

1. Advance Contract Award Notice (ACAN)

An ACAN is a public notice indicating to the supplier community that a department or agency intends to award a contract for goods, services or construction to a pre-identified supplier, thereby allowing other suppliers to signal their interest in bidding, by submitting a statement of capabilities. If no supplier submits a statement of capabilities that meets the requirements set out in the ACAN, on or before the closing date stated in the ACAN, the contracting officer may then proceed with the award to the pre-identified supplier.

2. Definition of the requirement

The objective of this contract is to access on-demand expert assistance regarding the extension, enhancement, maintenance and application of three distinct and unique models developed by Loch Alpine:

- **Provincial Multi-Region, Multi-Sector CGE model (EC-PRO):** This model, which supports Canada's domestic climate change policy agenda, is a multi-sector, multi-region model with 13 provinces/territories and around 40 economic sectors/subsectors. This model has undergone significant enhancements over the past years in terms of providing detailed sectoral level impacts analysis of new policy initiative such as the Federal Backstop carbon pricing in Canada. The model and data improved by incorporating feedbacks from official from Federal/Provincial and Territorial Governments. The modeling results are also being used by provinces and territories.
- **North-American CGE model (EC-NAM):** This model is being developed under a current contract to address climate policy issues over lapping the Canadian and the US states. Analysis of policy initiatives Western Climate initiatives particularly those involving Quebec, Ontario and California has been and remains a key priority for the Department to issues of equal treatment of all provinces and territories in the climate policy context. A step towards extending the current EC-PRO model to US 50 state level is being started in the current fiscal year. Further development is required over the next years to integrate the model with Mexico and rest-of the world. It is important the model is extended to be able to analyze these evolving issues.
- **International Multi-Region, Multi-Sector CGE model (EC-MS-MR):** This model, which supports Canada's international climate change policy agenda, is a multi-sector, multi-region model with 16 international regions/countries and around 40 economic sectors/subsectors.

Loch Alpine Economics Inc. team Dr. Thomas Rutherford and Dr. Christoph Böhringer is the developer all these model and they solely and exclusively own the intellectual property rights of these models. As such, all enhancement and extensions of the model that involves changes to the model code must be carried out by them.

The objective of the on-demand expert support from Loch Alpine Economics Inc. is to enhance the existing economic modeling and analytical capability both with advanced tools and training in Economic Analysis Directorate at SPB to meet the requirements for in-depth analysis. This includes extension and enhancements of all the three models to be able to address evolving and changing analytical needs of the Department. The three models will continue to be used to meet different policy questions and analytical needs, provincial, national, North-American and global. Keeping the Department's CGE (provincial, North-American and international) models used for day-to-day policy analysis up-to-date is the key for robust policy advice and prerequisite for sound decision making. The final objective is to develop user friendly tools to keep the models operational under circumstances of staff turnarounds. It is important that new staffs joining the modeling can easily adapt to the day-to-modeling requirements.

As an option to this Statement of Work, Loch Alpine Economics Inc. may be asked to deliver customized course in two modeling languages that underlie the Directorate's suite of computable general equilibrium models: General Algebraic Modeling System (GAMS) and Mathematical Programming System for General Equilibrium Analysis (MPSGE).

3. SCOPE OF WORK

The contractor will be tasked to provide training, technical support, and advice to the Model Development and Quantitative Research Division's analytical work using its suite of in-house CGE models. The contractor will be asked to undertake specific model development activities aimed at enhancing the Division's capability for supporting ECCC's, as well as the Government of Canada's, domestic and international environment and energy-energy-economy policy agenda.

The areas of on-demand technical support and model training include, but are not limited to the following broad area:

A. EC-PRO and EC-NAM

EC-PRO is EC's provincial model developed as a small open economy model essentially to address domestic inter-provincial policy issues. The EC-NAM is EC's north-American model currently under development to address policy issues involving both Canadian provinces and the US states.

