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## 1.0 CES Engineering Guidelines

### Overview of program

#### 1.1 Purpose

This guideline serves to provide the minimum requirements for delivering Scoping Audits, Engineering Studies, and Retro and Re-Commissioning (RCx) Investigations as part of the Custom Energy Solutions (CES) program offered by Energy Efficiency Alberta (EEA). Our Technical Reviewers will be able to complete the review of the Scoping Audits, Engineering Studies, and RCx Investigations

(“Deliverables”) in a timely manner, provided all the information described in this guideline are included and by ensuring the information provided is complete and accurate. The Scoping Audits, Engineering Studies, and RCx Investigations shall meet the technical, financial and commercial analysis outlined below. The technical review process, as part of the CES program, is subject to external audit, as such we are committed to delivering GHG reductions that can be verified using International Performance Measurement and Verification Protocol (IPMVP) standards.

## 1.2 Scope

The scope of this document pertains to documenting the identified GHG reductions at large commercial and industrial facilities by developing engineering deliverables. Scoping Audits involve high level assessments of energy use at facilities with the purpose of identifying quick and easy verifiable GHG reductions. A secondary purpose of Scoping Audits are to identify opportunities that may need more effort to determine the extent of GHG reduction through further in-depth engineering concept development as well as further financial and commercial analysis. This in-depth engineering analysis and the associated commercial review forms the basis for an Engineering Study. The RCx Investigation provides in-depth analysis on overall facility performance, opportunities for increased efficiency through improved operations and maintenance, equipment and building shell updates and behavioural initiatives.

Deliverables can be focused on all energy uses at a facility (electricity, natural gas, diesel or gasoline, etc.) or they can be focused on a single energy consuming system (e.g. compressed air, steam generation and distribution or refrigeration, etc.).

## 1.3 Overall Eligibility

The following eligibility requirements apply to participants performing Scoping Audits, Engineering Studies and/or RCx Investigations:

- The facility where the Scoping Audit, Engineering Study, or RCx Investigation is performed shall be located in Alberta.
- The facility shall be part of industrial, commercial or institutional sectors.
- Up to \$1 million per project, per year for facilities with 10,000 tonnes or more annual GHG emissions. Up to \$250,000 per project per year for facilities under 10,000 annual tonnes of annual GHG emissions.
- Inclusive of incentives for Scoping Audits, Engineering Studies and RCx Investigations.
- Up to \$2 million per parent company, per year for customers with multiple sites with 10,000 tonnes or more annual GHG emissions. Up to \$500,000 per parent company with multiple sites under 10,000 annual GHG emissions.
- Inclusive of incentives for Scoping Audits, Engineering Studies and RCx Investigations.

Parent company is to be defined by Canada Revenue Agency’s nine-digit Business Number Applications and must be made online through the Facility Owner Log In or Program Ally Log In (<https://cr107.secure.force.com/ies/>).

Facilities designated as Large Final Emitters (LFE) are not eligible to participate in the program.

A program participant can directly undertake an Engineering Study or RCx Investigation at a facility without having performed a Scoping Audit first.

A facility can choose to apply for incentives without performing a Scoping Audit, an Engineering Study or RCx Investigation (without having Deliverables developed by qualified Program Allies). All incentive applications will be held to the same standard and level of detail requirements.

#### 1.4 Program Incentives

Incentives are paid based on verified GHG reductions, to the lesser of the following:

- a. \$175\* per ton GHG reduction\*\*, or
- b. Simple payback down to 1 year

\* Year 1 (May 1, 2018 to March 31, 2019) incentive. Bonus incentives are available for early verified GHG reductions, contact CES Account Managers for further detail.

\*\* All incentives are based on \$/tonne, Year 1, annualized GHG reduction. Incentives are paid out for GHG emissions reductions in Year 1 only.

Incentives for projects in Year 2 and Year 3 of the Program, starting April 1, 2019 and April 1, 2020, respectively, are subject to change and are expected to be lower than Year 1.

Incentives rates, including relevant incentive bonuses, based on verified GHG reductions are valid for 12 months from the date of the pre-approval application notification issued by the CES program. Projects requiring more than the 12 months allotted time to verify GHG reductions will be subject to the prevailing incentive rates.

#### 1.5 General

Deliverables shall be dated and shall include revision control.

Engineering Studies and RCx Investigations shall be signed by a Professional Engineer in good standing with APEGA.

Information submitted in support of an incentive application shall be reviewed and approved by a Professional Engineer in good standing with APEGA.

The system boundaries shall be limited to the permanently installed location of the equipment under consideration. Opportunities for GHG reduction shall be limited to savings realised by the operation of the proposed system.

#### 1.6 Engineering Standards & Conversion Factors

All reports shall be completed using metric units.

Units used in the analysis/calculation shall be clearly indicated.

Capital and operation costs shall be quoted in Canadian Dollars.

Energy use and savings shall be reported as shown in Table 1 below.

