reported to earn [Checklist Item 6.9 — Results in comparison with Targets](#), which is required for both Silver and Gold Champion Level Reporter status.

Checklist Item 4.3 — Include a timeframe

To earn this checklist element, at least one Target must include a timeframe. Targets are typically set for one, two or five years following the most recent available data. The Target timeframe should be expressed as a year, such as "Fiscal Year 2008".

Points Awarded: 2 Mandatory Element for: Gold

Checklist Item 4.4 — Target projected to at least 5 years in future

To earn this checklist element, the timeframe for at least one Target must be at least 5 years in the future and preferably more than 5 years. Vague Targets, such as “Our goal continues to be to reduce our energy intensity by one per cent per year,” must specify the time period of 5 years or later to earn this checklist element.

Points Awarded: 2

Checklist Item 4.5 — Process for Target review and update

To earn this checklist element, your report must indicate how past Targets were reviewed and updated, as well as when new Targets will be reviewed and updated.

Points Awarded: 2



For example, “Low demand for our product caused a production reduction, which resulted in missing our emissions intensity Target set in 2001. We have adjusted our goal for year 2005 based on our current rate of production. Senior management will review this new Target on an annual basis.”

Section 5. Measures to Achieve Targets

Checklist Item 5.1 — List key activities/projects

To earn this checklist element, the report must list activities and/or projects that will be implemented in the future.

Points Awarded: N/A

Mandatory Element for: Bronze, Silver, Gold

Checklist Item 5.2 — Quantify the potential aggregate impact using any reporting format

To earn this checklist element, the report must include an estimate of the total impact of all future activities and/or projects.

Points Awarded: 4

Checklist Item 5.3 — Quantify the impact of individual activities using any reporting format

To earn this checklist element, the report must include estimates of the impact of each future activity and/or project. If some activities are not quantifiable, the report should indicate why. At least two key activities or projects must be quantified.

Points Awarded: 3

Checklist Item 5.4 — Quantify the potential aggregate impact in absolute quantity of GHG emissions

To earn this checklist element, you must report a list of future emissions reduction activities and estimate the total impact of these activities in tonnes CO₂ equivalent.

Points Awarded: 4

Checklist Item 5.5 — Quantify the impact of individual activities in absolute quantity of GHG emissions

To earn this checklist element, organizations must report a list of future emissions reduction activities and quantify the impact of each individual activity in tonnes CO₂

equivalent. If some activities are not quantifiable, the report should indicate why. The impacts of at least two key activities or projects must be estimated.

Points Awarded: 4

Checklist Item 5.6 — Categorize the measures

The activities and/or projects that will be implemented in the future should be categorized according to the type of reduction. Examples of emission reduction types include direct emission reductions, indirect emission reductions (such as reduced electricity consumption), offsets, biomass energy systems, carbon sequestration, GHG emissions trading, regulated emissions reductions, Clean Development Mechanism projects, Joint Implementation projects, and Technology Early Action Measures (TEAM) projects.

Points Awarded: 4

Section 6. Results Achieved

Checklist Item 6.1 — Results reported within one year of commitment

To earn this checklist element, you must report the quantified results of at least one performance measure for the most recent reporting year. The results can be any performance measure that has an impact on GHG emissions, including emissions intensity or energy intensity. We prefer results expressed in absolute GHG emissions (tonnes CO₂ equivalent). However, any quantification related to GHG emissions is acceptable. An estimate of energy consumption or utility costs for the most recent reporting year is generally considered the absolute minimum to earn this element. First time participants can earn this element if results are reported in their next Action Plan, which is submitted within one year.

Points Awarded: N/A

Mandatory Element for: Bronze, Silver, Gold

Checklist Item 6.2 — Results in all years since Base Year quantification

To earn this checklist element, organizations must report the trend in results between the Base Year and the most recent reporting year. We encourage registrants to address each and every year. Special consideration will be given to those who claim that research costs or questionable data prevent attributing results for all interim years. However, to earn this checklist element, registrants must estimate results for at least one year between the Base Year and the current reporting year, as well as justify all gaps in the results data.

Points Awarded: 2

Checklist Item 6.3 — Tonnage inventory of emissions

To earn this checklist element, the results of the most recent reporting year must be reported in terms of mass emissions (tonnes CO₂ equivalent) or emissions intensity (tonnes CO₂ equivalent per unit production or per facility area).

Points Awarded: 2

Mandatory Element for: Silver, Gold

Checklist Item 6.4 — Tonnage inventory of emissions since Base Year quantification

To earn this checklist element, the results of each year between the Base Year and the most recent reporting year must be reported in terms of mass emissions (tonnes CO₂ equivalent) or emissions intensity (tonnes CO₂ equivalent per unit production or per facility area). Special consideration will be given to those registrants who claim that research costs or questionable data prevent attributing emissions or emissions intensities for each interim year. However, to earn this checklist element, registrants must estimate emissions or emissions intensity for at least one year between the Base Year and the current reporting year, as well as justify all gaps in the emissions or emissions intensity inventory data.

Points Awarded: 2

Checklist Item 6.5 — As an aggregate of identified key activities

To earn this checklist element, you must report a list of implemented emissions reduction activities and estimate the total impact of these activities.