Data build:

- i. A user friendly EC-PRO data-build system for provincial input-output data: LAE will enhance the data build system developed over the years in-house and make it more user friendly allowing for a timely update when new data becomes available. The enhancement aims at greater flexibility and efficiency when updating EC-PRO's input-output tables which are now based on the detailed (D) supply and use tables at the provincial level for 2013.



- ii. Tools for satellite data integration into EC-PRO: LAE will develop tools for the integration of satellite data into the EC-PRO baseline data adding to the core D-level input-output data. This includes, but will not be limited to, 1) fiscal data such as marginal and effective tax rates, and splitting the royalty payments from aggregate tax data; 2) capturing and reflecting existing carbon taxes of other regulatory instruments (implied or explicit) and linking to emissions thereby ensuring a more robust forward calibration; 3) developing methodologies for a more appropriate representation of various margins, taxes, subsidies and royalty payments in the relevant sectors.
- iii. Baseline data for EC-NAM: LAE will develop and implement data routines for the construction of baseline data to feed into the forward calibration of EC- NAM.
- iv. Extension of EC- NAM baseline data routine to include Mexico: LAE will extend the EC- NAM database to include data for Mexico.
- v. Electricity market and network data for EC-PRO: LAE will collect Canadian electricity market and network data for the extension of the EC-PRO model with an explicit electricity network module. This electricity data base will feature details of electricity supply and demand as well as physical network constraints.

4. Model extensions:

- vi. Calibration of EC-PRO to pre-existing fiscal taxes and emission pricing measures: Accounting for pre-existing fiscal taxes and emission pricing measures in the historical and projected data, LAE will extend EC-PRO to capture the impacts of pre-existing policies such as taxes (including carbon taxes) and other regulatory policies which can be characterized in terms of their marginal cost of public funds (MCPFs). The MCPFs do not only drive the so-called tax interaction effects of environmental regulation but also determine the scope for efficiency gains in the context of green tax reforms where environmental rents are used for tax cuts in the most distortionary taxes. Calibrate of the EC-PRO model based on D-level data to public finance data towards an appropriate representation of pre-existing taxes on income, final consumption as well as initial energy taxes and subsidies.
- vii. Baseline calibration routine for EC-NAM: LAE will develop routines to calibrate EC-NAM to baseline data.
- viii. Extension of EC-NAM with Mexico: LAE will extend EC-NAM to allow for the explicit representation of Mexico.
- ix. Other model enhancements in EC-PRO: The list of items under this will evolve overtime to keep the model at the state-of-the-art level. While the items listed below have been identified as priority at this moment, areas of future model enhancements are not necessarily limited to the following items:
 - Establishing a solid foundation for future technology options that economic sectors will have in the medium to long



- Introducing technological change (either directly related to increased R&D funding or learning by doing)
 - Re-structuring input-output flows to address issues of a circular economy
 - Disaggregating the representative households across provinces in EC-PRO
- x. Electricity network submodule in EC-PRO: LAE will modify model code to facilitate the implementation of a bottom-up electricity market submodule. This submodule will be integrated into the top-down EC-PRO model that allows for the assessment of future decarbonisation policies based on renewable energy sources (RES) and capturing the intermittency issues associated with these technologies. This work will ensure that the module captures both the direct impacts of regulation on the electricity market, as well as spill-over effects to the rest of the Canadian economy via market interaction effects and income effects.

5. Policy applications:

Develop and implement tools for policy simulation analysis reflecting both current and emerging priorities in the Canadian environmental policy debate. These topics include proposals for:

- i. Green tax reforms
- ii. Low carbon fuel standards
- iii. Policies to spur endogenous technical progress
- iv. Electricity market regulations

B. EC-MS-MR

The EC-MS-MR model which is based on the GTAP global economic dataset currently does not distinguish Canadian provinces. The key work on this model will be targeted to disaggregate Canada into its provinces thereby replacing the composite dataset of GTAP for Canada with more detailed provincial information by Statistics Canada (D-level data set).