**Table 1: Metric units for energy usage and savings**

| Fuel Type                        | Description                    | Units   |
|----------------------------------|--------------------------------|---|
| <b>Electricity</b>               | Annual energy consumed/savings | Kilowatt hours per year (kWh/yr) or megawatt hours per year (MWh/yr)                          |
|                                  | Demand consumed/savings        | Kilowatt (kW), megawatt (MW) or kilovolt-amp (kVA), megavolt-amp (MVA) (include power factor) |
| <b>Natural Gas</b>               | Annual energy consumed/savings | Gigajoule per year (GJ/yr)  |
| <b>Methane</b>                   | Annual energy consumed/savings | Cubic meter per year (m <sup>3</sup> /yr)   |
| <b>Propane, Diesel, Fuel Oil</b> | Annual energy consumed/savings | Litre per year (L/yr)   |

Refer to the following websites for standard metric units and conversion factors:

<https://apps.neb-one.gc.ca/Conversion/conversion-tables.aspx?GoCTemplateCulture=en-CA&wbdisable=true%20-%202-6>

and

<http://www.nrcan.gc.ca/energy/international/nacei/18057>

Please refer to the Carbon Offset Emission Factor Handbook published by the Government of Alberta for the most recent and comprehensive list of the grid displacement and emission factors:

<https://open.alberta.ca/dataset/dd23dec0-e408-49b7-8bdc-151cc1ce58f5/resource/18f3a5f5-6370-467b-be5a-664330014723/download/2015-carbonemissionhandbook-mar11.pdf>

## 2.0 Scoping Audits

### 2.1 Purpose of Scoping Audits

The purpose of Scoping Audits are to assist participants find easy quick-win GHG reductions and to help them identify feasible capital projects that can reduce GHG emissions. An interested participant may not know if energy conservation opportunities exist at their facility or if the potential opportunity they have in mind can translate into real GHG reductions. Scoping Audits are available to help facility owners/operators develop a list of energy savings opportunities that can be ranked based on internal and financial priorities.

Savings opportunities with a high confidence levels can directly apply for incentives through the respective CES Programs. Opportunities requiring more detailed engineering effort to achieve a high level of confidence in estimated savings can proceed to an Engineering Study.

Scoping Audits are required to have a minimum +/- 50 % accuracy with regards to GHG reduction and associated project cost estimates.

### 2.2 Eligibility Criteria

The eligibility criteria for participating in a Scoping Audit, over and above the criteria mentioned in Section 1.3, and shown in Table 3 below, are:

- Itemized fixed fee proposal required with detailed requirements outlined in Section 2.3
- Audit shall be performed by an approved CES Program Ally
- 50% of incentive funding for Scoping Audit subject to implementing identified custom energy conservation measures (ECMs) resulting in minimum GHG reduction as per eligibility criteria shown in Table 3.

**Table 3: Eligibility Criteria for Scoping Audits**

| Facility's Existing Carbon Footprint | Maximum Scoping Audit Incentive | Minimum GHG Savings Requirement  |
|--------------------------------------|---------------------------------|----------------------------------|
| <10,000 tCO <sub>2</sub> e           | \$4,000                         | 5% of existing carbon footprint* |
| >10,000 tCO <sub>2</sub> e           | \$8,000                         | 5% of existing carbon footprint* |

\*As determined by the Scoping Audit

A list of qualified Program Allies is available from your CES Account Manager or contact us. ([https://cr107.secure.force.com/ies/ALB\\_dsmtContactUS](https://cr107.secure.force.com/ies/ALB_dsmtContactUS)).

### 2.3 Proposal Requirements

All proposals for Scoping Audits shall include the following:

- Enrollment number (EA-XXXXX)
- Customer name, address, contact name(s), telephone number(s)
- Facility information (if different than above)

- Facility type (e.g. manufacturing, healthcare, etc.)
- Most recent available 12-month energy use of facility/system(s) under review (applicable sources i.e. electricity when reviewing compressed air systems, natural gas when reviewing boilers and steam systems, etc.)
- Brief facility description (incl. construction, operations, etc. as applicable to end-uses)
- End-uses included in Scoping Audit
- Information of person responsible for signing off on the Scoping Audit
- Itemized cost breakdown by tasks, roles, hours and hourly rates (excl. taxes)
- List estimated audit disbursements/expenses separately.
- Limitations of proposal, system(s) excluded

## 2.4 Application Process

All Scoping Audit applications will be tracked in Demand Side Management Tracking (DSMT) platform. All logged applications by Customers and Program Allies (on behalf of Customers) will be screened for necessary completeness of information provided. Initial application intake process will be conducted by Program Coordinators.

### I. Application Intake & Administrative review

Apply online by registering and filling out an application at: <https://cr107.secure.force.com/ies/>

During this process the application will receive an enrollment number EA-XXXXX.

