Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire

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Advance Contract Award Notice

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1.0 Introduction

The Canadian Nuclear Safety Commission (CNSC) has a requirement for an expert in statistics, statistical inference and statistical treatment of uncertainties to assist CNSC staff in the review of Neutron Overpower Protection analyses for aging conditions, as well as of safety cases for isotope production in Canadian reactor projects. The purpose of this advance contract award notice (ACAN) is to signal the CNSC's intention to award a contract for these services to:

Anthony O'Hagan
Emeritus Professor, Sheffield University
4 Chestnut Grove
Radcliffe on Trent
Nottingham
Nottinghamshire
NG12 1AH
UK

Before awarding a contract, however, the CNSC would like to provide other suppliers with the opportunity to demonstrate that they are capable of satisfying the requirements set out in this ACAN, by submitting a statement of capabilities within the posting period for this ACAN, which is 15 calendar days.

If, during the posting period, other potential suppliers submit a statement of capabilities that meets the requirements set out in this ACAN, the CNSC may proceed to a full tendering process via the Government Electronic Tendering Service or by inviting bids directly from suppliers.

If no other supplier submits, on or before the closing date, a statement of capabilities meeting the requirements set out in the ACAN, a contract will be awarded to the above-noted supplier.

2.0 Background

The CNSC has a requirement to for an expert in statistics, statistical inference and statistical treatment of uncertainties, and possessing technical familiarity with Neutron Overpower Protection (NOP) equations, the input parameters to the equations, and the original Extreme Value Statistic (EVS) theory, model, and algorithm to assist CNSC staff in the review of Neutron Overpower Protection analyses for aging conditions, as well as of safety cases for isotope production in Canadian reactor projects. The work will involve the following:

The recently updated NOP analyses for Canadian reactors are using two different advanced variants of the EVS method: EVS 2018 and EVS 2016. Also, these new versions are used in a variety of new applications, from compliance with operational issues to design analysis supporting core design changes related to isotope production. These new versions are based on a more sophisticated algebra and claimed improvements of some of the key concepts, such as the "surrogate approximation and methodology". CNSC staff's cursory review identified several

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technical challenging aspects of the new EVS versions which warrant an expert statistician verification. Specifically, an independent specialized verification is necessary to confirm the justification for some key concepts and robustness of the new EVS versions to model misspecifications.

The Contractor must perform an independent verification and review of the key concepts and basis supporting the new 2016 and 2018 EVS methodology and provide an expert judgment regarding the methods robustness to model misspecifications.

The contractor will undertake the following tasks:

a. Review the provided relevant information with a focus on:
   o the τ distribution (estimated epistemic error) and the treatment of its "extreme value distribution" in relation to the perceived "inherent bias" in the estimation of the minimum/maximum over many similar channels (or detectors);
   o the assumption of random data and channel independence;
   o the impact of systematic (i.e., non-random) components for problems that involve extrema and the statistical nature of the resulting extreme value distribution; and
   o the error structure and correlations.

b. Based on the information related to ripples and Critical Channel Power (CCP) calculations, briefly assess the following aspects with the purpose of providing a judgement and suggestions:
   o Generation of CCP errors structure and actual information versus the input information for the statistical calculation of Trip SetPoint; and
   o Generation of ripples "radial error" and actual information versus the input information.

c. Prepare a draft report consolidating the main review findings in the following areas:
   o Main differences between the proposed two sets of main improvements;
   o The "surrogate methodology" and treatment of "extreme value distributions";
   o Available prior information and information in the input data ;and
   o The robustness of improved methods to "model misspecification".

d. Present the results in a seminar with CNSC staff and invited guests.

e. Disposition the CNSC staff comments and industry feedback on the draft final report.

f. Finalize the report.

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> g. Provide ongoing support if required and formally requested by the technical authority.

The proposed contract is for the provision of start-up meeting, monthly progress meetings, draft report, presentation to CNSC staff, and final report, for delivery within 14 weeks of contract award. Ongoing support to CNSC staff will be on an as requested basis until March 31, 2024.

The estimated value of the contract, including the option period, is **$100,000.00 CAD.**

3.0 Minimum Mandatory Requirements

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

M1: Knowledge and familiarity with NOP system and equations, input parameters and error terms, original EVS theory, model, and algorithm, statistical inference and treatment of uncertainties, demonstrated through previous experience in conducting an independent review of a previous variant of the EVS method for Canadian reactors.

M2: Recognized expertize and significant experience in conducting statistics studies and applications, demonstrated through 20 or more previous publications and/or conference, workshop, or seminar presentation.

M3: Significant experience writing and disseminating scientific information demonstrated through a minimum of 20 publications in scientific journals, bulletins, and book chapters.

M4: Significant experience presenting scientific results to technical audience demonstrated through a minimum of 20 conference, workshop, or seminar presentations.

M5: Significant experience (over 20 years) working in the field of statistics.

M6: The project lead must hold a PhD in statistics.

M7: Must be independent from the development of the original EVS method and recent EVS 2016 and/or EVS 2018.

4.0 Justification for the Pre-selected Supplier

The pre-selected supplier meets all of the minimum mandatory requirements and is an expert in the area of interest.

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The pre-selected supplier possess' significant expertise and skills in statistics and application to NOP problem. The pre-selected supplier has experience conducting an independent review of the Extreme Value Statistic (EVS) 2010 for Canadian reactors. Many of the changes in the EVS 2016 and 2018 methods, used for Canadian reactors, have been done in response to Professor Anthony O'Hagan's previous review. Experience in reviewing a previous variant of EVS for Canadian reactors is required to carry out a focused review of the newer versions.

5.0   Intellectual Property

Ownership of any foreground intellectual property arising out of the proposed contract will vest in the contractor.

6.0   Statement of Capabilities

Suppliers who consider themselves fully qualified and available to meet the specified requirements may submit a statement of capabilities in writing to the contracting authority 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.

The closing date and time for accepting statements of capabilities is June 15, 2021 at 2:00 p.m. EST.

7.0   Contact Information

Inquiries and statements of capabilities are to be directed in writing to:

Jessica Brutus
Contracting Specialist
280 Slater Street
P.O. Box 1046, Station B
Ottawa ON K1P 5S9
Canada

Telephone: 343-550-6808
Email: solicitation-demandedesoumission@cnsc-ccsn.gc.ca.

8.0   Policy Information

Government Contracts Regulations (GCRs) section 6: "Notwithstanding section 5, a contracting authority may enter into a contract without soliciting bids where… (d) only one person is capable of performing the contract."