Data build:

- i. GTAP10, WEO2018, and Canadian D-level provincial data: LAE will establish and implement a procedure for extending EC's global multi-region multi-sector CGE model for international climate policy analysis – EC-MS-MR. This will procedure will allow for the disaggregation of Canadian data in the GTAP database version 10 and WEO2018 into provincial and territorial level. This work will use complementary data sources (e.g., Industry Canada trade data online) to differentiate international exports by Canadian provinces across major trading partners of Canada that are covered in the GTAP database.



- ii. Baseline data on carbon pricing policies: LAE will develop methodologies and procedures for capturing and accommodating existing or legally binding future carbon pricing policies into the baseline projections. The incorporation of such business-as-usual (BaU) policies is an important pre-requisite for assessing the economic impacts of future policy initiative aiming at more stringent regulation beyond BaU levels.

6. Model extensions:

- iii. Undertake and fully implement model extensions that include, but are not limited to the following:
 - Calibration of EC-MS-MR to disaggregate (D-level) data for Canadian provinces
 - Recalibration of EC-MS-MR to the forthcoming version 10 of the GTAP database and the most recent WEO2018
 - Updating of business-as-usual model calibration to account for pre-existing or forthcoming carbon emission pricing
 - Logical model extensions to address the economic impacts of future regulatory policy shifts towards a circular economy
 - Implementation of endogenous technical change features (either directly related to increased R&D funding or learning by doing)

7. Policy applications

Develop, set-up and implement policy simulation code for a set of contemporary and emerging policy issues that will empower EC to deliver quantitative economic impact assessment and to develop robust policy insights in a timely manner regarding policy decision support. These policy issues will emerge from the international climate policy process after the Paris Agreement such as the implementation of Nationally Determined Contributions (NDCs) or climate finance mechanisms.

The specific tasks that will actual be undertaken will be the subject of task authorizations. The task authorization will identify the scope of work, the anticipated level of effort and the expected deliverables.

C. Optional GAMS/MPSGE Training Courses

As an option to this Statement of Work, Loch Alpine Economics Inc. will be asked to deliver customized course in two modeling languages that underlie the Directorate's suite of computable general equilibrium models: General Algebraic Modeling System (GAMS) and Mathematical Programming System for General Equilibrium Analysis (MPSGE).

1. Economic modeling using mathematical programming and mixed complementarity in GAMS
2. Basic general equilibrium models using GAMS/MPSGE
3. Energy and Environmental CGE Modeling with GAMS/MPSGE

8. Criteria for assessment of the Statement of Capabilities (Minimum Essential Requirements)

Detail the criteria against which the statement of capabilities submitted by potential suppliers will be assessed. This will allow the contracting officer to have an adequate basis for evaluating a potential supplier's statement of capabilities. The pre-identified supplier must be evaluated on the same basis.

Any interested supplier must demonstrate by way of a statement of capabilities that it meets the following requirements:

- 10 years of experience in building integrated energy, emissions economy models using General Algebraic Modeling System (GAMS) and Mathematical Programming System for General Equilibrium Analysis (MPSGE).
- 10 years of experience in developing long term integrated energy, emissions and economic forecasts using computable general equilibrium models using General Algebraic Modeling System (GAMS) and Mathematical Programming System for General Equilibrium Analysis (MPSGE).
- 10 years of experience in providing training and technical support relating to the modeling software using MPSGE.
- 10 years of experience in teaching computable general equilibrium modeling approaches at internationally recognized academic institutions and in publishing in international recognized academic journals.

9. Applicability of the trade agreement(s) to the procurement

This procurement is subject to the following trade agreement(s) (*insert the applicable trade agreement(s)*):

CETA / WTO-AGP / NAFTA / CFTA / CCFTA / CCoFTA / CHFTA / CPaFTA / CPFTA / CKFTA

Comprehensive Economic and Trade Agreement (CETA)

World Trade Organization - Agreement on Government Procurement (WTO-AGP)

North American Free Trade Agreement (NAFTA)

Canadian Free Trade Agreement (CFTA)

Canada-Chile Free Trade Agreement (CCFTA)