At a minimum the application will be verified for:

- Customer name and Facility address within Alberta
- That the customer has minimum 12 months of energy use
- The Facility is not a LFE
- Measures included in the application
- Costs and proposed project completion time

### II. Technical Review

During this process, the application and the supporting proposal will be reviewed by CES program engineers to qualify the Scoping Audit for approval. This submittal, at a minimum, shall include all information as described in Section 2.3. As next steps, a site visit will be arranged to discuss the scope and schedule of the proposed Scoping Audit. CES program engineers will conduct a walk through and verify the information submitted in the proposal. The Scoping Audit approval will then be sent back to the program coordinators for processing.

### III. Scoping Audit Approval

A Scoping Audit technical screening and audit incentive letter will be sent to the Customer upon approval.

## 2.5 Audit Scoping Report Structure

This section describes the minimum requirements and minimum content that shall be included in the Scoping Audit report. This information is required to create a standard format for all program participants. The intent is not to limit or prescribe the services provided, but to ensure the completeness and quality of the information presented to the CES program.

### I. Executive Summary

- a. Summary of ECMs – include a high level description of the business case of the priority ECMs

Tabulate results:

- ECM identifier
- ECM name
- ECM electrical savings (MWh/yr)
- ECM demand savings (MW/yr)
- ECM natural gas savings (GJ/yr)
- ECM other fuel savings (e.g. L/yr)
- ECM GHG reduction (tons CO<sub>2</sub>e/yr)
- ECM dollar savings (\$/yr)
- ECM capital cost (\$)
- ECM simple payback (years)

- b. Date of walk-through – note date(s) of site visit(s)

- c. Recommendations

- d. Next steps

### II. Customer Information

- a. Legal company name
- b. Name of parent company, if applicable
- c. Facility name
- d. Unique site identifier or facility address
- e. Utility account numbers
- f. Business Number (BN) or Tax Identification Number (TIN)

### III. Contact Information

- a. Customer – Site contact name, title, address, phone number, e-mail address
- b. Consultant – Company name, contact name, title, address, phone number, e-mail address

### IV. Facility and System Descriptions

- a. Description of facility, systems and processes using energy





- Analysis/calculations shall be systematic and easy to follow/review (workbooks with only values and no explanation how values are derived will be rejected)
- Methodology shall be clear and based on sound engineering principles
- All assumptions shall be stated
- Any supporting documentation (i.e. site measurements, shop drawings, vendor and installation quotes, etc.)

The interactive effects between different energy sources shall be included in the analysis and report.

The interactive effects between ECMs, when bundled, shall be include in the analysis and report.

Sub-metering is NOT specifically required. The expectation is that measurements will be taken to substantiate assumptions made when estimating load factor, runtimes, thermal loads, mass flow, etc. Available information from plant control systems, building schedules or logs can be used to support calculations.

## 3.0 Engineering Studies

### 3.1 Purpose of Engineering Studies

The purpose of Engineering Studies are to assist participants obtain a high level of confidence in achieving GHG reduction when the projects are implemented. The information used in developing the Engineering Study and the result from the Engineering Study shall be of sufficient quality and detail to allow the Facilities/Customers to make investment decisions with minimum additional information required.

Savings opportunities with a high confidence levels (e.g. steam trap replacement or leak reduction) can directly apply for incentives through the respective EEA Programs without going through an Engineering Study, provided it can meet all the criteria stated.

Engineering Studies are required to have a minimum +/- 15 % accuracy with regards to GHG reduction and associated project cost estimates.

### 3.2 Eligibility Criteria

The eligibility criteria for participating in an Engineering Study, over and above the criteria mentioned in Section 1.3, and shown in Table 4 below, are:

- Itemized fixed fee proposal required with detailed requirements outlined in Section 3.3.
- Payment of final 25% of study funding subject to implementation of identified ECMs with minimum GHG reduction as per eligibility criteria shown in Table 4 and a simple payback of five (5) years or less. GHG savings achieved are eligible for incentives.
- Engineering Study shall be performed by a qualified CES Program Ally.

**Table 4: Eligibility Criteria for Engineering Studies**

| Facility's Existing Carbon Footprint | Maximum Engineering Study Incentive | Minimum GHG Savings Requirement |
|--------------------------------------|-------------------------------------|---------------------------------|
| <10,000 tCO <sub>2</sub> e           | \$20,000                            | 225 tCO <sub>2</sub> e          |
| >10,000 tCO <sub>2</sub> e           | \$40,000                            | 450 tCO <sub>2</sub> e          |

A list of qualified Program Allies is available from your CES Account Manager or contact us. ([https://cr107.secure.force.com/ies/ALB\\_dsmContactUS](https://cr107.secure.force.com/ies/ALB_dsmContactUS)).