Points Awarded: 2

Checklist Item 6.6 — For individual key activities/projects

To earn this checklist element, you must report a list of implemented emissions reduction activities and quantify the impact of each of these activities. If some activities are not quantifiable, the report should indicate why. At least two key activities or projects must be quantified.

Points Awarded: 2

Checklist Item 6.7 — Aggregated impact of key activities/projects in tonnes of GHG emissions

To earn this checklist element, you must report a list of implemented emissions reduction activities and estimate the total impact of these activities in tonnes CO₂ equivalent.

Points Awarded: 2

Checklist Item 6.8 — Individual impact of key activities/projects in tonnes of GHG emissions

To earn this checklist element, you must report a list of implemented emissions reduction activities and quantify the impact of each individual activity in tonnes CO₂ equivalent. If some activities are not quantifiable, the report should indicate why. The impacts of at least two key activities or projects must be estimated.

Points Awarded: 2

Checklist Item 6.9 — Results in comparison with Targets

To earn this checklist element, registrants with set Targets must report the results of the most recent reporting year such that they can be compared to the Targets. If Targets were set in previous years, the report should address to what degree the organization has succeeded in meeting their Targets.

Points Awarded: 4

Mandatory Element for:

Silver, Gold



If a registrant has not reported a Target, ([Checklist Item 4.2 — Quantify a Target](#)), they cannot earn this checklist element.

Checklist Item 6.10 — Results which are below Base Year quantification levels of CO₂ equivalent or energy intensity per unit of output

To earn this checklist element, one or more reported performance measures for the most recent reporting year must be an improvement on the Base Year performance measures. We would prefer that the performance measure credited for improvement is the same performance measure used for setting Targets.

Points Awarded: 6 Mandatory Element for: Gold

Checklist Item 6.11 — Results which are verifiable

To earn this checklist element, your system of estimating performance measures must be transparent. The current year results should include references to any calculation methodologies and guidelines used.

As well, if a unique calculation methodology is used, sample calculations should be included in the body of the report or in an appendix. The report should indicate that, with access to the original data set, the documented results could be replicated.

Points Awarded: 2 Mandatory Element for: Gold

Checklist Item 6.12 — Results which have been externally verified

To earn this checklist element, the report must explicitly state that the organization engaged a third-party to verify the results presented in the report. We will not assume that a third party engaged to compile or write a report is also verifying the report. In general, third party verification is independent of the writing and compilation process.

Points Awarded: 3

Checklist Item 6.13 — Document emission reduction offsets

To obtain the points for this element, you need to document your understanding of the use of emission reduction offsets. An indication that your organization has considered the implications of utilizing offsets to manage your GHG emissions impacts is sufficient.

Points Awarded: 2

Checklist Item 7.6 — Create incentives for emissions reductions through demand side management

To earn this checklist element, an organization must report how they share ideas with their customers and encourage GHG emissions reductions downstream of their operations.

Points Awarded: 2

Checklist Item 7.7 — Participate in life-cycle analysis or other activities to influence external contacts

To earn this checklist element, an organization must report how they initiated or were engaged in a life-cycle analysis of a product or output, and how this life-cycle analysis included climate change impacts. This checklist element could also be earned by documenting how the organization worked with external contacts, such as trade associations, on climate change issues.

Points Awarded: 1

Checklist Item 7.8 — Undertake public education

To earn this checklist element, the report must include an explanation of how the organization attempted to encourage the public-at-large to reduce their impact on GHG emissions.

Points Awarded: 1

6. Leadership Awards

Our annual Leadership Awards are granted based on the results achieved by registrants, with the intention of recognizing them for their contributions in meeting Canada's commitment to reduce GHG emissions.

We have established four broad categories in an effort to capture the efforts of all registrants and of the advocates of the voluntary approach towards the reduction of GHG emissions. The categories are as follows:

- Best New Submission;
- Individual;
- Association; and
- Sectors

All Leadership Award winners from previous years, current award winners, and those receiving Honourable Mention, are invited to our annual Council of Champions Meeting and Leadership Awards Ceremony usually held in March or April of every year. It has become customary for the Ministers of *Natural Resources Canada* and *Environment Canada* to present the awards to the recipients.

Our *Technical Advisory Committee* developed the following selection criteria for the awards, and also provides the judging panel for the program.

6.1 Minimum Criteria For Best New Submission and Sector Award Categories

As minimum criteria, award candidates must:

- Be registered with VCR Inc.; and
- Have filed an Action Plan containing no confidential information, in the Challenge Registry between October 31st of the current year and November 1st of the previous year; and
- Have not received a Sector Leadership Award the previous year

Other considerations include:

- Representation of different sectors in selecting award candidates;
- Leadership among peers; and
- Best submission from a new registrant

6.2 Specific Criteria — All Four Award Categories

To select award winners, assessments will be made based on the following criteria:

6.2.1 Commitment and Action

Depth of commitment to GHG emission reduction as expressed in:

- Senior management support, and the development of corporate actions and policies.



i.e. Does your organization operate other environmental programs in addition to those described in your VCR Inc. Action Plan? Does your organization have a good history of energy management? Has your organization implemented purchasing policies that promote environmental awareness? Has your organization reported thoroughly?