Canada-Columbia Free Trade Agreement (CCoFTA)

Canada-Honduras Free Trade Agreement (CHFTA)

Canada-Panama Free Trade Agreement (CPaFTA)

Canada-Peru Free Trade Agreement (CPFTA)

Canada-Korea Free Trade Agreement (CKFTA)

10. Justification for the Pre-Identified Supplier

Loch Alpine are the owners and developers of Environment and Climate Canada's suite of CGE models (i.e., EC-PRO which is a provincial-based multi-region and multi-sector model, EC-MRMR which is an international-based multi-region and multi-sector model, and EC-NAM the north-American multi-sector, multi-region CGE model). The intellectual property rights to the suite of CGE models vests with Loch Alpine. While Environment and Climate Change Canada has a license to use these models, Loch Alpine has the exclusive IP rights to modify the suite of CGE models, and they retain the rights to use the model. Moreover, there is no other firm which has the capacity to offer the technical support and make the model modifications required by Environment and Climate Change Canada.

Loch Alpine does not authorize value-added resellers or distributors for their models.

As the main requirement of the contract is provision of on-demand expert assistance to the Economic Analysis Directorate's Model Development and Quantitative Research Division regarding the enhancement, maintenance, and application of its in-house CGE models, access to the source code is required prerequisite. All members of the Loch Alpine team have access to the source code and expertise to manipulate it.

Given the nature of the requirements, and need to have access to the model's intellectual property (i.e., the source code) only the Loch Alpine team can successfully complete the work outlined in the Statement of Work.

11. Government Contracts Regulations Exception(s)

The following exception(s) to the *Government Contracts Regulations* is (are) invoked for this procurement under subsection 6(d) - "only one person is capable of performing the work".

12. Ownership of Intellectual Property

Ownership of any Foreground Intellectual Property arising out of the proposed contract will vest in the Contractor.

The Contractor will grant to Canada a non-exclusive, perpetual, irrevocable, world-wide, fully-paid and royalty-free license to exercise all Intellectual Property Rights in the Foreground Information that vest in the Contractor, for any public purpose except Commercial Exploitation in Competition with the Contractor.



13. Period of the proposed contract or delivery date

The proposed contract is for a period of contract award to March 31, 2019, with two options to extend the contract period for a one year period each.

14. Cost estimate of the proposed contract

The estimated value of the contract, including option(s), is \$900,000.00 x (GST/HST excluded).

Optional Training:

Basis of Payment for Optional Workshops:

The daily rate per instructor is \$3000USD.

- Economic modeling using mathematical programming and mixed complementarity in GAMS;

One (1) Instructor x 3 days = \$9,000.00USD

Two (2) Instructors x 3 days = \$18,000.00USD

- Basic general equilibrium models using GAMS/MPSGE;

One (1) Instructor x 3 days = \$9,000.00USD

Two (2) Instructors x 3 days = \$18,000.00USD

- Energy and Environmental CGE modelling with GAMS/MPSGE;

One (1) Instructor x 3 days = \$9,000.00USD

Two (2) Instructors x 3 days = \$18,000.00USD

15. Name and address of the pre-identified supplier

Loch Alpine
1824 Vilas Ave
Madisson, Wisconsin
53711

16. Suppliers' right to submit a statement of capabilities

Suppliers who consider themselves fully qualified and available to provide the goods, services or construction services described in the ACAN may submit a statement of capabilities in writing to the contact person identified in this notice on or before the closing date of this notice. The statement of capabilities must clearly demonstrate how the supplier meets the advertised requirements.



17. Closing date for a submission of a statement of capabilities

The closing date and time for accepting statements of capabilities is March 13, 2018 at 2:00 p.m. EST.

18. Inquiries and submission of statements of capabilities

Inquiries and statements of capabilities are to be directed to:

Mitchel Easey

Procurement and Contracting Division

Corporate Services and Finance Branch

Environment Canada

200 Sacre-Coeur Blvd, Gatineau, QC K1A 0H3

E-Mail: mitchel.easey@canada.ca