### 3.3 Proposal Requirements

All proposals for Engineering Studies shall include the following:

- Unique application number (if available)
- Enrollment Application (EA) number applicable to ECMs included in earlier Scoping Audits (if applicable)
- Customer name, address, contact name(s), telephone number(s)

- Facility information (if different than above)
- Facility type (e.g. manufacturing, healthcare, etc.)
- Most recent available 24-month energy use of facility/system(s) under review
- Brief facility description (incl. construction, operations, etc. as applicable to end-uses)
- Detailed description of systems under review
- ECMs included in Engineering Study
- Estimate of GHG reductions that can be achieved under scope of work
- Proposed methodology for estimating/analysing the ECMs
- Information of person responsible for signing off on the Engineering Study
- Itemized cost breakdown by tasks, roles, hours and hourly rates (excl. taxes)
- List estimated study disbursements/expenses separately
- Limitations of proposal, system(s) excluded

### 3.4 Application Process

All Engineering Study applications will be tracked in Demand Side Management Tracking (DSMT) platform. All logged applications by Customers and Program Allies (on behalf of Customers) will be screened for necessary completeness of information provided. Initial application intake process will be conducted by Program Coordinators.

#### I. Application Intake & Administrative review

Apply online by registering and filling out an application at: <https://cr107.secure.force.com/ies/>

During this process the application will receive an enrollment application number EA-XXXXX. Reference previous enrollment application numbers, if applicable.

At a minimum the application will be verified for:

- Customer name and Facility address within Alberta
- That the customer has minimum 36 months of energy use
- The Facility is not a LFE
- Measures included in the application and estimated GHG reduction
- Costs and proposed project completion time

#### II. Technical Review

During this process, the application and the supporting proposal will be reviewed by CES program engineers to qualify the Engineering Study for approval. This submittal, at a minimum, shall include all information as described in Section 3.3. As next steps, a site visit will be arranged to discuss the scope and schedule of the proposed Engineering Study. CES program engineers will conduct a walk through and verify the information submitted in the proposal. The Engineering Study approval will then be sent back to the program coordinators for processing.

### III. Engineering Study Approval

An Engineering Study technical screening and audit incentive letter will be sent to the Customer upon approval.

### 3.5 Engineering Study Report Structure

This section describes the minimum requirements and minimum content that shall be included in the study report. This information is required to create a standard format for all program participants. The intent is not to limit or prescribe the services provided, but to ensure the completeness and quality of the information presented to the CES program.

#### I. Executive Summary

- a. Summary of ECMs – include a high level description of the business case of the priority ECMs

Tabulate results:

- ECM identifier
- ECM name
- ECM electrical savings (MWh/yr)
- ECM demand savings (MW/yr)
- ECM natural gas savings (GJ/yr)
- ECM other fuel savings (e.g. L/yr)
- ECM GHG reduction (tonnes CO<sub>2</sub>e/yr)
- ECM dollar savings (\$/yr)
- ECM capital cost (\$)
- ECM simple payback (years)

- b. Date of site visit(s) – note date(s) of site visit(s)

- c. Recommendations

- d. Next steps

#### II. Customer Information

- a. Legal company name

- b. Name of parent company, if applicable

- c. Facility name

- d. Unique site identifier or facility address

- e. Utility account numbers

- f. Business Number (BN) or Tax Identification Number (TIN)

#### III. Contact Information

- a. Customer – Site contact name, title, address, phone number, e-mail address

- b. Consultant – Company name, contact name, title, address, phone number, e-mail address

**IV. Facility and System Descriptions**

- a. Description of facility, systems and processes using energy
- b. Major equipment/load list – refer to unique identifiers
- c. Annual production data
- d. Other pertinent facility information

**V. Billing Analysis (all applicable energy sources)**

- a. Billing analysis (36-month minimum)
- b. Utility rate analysis (see Appendix A for details)
- c. Facility GHG emission (tonnes CO<sub>2</sub>e)

**VI. Energy End-use Breakdown**

- a. Detailed facility energy end-use breakdown by fuel/energy type
- b. Independent variables affecting energy use (weather, occupancy, production, etc.)

**VII. Energy Conservation Measures**

Provide uniquely identified descriptions of the ECMs identified

- a. Define baseline
- b. Technical description of ECMs
- c. Methodology used in estimating the savings
- d. Assumption made in calculating savings
- e. Capital cost estimates
- f. Tabulate results:
  - ECM identifier
  - ECM name
  - ECM electrical savings (kWh/yr)
  - ECM demand savings (kW/yr)
  - ECM natural gas savings (GJ/yr)
  - ECM other fuel savings (e.g. L/yr)
  - ECM GHG reduction (tonnes CO<sub>2</sub>e/yr)
  - ECM dollar savings (\$/yr)
  - ECM capital cost (\$)
  - ECM simple payback (years)
- g. Next steps/action items
- h. Describe non-energy benefits of ECMs

- VIII.** M&V Consideration – include description of how ECMs can be measured and verified based on IPMVP principles. Include description of instrumentation required and independent variables affecting energy use/intensity.
- IX.** Conclusions
- X.** Appendix
  - a.** Vendor quotes
  - b.** Shop drawings
  - c.** Billing Data
  - d.** Technical references

### **3.6 Additional Requirements**

The following information shall be included with the submission of the Engineering Study;

- Fully accessible native electronic copies of the ECM analysis/calculations
  - Analysis/calculations shall be systematic and easy to follow/review (workbooks with only values and no explanation how values are derived will be rejected)
  - Methodology shall be clear and based on sound engineering principles
  - All assumptions shall be stated
- Any supporting documentation (i.e. site measurements, shop drawings, vendor and installation quotes, etc.)