- Education, training and awareness programs for employees.
- Submission of an updated Action Plan(s), serving to indicate successful results related to the reduction of GHG emissions.
- Quality of results reported regularly, achievement of Targets and overall impact on the organization's GHG emissions.
- Innovation in addressing GHG emission reductions.

6.2.2 Sector Leadership/Cooperation

Leadership within the organization's sector as expressed in:

- Cooperation and participation with related government (Federal, Provincial, Municipal) and/or industry programs.
- Promotion of the climate change challenge to peers, through trade associations, and/or to the general public.
- Assisting peers in planning actions to address GHG emission reductions.
- Realization of an organization's efforts results in an increased numbers of participants (at all levels of engagement) in VCR Inc. or in a related energy efficiency program related to the climate change challenge.

Throughout the judging process, special emphasis is placed on finding organizations that have demonstrated *commitment*, *action* and *leadership* within their economic sector.



Our judging panel members pay close attention to the Results Achieved section of the reports under review.

Individual and Association Leadership Award candidates should be nominated through the forms available on the VCR Inc. web site at www.vcr-mvr.ca/challenge/individual_e.cfm and www.vcr-mvr.ca/challenge/association_e.cfm, respectively.

6.3 Listing of Leadership Award Winners Over the Last Several Years

Best New Submission

2002	Famz Foods
2001	Honda of Canada Mfg.
1999	Northwest Territories Power Corporation
1998	Encal Energy Limited

Individual Leadership Award

2002	Peter Chantraine, DuPont Canada Inc.
2001	Bob Page, TransAlta
2000	Sadettin Yilmaz, Natural Resources Canada Ken Ogilvie, Pollution Probe
1999	Rahumatula Marikkar, Interface Flooring John Donner, Government of Alberta
1998	The Honourable Anne McLellan, role as Minister of Natural Resources Canada (November 1993 to June 1997)

Association Leadership Award

2002	Aluminium Association of Canada
2001	Mining Association of Canada
2000	Canadian Chemical Producers' Association
1999	Canadian Industry Program for Energy Conservation
1998	Canadian Association of Petroleum Producers

Sector Leadership Awards

Automotive Manufacturing

2002	Honda of Canada Mfg.
2001	General Motors of Canada Ltd.
2000	DaimlerChrysler Canada Ltd. General Motors of Canada Ltd. (HM)
1999	Ford Motor Company of Canada, Ltd. General Motors of Canada Ltd. (HM)

Electric Utilities

2002	Manitoba Hydro
2001	Northwest Territories Power Corporation
2000	BC Hydro
1999	EPCOR Northwest Territories Power Corporation (HM)
1998	TransAlta

Cement Manufacturing

2002 St. Lawrence Cement Inc. (HM)

Commercial

2000 Van City Savings Credit Union
Novotel Canada Inc. (HM)

Chemicals

2002 DuPont Canada Inc.
2001 Dow Chemical Canada Inc.
2000 NOVA Chemicals
DuPont Canada Inc.
1999 Dow Chemical Canada Inc.
NOVA Chemicals (HM)
1998 DuPont Canada Inc.

Educational Institutions — Colleges and Universities

2002 Kwantlen University College
2001 University of Lethbridge
2000 New Brunswick Community Colleges
1999 Langara College (HM)
1998 Southern Alberta Institute of Technology

Educational Institutions — School Boards

2002 School District 43 (Coquitlam) BC
2000 School District 43 (Coquitlam) BC
1999 Rocky View District School Division No. 41

Forestry, Pulp and Paper

2002 Alberta-Pacific Forest Industries Inc.
2001 Tembec – Spruce Falls Operations
Alberta-Pacific Forest Industries Inc. (HM)
2000 Abitibi-Consolidated Inc.
1999 Spruce Falls Inc.
Stora Enso Port Hawkesbury Limited (HM)
1998 MacMillan Bloedel Limited

General Manufacturing

2002 Husky Injection Molding Systems Ltd.
2001 Consoltex Inc.
2000 IBM Canada Ltd.
Orenda Aerospace Corporation (HM)

1999 Husky Injection Molding Systems Ltd.
Kodak Canada Inc. (HM)
IBM Canada (HM)
Metroland Printing, Ltd. (HM)

Greenhouse Gas Reduction Technology

2002 Prince Edward Island Energy Corporation — North Cape Wind Farm

Health Services

2002 The Scarborough Hospital
2001 Brandon Regional Health Authority
2000 University of Alberta Hospital
1999 Glenrose Rehabilitation Hospital and Energy Centre (HM)

Integrated Oil and Gas Corporations

2002 Shell Canada Limited
Petro-Canada (HM)
2001 Suncor Energy Inc.
Imperial Oil (HM)
Shell Canada Limited (HM)
1999 Suncor Energy Inc.

Governments

2000 Alberta Government
Government of British Columbia (HM)
1999 Government of Canada (HM)
City of Regina (HM)
1998 Alberta Government
City of Ottawa

Metal Mining

2002 INCO Limited
Luscar Ltd. (HM)
2000 INCO Limited
Luscar Limited (HM)
Falconbridge Limited (HM)
1999 Cominco Ltd.
INCO Limited (HM)
Luscar Limited (HM)
Falconbridge Limited (HM)
1998 Dofasco Inc.

Nuclear Technology

2000 Atomic Energy of Canada Ltd.

Oil and Gas – Refiners and Upgraders

2000 Syncrude Canada Ltd.
Irving Oil (HM)
Petro-Canada (HM)

Oil and Gas – Downstream

2000 Syncrude Canada Ltd.
Irving Oil Limited (HM)
1999 Irving Oil Limited (HM)
1998 Petro-Canada
Husky Oil Operations Limited

Oil and Gas – Upstream

2002 ConocoPhillips Canada
BP Canada Energy Company (HM)
2001 ExxonMobil Canada Ltd.
2000 Startech Energy Inc. (ARC Resources Ltd.)
Burlington Resources Canada Energy Ltd.
1999 Mobil Canada Ltd.
Koch Oil Co. Ltd. (HM)
1998 Syncrude Canada Ltd.

Oil and Gas – Pipelines and Natural Gas Distribution

2002 Gaz Métropolitain
2001 BC Gas
2000 SaskEnergy and TransGas
1999 TransGas Limited
SaskEnergy Incorporated (HM)
TransCanada (HM)
1998 Enbridge Consumers Gas

Primary Metals Manufacturing

2002 Dofasco Inc.
2001 Stelco Inc.
2000 Dofasco Inc.

Small and Medium Sized Enterprise (SME)

2002 NRI Industries Inc.
2001 Yukon Development Corporation
2000 Enviros RIS Canada

Transportation

1999 Canadian National Railway Company (HM)

7. Other Linkages, Trade and Industry Associations

Trade associations play an essential role in helping their members to reduce GHG emissions. Some produce sector-specific guides that are designed to assist their member organizations with VCR Inc. reporting. Others produce amalgamated reports on behalf of their membership, which provides each member organization with the benefit of full VCR Inc. registration. In addition, some associations also publish more general, sector-wide GHG emission “roll-up” reports on an annual basis, while others offer educational programs and software assistance for those among their members working on GHG emissions reduction initiatives and on VCR Inc. reports.

The VCR Inc. office maintains contact information on trade associations and government program activities related to climate change. Please visit our web site or contact our office for more information.

Any industry and program specific guidelines or reporting templates will be available at our website. For more information, visit the VCR Inc. website at www.vcr-mvr.ca and click on [Register at VCR](#).

8. Global Warming Potentials

In order to measure the impact of the various gases involved in global warming using a single unit of measurement, the scientific community has adopted a standard based on the impact of one tonne CO₂ over a 100-year time frame. The impacts of other gas types are compared to CO₂ over the same time frame to produce standard Global Warming Potentials (GWPs), expressed in tonnes CO₂ equivalent (CO₂e). For example, an emission of one tonne of Methane (CH₄) is equivalent to an emission of 21 tonnes CO₂ when the impact is averaged over 100 years. The impact of that tonne of CH₄ is then expressed as 21 t CO₂e.

The following figures represent the standards used by Environment Canada for determining GHG emissions in the preparation of Canada's National GHG Inventory. These were originally published by the IPCC in 1996. While these factors were updated by the IPCC in 2001², the new emission factors have yet to be adopted by Environment Canada. The factors published in 1996 will likely remain the official standard until the end of the first Kyoto budget period (2012). By reporting individual greenhouse gases separately, you can always adjust using the most current GWP factors.

Table 2 — Global Warming Potentials

Greenhouse Gas	Chemical Formula	Global Warming Potential (based on a 100-year period) ³
Carbon Dioxide	CO ₂	1
Methane	CH ₄	21
Nitrous Oxide	N ₂ O	310
Sulphur Hexafluoride	SF ₆	23,900
Hydrofluorocarbons (HFCs):		
HFC-23	CHF ₃	11,700
HFC-32	CH ₂ F ₂	650
HFC-41	CH ₃ F	150
HFC-43-10mee	C ₅ H ₂ F ₁₀	1,300
HFC-125	C ₂ H ₂ F ₅	2,800
HFC-134	C ₂ H ₂ F ₄ (CHF ₂ CHF ₂)	1,000
HFC-134a	C ₂ H ₂ F ₄ (CH ₂ FCF ₃)	1,300
HFC-143	C ₂ H ₃ F ₃ (CHF ₂ CH ₂ F)	300
HFC-143a	C ₂ H ₃ F ₃ (CF ₃ CH ₃)	3,800
HFC-152a	C ₂ H ₄ F ₂ (CH ₃ CHF ₂)	140
HFC-227ea	C ₃ HF ₇	2,900
HFC-236fa	C ₃ H ₂ F ₆	6,300
HFC-245ca	C ₃ H ₃ F ₅	560

² Intergovernmental Panel on Climate Change, *IPCC Third Assessment Report – Climate Change 2001*, <http://www.ipcc.ch/index.html>, "Volume One: Climate Change 2001: The Scientific Basis", Technical Summary, p. 47.