The baseline(s) for the identified ECMs shall be based on sub-metering (or available historian data) of the relevant system(s) for a duration of time sufficient to obtain a representative energy use profile providing a high degree of confidence. Major independent variables significantly affecting the baseline shall be identified and included in the analysis.

The interactive effects between different energy sources shall be included in the analysis and report.

The interactive effects between ECMs, when bundled, shall be included in the analysis and report.

Cost estimates shall be supported by comprehensive vendor and/or installation quotes or by engineering cost estimates. Project costs shall include all cost required to move a project from concept stage through to being fully operational.

## 4.0 Retro- and Re-Commissioning (RCx) Investigations

### 4.1 Purpose of RCx Investigations

The purpose of Retro-Commissioning and Re-Commissioning (RCx) Investigations is to provide in-depth analysis on overall facility performance, opportunities for increased efficiencies through improved operations and maintenance (O&M), equipment and building shell updates and behavioural initiatives. It is an organized process that defines facility performance objectives, establishes a methodology for testing and verifying those objectives, and documents the results of facilities that are already in operation.

It also provides an understanding of how closely the building comes to operating as designed, identifies equipment or systems that need to be replaced, opportunities for saving energy and money, and results in specific strategies for improving performance of the various building systems.

The details emanating from the RCx Investigation shall be of sufficient quality and detail to allow the facility owners/participants to make investment decisions with minimum additional information required.

RCx Investigations are required to have a minimum +/- 15 % accuracy with regards to GHG reduction and associated project cost estimates.

### 4.2 Eligibility Criteria

The eligibility criteria for participating in an RCx Investigation, over and above the criteria mentioned in Section 1.3, and shown in Table 5 below, are:

- Itemized fixed fee proposal required with detailed requirements outlined in Section 4.3.
- Payment of final 25% of funding subject to full M&V of ECMs after implementation with minimum GHG reduction as per eligibility criteria shown in Table 5. If customers do not fulfill the minimum GHG commitments, the Program will issue a pro-rated payment of the remaining amount based on the minimum goal.
- Investigations shall be performed by an approved CES Program Ally.

**Table 5: Eligibility Criteria for RCx Investigations**

| Facility's Existing Carbon Footprint | Maximum RCx Investigation Incentive | Minimum GHG Savings Requirement |
|--------------------------------------|-------------------------------------|---------------------------------|
| <10,000 tCO <sub>2</sub> e           | \$30,000                            | 375 tCO <sub>2</sub> e          |
| >10,000 tCO <sub>2</sub> e           | \$60,000                            | 750 tCO <sub>2</sub> e          |

A list of qualified Program Allies is available from your CES Account Manager or contact us. ([https://cr107.secure.force.com/ies/ALB\\_dsmtContactUS](https://cr107.secure.force.com/ies/ALB_dsmtContactUS)).

### 4.3 Proposal Requirements

All proposals for RCx Investigations shall include the following:

- Unique application number (if available)

- Enrollment Application (EA) number applicable to ECMs included in earlier Scoping Audits (if applicable)
- Customer name, address, contact name(s), telephone number(s)
- Facility information (if different than above)
- Facility type (e.g. manufacturing, healthcare, etc.)
- Most recent available 24-month energy use of facility/system(s) under review
- Brief facility description (incl. construction, operations, etc. as applicable to end-uses)
- Detailed description of systems under review
- ECMs included in RCx Investigation
- Estimate of GHG reductions that can be achieved under scope of work
- Proposed methodology for estimating/analysing the ECMs
- Information of person responsible for signing off on the RCx Investigation
- Itemized cost breakdown by tasks, roles, hours and hourly rates (excl. taxes)
- List estimated RCx Investigation study disbursements/expenses separately
- Limitations of proposal, system(s) excluded

Applications must be made online through the Facility Owner Log In or Program Ally Log In (<https://cr107.secure.force.com/ies/>).

#### 4.4 Application Process

All RCx Investigation applications will be tracked in Demand Side Management Tracking (DSMT) platform. All logged applications by Customers and Program Allies (on behalf of Customers) will be screened for necessary completeness of information provided. Initial application intake process will be conducted by Program Coordinators.

##### I. Application Intake & Administrative review

Apply online by registering and filling out an application at: <https://cr107.secure.force.com/ies/>

During this process the application will receive an enrollment application number EA-XXXXX. Reference previous enrollment application numbers, if applicable.