³ IPCC (1996a), 1995 Summary for Policy Makers – A Report of Working Group I of the Intergovernmental Panel on Climate Change.

Greenhouse Gas	Chemical Formula	Global Warming Potential (based on a 100-year period)³
Perfluorocarbons (PFCs):		
Perfluoromethane	CF ₄	6,500
Perfluoroethane	C ₂ F ₆	9,200
Perfluoropropane	C ₃ F ₈	7,000
Perfluorobutane	C ₄ F ₁₀	7,000
Perfluorocyclobutane	c-C ₄ F ₈	8,700
Perfluoropentane	C ₅ F ₁₂	7,500
Perfluorohexane	C ₆ F ₁₄	7,400

9. Emission Factors

All energy-related emissions factors have been drawn from the Environment Canada publication, *Canada's Greenhouse Gas Inventory 1990-2000*⁴, unless otherwise noted.

Table 3 — Emissions Factors for Common Combustion Energy Sources for Commercial And Industrial Boilers (Not Steel Production)

Fuel	Carbon Dioxide CO ₂	Methane CH ₄	Nitrous Oxide N ₂ O
Natural Gas (m ³)	1.891 kg/m ³ (all sectors except natural gas producers) 2.389 kg/m ³ (producer consumption only) ⁵	0.000037 kg/m ³ (industrial, commercial and residential) 0.00049 kg/m ³ (electric utilities) 0.0019 kg/m ³ (pipelines) 0.0065 kg/m ³ (producer consumption)	0.000033 kg/m ³ (industrial, commercial, residential, producer consumption) 0.000049 kg/m ³ (electric utilities) 0.00005 kg/m ³ (pipelines)
Natural Gas (GJ)	For virtually all applications, multiply factors above by 26.86 to get kg/GJ. (This factor does not apply to natural gas producers.)		
Still Gas	2.000 kg/m ³	0.000037 kg/m ³	0.000002 kg/m ³
Light (‘Distillate’) Oil (Oil #2)	2.830 kg/l	0.000006 kg/l (industrial) 0.000026 kg/l (commercial, residential) 0.00018 kg/l (electric utilities)	0.000031 kg/l (electric utilities, industrial, commercial) 0.000006 kg/l (residential)
Heavy (‘Residual’) Oil (Oil #6)	3.090 kg/l	0.00012 kg/l (industrial) 0.000057 kg/l (commercial, residential) 0.000034 kg/l (electric utilities)	0.000064 kg/l
Kerosene	2.550 kg/l	0.000006 kg/l (electric utilities, industrial) 0.000026 kg/l (commercial, residential)	0.000031 kg/l (electric utilities, industrial) 0.000006 kg/l (commercial, residential)
Diesel	2.730 kg/l	0.00013 kg/l	0.0004 kg/l
Propane	1.500 kg/l	0.000024 kg/l	0.000108 kg/l
Butane	1.730 kg/l	0.000024 kg/l	0.000108 kg/l
Ethane	0.976 kg/l	-	-

⁴ *Canada's Greenhouse Gas Inventory 1990-2000*, Greenhouse Gas Division, Environment Canada, June 2002.

⁵ Raw natural gas is often used as fuel by the upstream oil and gas industry. This fuel contains ethane, propane, butane and other non-methane hydrocarbons, which are stripped out of natural gas at gas plants.

Table 4 — Indirect Emissions Resulting from Electric Energy Consumption in kg CO₂e/kWh⁶

Province	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Alberta ⁷	1.046	1.056	1.061	1.059	1.063	1.058	1.049	1.054	1.032	1.022	1.001	0.985	
British Columbia ⁸	0.019	0.012	0.020	0.045	0.044	0.059	0.012	0.021	0.035	0.025	0.042	0.056	
Manitoba ⁹	0.0273	0.0206	0.0203	0.0117	0.0131	0.0114	0.0105	.00075	0.0107	0.0354	0.0253	0.0290	
New Brunswick ¹⁰					0.425	0.580	0.425	0.546	0.546	0.510			
Newfoundland and Labrador ¹¹	0.280	0.212	0.241	0.216	0.122	0.210	0.194	0.196	0.185	0.142	0.136	0.261	
Northwest Territories / Nunavut ¹²	0.377	0.355	0.340	0.339	0.447	0.428	0.303	0.263	0.264	0.168	0.167	0.163	
Nova Scotia ¹³	0.791	0.800	0.800	0.800	0.790	0.771	0.800	0.819	0.815	0.815	0.947	0.933	
Ontario ¹⁴	0.223	0.208	0.203	0.150	0.127	0.143	0.150	0.202	0.264	0.261	0.295	0.302	
Prince Edward Island ¹⁵	0.77	0.73	0.55	0.65	0.71	0.67	0.71	0.75	0.71	0.71	0.73	0.71	
Québec ¹⁶	0.0135	0.0039	0.0078	0.0020	0.0021	0.0014	0.0012	0.0016	0.0105	0.0068	0.0022	0.0024	
Saskatchewan ¹⁷	0.827	0.825	0.921	0.868	0.929	0.884	0.875	0.899	0.912	0.913	0.946		
Yukon – diesel ^{18, 19,20}	0.829	0.850	0.784	0.815	0.748	0.783	0.778	0.797	0.794	0.801	0.804	0.810	
– System	0.080	0.069	0.079	0.074	0.040	0.114	0.194	0.219	0.061	0.080	0.048		

⁶ Values are based on utility average emissions (i.e. total annual CO₂ eq emissions/total annual kWh generated), not marginal emissions (i.e. based on the type of electricity generation used for the peak electricity); values do not include any purchased greenhouse gas offsets (if any); values include the impact of electricity imported into each province (if data was available); values exclude electricity used to run power plants (i.e. net electricity generated is used); emissions from vehicles and heating buildings excluded

⁷ Alberta Electrical Generation System's Average Greenhouse Gas Emission Intensity, KEFI-Exchange report for Albert Environment

⁸ BC Hydro Greenhouse Gas Report June 2001, Page 19

⁹ Manitoba Power, VCR Inc. 2001 Update report, Table 8

¹⁰ New Brunswick Power, VCR Inc. 2000 Annual Report

¹¹ Newfoundland and Labrador Hydro Voluntary Challenge and Registry Update 1998, Appendix 1

¹² Northwest Territories Power Corporation, VCR Inc. Greenhouse Gas Report October 2001 and personal correspondence

¹³ Nova Scotia Power, VCR Inc. 2000 Annual Report, Table 5 personal communications.

¹⁴ Ontario Power Generation VCR Inc. 2000 Annual Report NOTE: Purchased emissions reduction credits excluded

¹⁵ Correspondence with Maritime Electric, Feb 2002

¹⁶ Hydro Quebec, Environmental Performance Reports, 1996 to 2001 and personal communications.

¹⁷ SaskPower, VCR Inc. Climate Change Action Plan [Progress Report – June 2001] and personal communications.

¹⁸ Yukon Development Corporation, An Action Plan for Reducing Greenhouse gases, page 8.

¹⁹ NOTE: data is based on fiscal years, which start in April.

²⁰ NOTE: GHG emissions rates depend on local generation equipment. These are system-side averages. Contact your utility company for more accurate values.

Table 5 — Emissions Factors For Common Transportation Fuels²¹

Vehicle (Fuel)	Carbon Dioxide CO ₂	Methane CH ₄	Nitrous Oxide N ₂ O
Car (Gasoline)	2.360 kg/l	0.00025 kg/l	0.00026 kg/l
Car (Diesel)	2.730 kg/l	0.00005 kg/l	0.0002 kg/l
Light Truck (Gasoline)	2.360 kg/l	0.00019 kg/l	0.00041 kg/l
Light Truck (Diesel)	2.730 kg/l	0.00007 kg/l	0.0002 kg/l
Heavy-Duty Vehicle (Gasoline)	2.360 kg/l	0.00017 kg/l	0.001 kg/l
Heavy-Duty Truck (Diesel)	2.730 kg/l	0.00012 kg/l	0.00008 kg/l
Motorcycle (Gasoline)	2.360 kg/l	0.0014 kg/l	0.000046 kg/l
Propane Vehicles	1.500 kg/l	0.00052 kg/l	0.000028 kg/l
Natural Gas Vehicles ²²	2.758 kg/kg	0.03210 kg/kg	0.00009 kg/kg
Off-Road Vehicles (Gasoline)	2.360 kg/l	0.0027 kg/l	0.00005 kg/l
Off-Road Vehicles (Diesel)	2.730 kg/l	0.00014 kg/l	0.0011 kg/l
Railroad Locomotives (Diesel)	2.730 kg/l	0.00015 kg/l	0.0011 kg/l
Small Marine Transport (Gasoline)	2.360 kg/l	0.0013 kg/l	0.00006 kg/l
Marine Transport (Diesel)	2.730 kg/l	0.00015 kg/l	0.00100 kg/l
Marine Transport (Light 'Distillate' Oil)	2.830 kg/l	0.0003 kg/l	0.00007 kg/l
Marine Transport (Heavy 'Residual' Oil)	3.090 kg/l	0.0003 kg/l	0.00008 kg/l
Aircraft (Aviation Gasoline)	2.330 kg/l	0.00219 kg/l	0.00023 kg/l
Aircraft (Jet Fuel / Aviation Turbo)	2.550 kg/l	0.00008 kg/l	0.00025 kg/l

Table 6 — Indirect Emissions Factors for Transportation

Rail Transportation ²³ (Freight)	0.0162 kg CO ₂ e/tonne-km
Rail Transportation (Passengers)	0.1033 kg CO ₂ e/passenger-km
Bus Travel ²⁴ (Urban)	0.1589 kg CO ₂ e/passenger-km
Bus Travel (Inter-city)	0.0587 kg CO ₂ e/passenger-km
Air Travel ²⁵	34.1 kg CO ₂ e/passenger (take-off) + 0.1046 kg CO ₂ e/passenger-km (in air)

²¹ Only emission factors for vehicles with latest emissions control technology are referred to in this list. To better estimate CH₄ and N₂O from older or less technically sophisticated vehicles, please refer to the Environment Canada document [Canada's Greenhouse Gas Emission Inventory 1990-2000](#), Table D-4 Energy Mobile Combustion Sources, p. 148.