At a minimum the application will be verified for:

- Customer name and Facility address within Alberta
- That the customer has minimum 36 months of energy use
- The Facility is not a LFE
- Measures included in the application and estimated GHG reduction
- Costs and proposed project completion time



## II. Technical Review

During this process, the application and the supporting proposal will be reviewed by CES program engineers to qualify the RCx Investigation for approval. This submittal, at a minimum, shall include all information as described in Section 4.3. As next steps, a site visit will be arranged to discuss the scope and schedule of the proposed RCx Investigation. CES program engineers will conduct a walk through and verify the information submitted in the proposal. The RCx Investigation approval will then be sent back to the program coordinators for processing.

## III. RCx Investigation Approval

A RCx Investigation technical screening and audit incentive letter will be sent to the Customer upon approval.

### 4.5 RCx Investigation Report Structure

This section describes the minimum requirements and minimum content that shall be included in the report. This information is required to create a standard format for all program participants. The intent is not to limit or prescribe the services provided, but to ensure the completeness and quality of the information presented to the CES program.

#### I. Executive Summary

- a. Summary of ECMs – include a high level description of the business case of the priority ECMs

Tabulate results:

- ECM identifier
- ECM name
- ECM electrical savings (MWh/yr)
- ECM demand savings (MW/yr)
- ECM natural gas savings (GJ/yr)
- ECM other fuel savings (e.g. L/yr)
- ECM GHG reduction (tonnes CO<sub>2</sub>e/yr)
- ECM dollar savings (\$/yr)
- ECM capital cost (\$)
- ECM simple payback (years)

- b. Date of site visit(s) – note date(s) of site visit(s)

- c. Recommendations

- d. Next steps

#### II. Customer Information

- a. Legal company name
- b. Name of parent company, if applicable
- c. Facility name
- d. Unique site identifier or facility address

- e. Utility account numbers
      - f. Business Number (BN) or Tax Identification Number (TIN)
- III. Contact Information
  - a. Customer – Site contact name, title, address, phone number, e-mail address
  - b. Consultant – Company name, contact name, title, address, phone number, e-mail address
- IV. Facility and System Descriptions
  - a. Description of facility, systems and processes using energy
  - b. Major equipment/load list – refer to unique identifiers
  - c. Annual production data
  - d. Other pertinent facility information
- V. Billing Analysis (all applicable energy sources)
  - a. Billing analysis (36-month minimum)
  - b. Utility rate analysis (see Appendix A for details)
  - c. Facility GHG emission (tons CO<sub>2</sub>e)
- VI. Energy End-use Breakdown
  - a. Detailed facility energy end-use breakdown by fuel/energy type
  - b. Independent variables affecting energy use (weather, occupancy, production, etc.)
- VII. Energy Conservation Measures
  - Provide uniquely identified descriptions of the ECMs identified
  - a. Define baseline
  - b. Technical description of ECMs
  - c. Methodology used in estimating the savings
  - d. Assumption made in calculating savings
  - e. Capital cost estimates
  - f. Tabulate results:
    - ECM identifier
    - ECM name
    - ECM electrical savings (kWh/yr)
    - ECM demand savings (kW/yr)
    - ECM natural gas savings (GJ/yr)
    - ECM other fuel savings (e.g. L/yr)
    - ECM GHG reduction (tons CO<sub>2</sub>e/yr)

- ECM dollar savings (\$/yr)
- ECM capital cost (\$)
- ECM simple payback (years)

- g.** Next steps/action items
- h.** Describe non-energy benefits of ECMs

**VIII.** M&V Consideration – include description of how ECMs can be measured and verified based on IPMVP principles. Include description of instrumentation required and independent variables affecting energy use/intensity.

**IX.** Conclusions

**X.** Appendix

- a.** Vendor quotes
- b.** Shop drawings
- c.** Billing Data
- d.** Technical references

#### **4.6 Additional Requirements**

The following information shall be included with the submission of the RCx Investigation;

- Fully accessible native electronic copies of the ECM analysis/calculations
  - Analysis/calculations shall be systematic and easy to follow/review (workbooks with only values and no explanation how values are derived will be rejected)
  - Methodology shall be clear and based on sound engineering principles
  - All assumptions shall be stated
- Any supporting documentation (i.e. site measurements, shop drawings, vendor and installation quotes, etc.)

The baseline(s) for the identified ECMs shall be based on sub-metering (or available historian data) of the relevant system(s) for a duration of time sufficient to obtain a representative energy use profile providing a high degree of confidence. Major independent variables significantly affecting the baseline shall be identified and included in the analysis.

The interactive effects between different energy sources shall be included in the analysis and report.

The interactive effects between ECMs, when bundled, shall be included in the analysis and report.

Cost estimates shall be supported by comprehensive vendor and/or installation quotes or by engineering cost estimates. Project costs shall include all cost required to move a project from concept stage through to being fully operational.