²² Adapted from Environment Canada figures, converted to kg of natural gas, the common units for vehicle natural gas.

²³ Railway Association of Canada.

²⁴ End-Use Energy Handbook 1990 to 2000, Natural Resources Canada.

²⁵ Environmental Reporting, UK Department of Environment, Food and Rural Affairs, September 2001.

Table 7 — Emissions Factors Biomass Combustion

Source	Carbon Dioxide²⁶ CO₂	Methane CH₄	Nitrous Oxide N₂O
Wood Fuel/Wood Waste	0.950 kg/kg fuel	0.00005 kg/kg fuel	0.00002 kg/kg fuel
Accidental Forest Fires	1.630 kg/kg fuel	0.003 kg/kg fuel	0.00175 kg/kg fuel
Prescribed Burns	1.620 kg/kg fuel	0.0062 kg/kg fuel	0.0013 kg/kg fuel
Spent Pulping Liquor	1.428 kg/kg fuel	0.00005 kg/kg fuel	0.00002 kg/kg fuel
Stoves and Fireplaces			
Conventional Stoves	1.500 kg/kg fuel	0.015 kg/kg fuel	0.00016 kg/kg fuel
Conventional Fireplaces and Inserts	1.500 kg/kg fuel	0.015 kg/kg fuel	0.00016 kg/kg fuel
Stoves/Fireplaces with catalytic or other controls	1.500 kg/kg fuel	0.0069 kg/kg fuel	0.00016 kg/kg fuel
Other Wood Burning Equipment	1.500 kg/kg fuel	0.015 kg/kg fuel	0.00016 kg/kg fuel

²⁶ Typically, CO₂ from biomass is tracked but not included in official inventories. It is assumed that since the source fuel was a sustainable forest, the net CO₂ impact is virtually zero. However, CH₄ and N₂O emissions from biomass combustion are included in most inventories.

Table 8 — Biological Sequestration²⁷

Urban	9.18	kg CO ₂ /tree/yr
Rural	10.19	kg CO ₂ /tree/yr

Table 9 — Fugitive Emissions From Coal Mining

Province	Method	Coal Type	t CH ₄ /kt coal
Nova Scotia	Underground	Bituminous	13.79
	Surface	Bituminous	0.13
New Brunswick	Surface	Bituminous	0.13
Saskatchewan	Surface	Lignite	0.06
Alberta	Surface	Bituminous	0.45
	Underground	Bituminous	1.76
	Surface	Sub-Bituminous	0.19
British Columbia	Surface	Bituminous	0.58
	Underground	Bituminous	4.1

²⁷ Planting trees for carbon credits, Tree Canada Foundation.

Table 10 — Agriculture Emissions From Livestock

	Enteric CH ₄ (kg CH ₄ per head per year)	Manure Management CH ₄ (kg CH ₄ per head per year)	N ₂ O from Various Manure Management Systems ²⁸ (kg N ₂ O per head per year)			
			Liquid System	Solid Storage & Drylot	Other Systems	Pasture Range and Paddock
Non-Dairy Cattle	75 (Bulls) 72 (Beef Cows) 56 (Beef Heifers) 47 (Heifers for slaughter, steers and calves)	1	0.000447	0.50064	0.002235	0.37548
Dairy Cattle	118 (Dairy Cows) 56 (Dairy Heifers)	36	0.055756	0.56808	0	0.4208
Poultry	Not Estimated	0.078	0.0000144	0	0.00171	0.000072
Sheep and Lambs	8	0.19	0	0.03772	0.00205	0.03608
Swine	1.5	10	0.01044	0.0232	0	0
Horses	13	1.4	0	0.45356	0.01972	0.45356
Goats	8	0.12	0	0.45356	0.01972	0.45356

²⁸ Calculated by VCR Inc. based on Environment Canada source data from [Canada's Greenhouse Gas Inventory 1990-2000](#), pp. 152-153.

Table 11 — Agriculture Emissions From Soils

Process	Emission
Fertilizer application	0.0125 kg N ₂ O per kg N content
Animal wastes applied as fertilizer	0.0125 kg N ₂ O per kg N content
Plant biological nitrogen fixation and crop residue decomposition ²⁹	0.00032 kg N ₂ O per kg crop residue (dry peas, soya beans, lentils, field beans) 0.00016 kg N ₂ O per kg crop residue (wheat, barley, corn, oats, rye, mixed grains, flax, canola, buckwheat, mustard, sunflowers, canary seed, tame hay) 0.000056 kg N ₂ O per kg crop residue (fodder corn) 0.000047 kg N ₂ O per kg crop residue (potatoes) 0.000038 kg N ₂ O per kg crop residue (sugar beets)
Cultivation of Histosols (peatlands)	5 kg N ₂ O per ha per year

²⁹ Calculated by VCR Inc. based on Environment Canada source data from [Canada's Greenhouse Gas Inventory 1990-2000](#), p. 153.