## Appendix A – Consumption and Billing Data

### Consumption data

1. Cumulative meter data format for electricity or natural gas (minimum 12 months of data required):

| Starting date | End date      | kWh (or GJ)<br>(as applicable) |
|---------------|---------------|--------------------------------|
| Jan 1, 2018   | Jan 31, 2018  | 634,346 kWh                    |
| Feb. 1, 2018  | Feb 28, 2018  | 572,007 kWh                    |
| Mar. 1, 2018  | Mar.31,2018   | 610,334 kWh                    |
| April 1, 2018 | April 30,2018 | 549,383 kWh                    |
| May 1, 2018   | May 31, 2018  | 602,199 kWh                    |
| June 1, 2018  | June 30, 2018 | 612,937 kWh                    |
| July 1, 2018  | July 31,2018  | 586,837 kWh                    |
| Aug. 1, 2018  | Aug.31, 2018  | 645,847 kWh                    |
| Sept.1, 2018  | Sept.30,2018  | 478,851 kWh                    |
| Oct. 1, 2018  | Oct. 31,2018  | 620,099 kWh                    |
| Nov. 1, 2018  | Nov. 31, 2018 | 609,650 kWh                    |
| Dec. 1, 2018  | Dec. 31, 2018 | 621,824 kWh                    |

2. Hourly interval meter data format for electricity or natural gas (minimum 12 months of data required):

| Starting date  | Starting time | End date       | End time | kW (or GJ)<br>(as applicable) |
|----------------|---------------|----------------|----------|-------------------------------|
| Aug. 1, 2018   | 0:00          | Aug. 1, 2018   | 1:00     | 221.98                        |
| Aug. 1, 2018   | 1:00          | Aug. 1, 2018   | 2:00     | 209.51                        |
| Aug. 1, 2018   | 2:00          | Aug. 1, 2018   | 3:00     | 196.50                        |
| Aug. 1, 2018   | 3:00          | Aug. 1, 2018   | 4:00     | 181.85                        |
| Aug. 1, 2018   | 4:00          | Aug. 1, 2018   | 5:00     | 176.58                        |
| Aug. 1, 2018   | 5:00          | Aug. 1, 2018   | 6:00     | 169.40                        |
| Aug. 1, 2018   | 6:00          | Aug. 1, 2018   | 7:00     | 169.54                        |
| Aug. 1, 2018   | 7:00          | Aug. 1, 2018   | 8:00     | 175.11                        |
| Aug. 1, 2018   | 8:00          | Aug. 1, 2018   | 9:00     | 183.86                        |
| Aug. 1, 2018   | 9:00          | Aug. 1, 2018   | 10:00    | 188.24                        |
| Aug. 1, 2018   | 10:00         | Aug. 1, 2018   | 11:00    | 206.79                        |
| Aug. 1, 2018   | 11:00         | Aug. 1, 2018   | 12:00    | 218.95                        |
| Aug. 1, 2018   | 12:00         | Aug. 1, 2018   | 13:00    | 241.97                        |
| Aug. 1, 2018   | 13:00         | Aug. 1, 2018   | 14:00    | 242.24                        |
| ----           | ----          | ----           | ----     | ----                          |
| July. 31, 2019 | 23:00         | July. 31, 2019 | 0:00     | 234.35                        |

**Billing data - Electric**

Minimum 1 year typical Electric billing data without carried over fees, or taxes (or taxes and carried over fees are reported separately)

| Month - Year | Off Peak Usage kWh | On Peak Usage kWh | Off Peak Usage \$/kWh | On Peak Usage \$/kWh | UFE / Line Losses kWh | UFE / Line Losses \$/kWh | Power Pool Trading Chgs kWh | Power Pool Trading Chgs \$/kWh | Transmission Chgs (\$) | Distribution Chgs (\$) | Local Access Fee Paid to City (\$) | Riders (\$) | Subtotal (\$) | GST 5% (\$) | Total Cost / Blended Cost (\$) |
|--------------|--------------------|-------------------|-----------------------|----------------------|-----------------------|--------------------------|-----------------------------|--------------------------------|------------------------|------------------------|------------------------------------|-------------|---------------|-------------|--------------------------------|
| Jan-17       | 104,709            | 77,450            | 0.04775               | 0.04775              | 5,476                 | 0.01568                  | 187,000                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,428.48     | 821.42      | 17,249.90                      |
| Feb-17       | 104,944            | 77,487            | 0.04775               | 0.04775              | 5,504                 | 0.01568                  | 187,219                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,546.98     | 827.35      | 17,374.33                      |
| Mar-17       | 104,710            | 77,451            | 0.04775               | 0.04775              | 5,532                 | 0.01568                  | 187,001                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,429.45     | 821.47      | 17,250.93                      |
| Apr-17       | 104,945            | 77,488            | 0.04775               | 0.04775              | 5,560                 | 0.01568                  | 187,220                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,547.95     | 827.40      | 17,375.35                      |
| May-17       | 104,711            | 77,452            | 0.04775               | 0.04775              | 5,588                 | 0.01568                  | 187,002                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,430.43     | 821.52      | 17,251.95                      |
| Jun-17       | 104,946            | 77,489            | 0.04775               | 0.04775              | 5,616                 | 0.01568                  | 187,221                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,548.93     | 827.45      | 17,376.37                      |
| Jul-17       | 104,712            | 77,453            | 0.04775               | 0.04775              | 5,644                 | 0.01568                  | 187,003                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,431.40     | 821.57      | 17,252.97                      |
| Aug-17       | 104,947            | 77,490            | 0.04775               | 0.04775              | 5,672                 | 0.01568                  | 187,222                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,549.90     | 827.49      | 17,377.39                      |
| Sep-17       | 104,713            | 77,454            | 0.04775               | 0.04775              | 5,700                 | 0.01568                  | 187,004                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,432.37     | 821.62      | 17,253.99                      |
| Oct-17       | 104,948            | 77,491            | 0.04775               | 0.04775              | 5,728                 | 0.01568                  | 187,223                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,550.87     | 827.54      | 17,378.42                      |
| Nov-17       | 104,714            | 77,455            | 0.04775               | 0.04775              | 5,756                 | 0.01568                  | 187,005                     | 0.000329                       | 2,556                  | 2,304                  | 1,520                              | 1,203       | 16,433.35     | 821.67      | 17,255.02                      |
| Dec-17       | 104,949            | 77,492            | 0.04775               | 0.04775              | 5,784                 | 0.01568                  | 187,224                     | 0.000329                       | 2,568                  | 2,331                  | 1,554                              | 1,235       | 16,551.85     | 827.59      | 17,379.44                      |

\* GST will not be included in the blended/total rate for payback calculations

\* Above table should be used as an illustration of cost break down and calculation of total / blended cost

### **Billing data - Gas**

Minimum 1 year typical Gas billing data without carried over fees, or taxes (or taxes and carried over fees are reported separately)

| Month - Year | Block Purchase site allocation - GJ | Block Purchase site allocation - \$/GJ | Excess use site allocation - GJ | Excess use site allocation - \$/GJ | Distribution Charges (\$) | Franchise Fee paid to City (\$) | Riders (\$) | Carbon Levy (\$) | Subtotal (\$) | GST 5% (\$) | Total Blended Cost (\$) |
|--------------|-------------------------------------|--|---------------------------------|------------------------------------|---------------------------|---------------------------------|-------------|------------------|---------------|-------------|-------------------------|
| Jan-17       | 1976                                | 4.04                                   | 65                              | 2.76                               | 270                       | 166                             | 329         | 344              | 3,268.44      | 163.42      | 3,431.86                |
| Feb-17       | 2005                                | 4.04                                   | 65                              | 2.76                               | 278                       | 171                             | 342         | 351              | 3,330.44      | 166.52      | 3,496.96                |
| Mar-17       | 1977                                | 4.04                                   | 65                              | 2.76                               | 271                       | 167                             | 330         | 345              | 3,273.44      | 163.67      | 3,437.11                |
| Apr-17       | 2006                                | 4.04                                   | 65                              | 2.76                               | 279                       | 172                             | 343         | 352              | 3,335.44      | 166.77      | 3,502.21                |
| May-17       | 1978                                | 4.04                                   | 65                              | 2.76                               | 272                       | 168                             | 331         | 346              | 3,278.44      | 163.92      | 3,442.36                |
| Jun-17       | 2007                                | 4.04                                   | 65                              | 2.76                               | 280                       | 173                             | 344         | 353              | 3,340.44      | 167.02      | 3,507.46                |
| Jul-17       | 1979                                | 4.04                                   | 65                              | 2.76                               | 273                       | 169                             | 332         | 347              | 3,283.44      | 164.17      | 3,447.61                |
| Aug-17       | 2008                                | 4.04                                   | 65                              | 2.76                               | 281                       | 174                             | 345         | 354              | 3,345.44      | 167.27      | 3,512.71                |
| Sep-17       | 1980                                | 4.04                                   | 65                              | 2.76                               | 274                       | 170                             | 333         | 348              | 3,288.44      | 164.42      | 3,452.86                |
| Oct-17       | 2009                                | 4.04                                   | 65                              | 2.76                               | 282                       | 175                             | 346         | 355              | 3,350.44      | 167.52      | 3,517.96                |
| Nov-17       | 1981                                | 4.04                                   | 65                              | 2.76                               | 275                       | 171                             | 334         | 349              | 3,293.44      | 164.67      | 3,458.11                |
| Dec-17       | 2010                                | 4.04                                   | 65                              | 2.76                               | 283                       | 176                             | 347         | 356              | 3,355.44      | 167.77      | 3,523.21                |

\* GST will not be included in the blended/total rate for payback calculations

\* Above table should be used as an illustration of cost break down and calculation of total / blended cost