Table 12 — Coal Fired Boilers

Carbon Dioxide ³⁰ CO ₂			Methane ³¹ CH ₄	Nitrous Oxide ³² N ₂ O
Region / Coal Type	1990-1994	1995-1999		
Nova Scotia				
Canadian Bituminous	2.300 kg/kg	2.249 kg/kg		
U.S. Bituminous	2.330 kg/kg	2.288 kg/kg	0.000022 kg / kg (utility)	0.000032 kg / kg (utility)
New Brunswick				
Canadian Bituminous	2.230 kg/kg	1.996 kg/kg	0.00003 kg / kg (industry)	0.00002 kg / kg (industry)
U.S. Bituminous	2.500 kg/kg	2.311 kg/kg		
Quebec			0.0004 kg / kg (residential)	0.00002 kg / kg (residential)
U.S. Bituminous	2.500 kg/kg	2.343 kg/kg		
Anthracite	2.390 kg/kg	2.390 kg/kg	0.00003 kg / kg (metallurgical coke)	0.00002 kg / kg (metallurgical coke)
Ontario				
Canadian Bituminous	2.520 kg/kg	2.254 kg/kg		
U.S. Bituminous	2.500 kg/kg	2.432 kg/kg		
Sub-Bituminous	2.520 kg/kg	1.733 kg/kg		
Lignite	1.490 kg/kg	1.476 kg/kg		
Anthracite	2.390 kg/kg	2.390 kg/kg		

³⁰ Environment Canada, Canada's Greenhouse Gas Inventory, 1990-2000, June 2002, p. 146.

³¹ Environment Canada, Canada's Greenhouse Gas Inventory, 1997 Emissions and Removals with Trend, April 1999, p. 102.

³² Environment Canada, Canada's Greenhouse Gas Inventory, 1997 Emissions and Removals with Trend, April 1999, p. 102.

Table 12 — Coal Fired Boilers (cont'd)

Carbon Dioxide CO ₂			Methane CH ₄	Nitrous Oxide N ₂ O
Region / Coal Type	1990-1994	1995-1999		
Manitoba			0.000022 kg / kg (utility)	0.000032 kg / kg (utility)
Canadian Bituminous	2.520 kg/kg	2.252 kg/kg		
Sub-Bituminous	2.520 kg/kg	1.733 kg/kg		
Lignite	1.520 kg/kg	1.424 kg/kg	0.00003 kg / kg (industry)	0.00002 kg / kg (industry)
Saskatchewan				
Lignite	1.340 kg/kg	1.427 kg/kg	0.0004 kg / kg (residential)	0.00002 kg / kg (residential)
Alberta				
Canadian Bituminous	1.700 kg/kg	1.852 kg/kg		
Sub-Bituminous	1.740 kg/kg	1.765 kg/kg	0.00003 kg / kg (metallurgical coke)	0.00002 kg / kg
Anthracite	2.390 kg/kg	2.390 kg/kg		
British Columbia				
Canadian Bituminous	1.700 kg/kg	2.072 kg/kg	0.00003 kg / kg (metallurgical coke)	0.00002 kg / kg
All Provinces				
Metallurgical Coke	2.480 kg/kg	2.480 kg/kg		

10. Unit Conversion Tables³³

Table 13 — Metric Prefixes

Abbreviation	Prefix	Multiple
k	kilo-	10^3
M	mega-	10^6
G	giga-	10^9
T	tera-	10^{12}
P	peta-	10^{15}

Table 14 — Mass

1 tonne	1,000 kg
	10^{-3} kt (kilotonnes)
	10^{-6} Mt (megatonnes)
	1.1023 tons
	2,204.6 lbs. (pounds)

Table 15 — Volume

1 m ³ (cubic metre)	1,000 litres
	264.2 US gallons
	6.29 barrels
	35.315 ft ³ (cubic feet)
	1.308 yd ³ (cubic yards)

³³ Canada's Energy Outlook 1996-2020, Natural Resources Canada, Appendix D, April 1997.

Table 16 — Energy

1 GJ (gigajoule) = 947,817 Btu	277.8 kWh (kilowatt hour)
1 m ³ natural gas	0.03723 GJ
1 m ³ motor gasoline	34.66 GJ
1 m ³ aviation gasoline	33.62 GJ
1 m ³ diesel	38.68 GJ
1 m ³ light fuel oil	38.68 GJ
1 m ³ heavy fuel oil	41.73 GJ
1 m ³ light crude oil	38.51 GJ
1 m ³ heavy crude oil	40.90 GJ
1 kWh electricity = 3.6 MJ	0.0036 GJ
1 m ³ propane ³⁴	25.49 GJ
1 t wood (not wood pellets) ³⁵	18.0 GJ
1 cord hardwood (air dried) ³⁶	30.6 GJ
1 cord softwood (air dried) ³⁷	18.7 GJ
1 cord mixed wood (air dried) ³⁸	25.0 GJ
1 t wood pellets ³⁹	19.8 GJ
1 kg wood pellets	0.0198 GJ

³⁴ VCR Inc. estimate, 2003

³⁵ VCR Inc. estimate, 2003

³⁶ Natural Resources Canada, *A Guide to Residential Woodburning*, 2002, p. 54.

³⁷ *Ibid.*

³⁸ *Ibid.*

³⁹ *Ibid.*