

RESEARCH CALL TO DOE/FEDERAL LABORATORIES



**Cybersecurity for Energy Delivery Systems Research Call
RC-CEDS-2015**

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ISSUE DATE: March 27, 2015
DUE DATE: May 15, 2015

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SECTION I – GENERAL INFORMATION

A. SUMMARY

The Department of Energy's (DOE) National Energy Technology Laboratory (NETL) on behalf of the DOE Office of Electricity Delivery and Energy Reliability (OE), is seeking applications for high-risk, high-payoff, research, development and demonstration of technologies and techniques that advance the state-of-the-art, offer new capabilities not available today, and that will be widely adopted for use throughout the energy sector to further strengthen cybersecurity of the U.S. energy delivery infrastructure.

B. BACKGROUND INFORMATION

In 2011, the Energy Sector Control Systems Working Group (ESCSWG) released the *Roadmap to Achieve Energy Delivery Systems Cybersecurity*¹. This collaborative effort, led by the ESCSWG in support of the Electricity Sub-sector Coordinating Council, the Oil and Natural Gas Sub-sector Coordinating Council, and the Government Coordinating Council for Energy under the Critical Infrastructure Partnership Advisory Council (CIPAC) Framework, was facilitated by DOE-OE, in partnership with U.S. Department of Homeland Security Science and Technology Directorate, and more than 80 energy sector stakeholders. The Roadmap synthesized expert input from the energy delivery control systems community, including owners and operators, commercial vendors, national laboratories, industry associations, and government agencies. The Roadmap presents a strategy supported by key milestones that must be met to achieve the Roadmap vision that by 2020 resilient energy delivery systems are designed, installed, operated and maintained to survive a cyber-incident while sustaining critical functions.

This research call will support national laboratory collaborations, comprising at least two (or more) national laboratories, engaged in multi-year high-risk, high-payoff research and development of techniques and technologies to enhance the cybersecurity of energy delivery control systems. The strategic partnership between DOE and the DOE national laboratories, embodied in the Grid Modernization Laboratory Consortium, rests on multi-laboratory collaborations such as those required in this research call. In addition, this research call requires collaboration with one or more energy sector stakeholders, such as but not limited to, suppliers and integrators of energy delivery control systems and components, energy utilities, or energy asset owners and operators. Letters of commitment must be provided from all collaboration partners.

Solutions should be interoperable, scalable, cost-effective advanced tools and technologies that do not impede critical energy delivery functions and are compatible with common methods and best practices. The proposed applications should culminate in a demonstration to validate clear energy sector acceptance. It is expected that a strategy for transitioning solutions into practice throughout the energy sector, for example through commercialization or by making the solution available through open source for no cost, will be included.

¹ www.controlsroadmap.net

C. TOPIC AREA

This Research Call (RC) includes eight (8) Topic Areas. **Only applications that specifically address Topic Areas described in the following section will be accepted under this RC.**

Topics Areas

Topic Area 1 – Cybersecurity for Renewable and/or Distributed Energy Resources

Topic Area 2 – Cryptographic Key Management for Distribution-Level Devices

Topic Area 3 – Cybersecurity for Forecast Data That Can Affect Energy Operations

Topic Area 4 – Cybersecurity for Cloud Use in Energy Delivery

Topic Area 5 – Detect Compromise of Hardware, Firmware or Software in the Supply Chain and Restore Integrity

Topic Area 6 – Detect, Contain and Eradicate Cyber-Attack on Embedded Devices Used in Energy Delivery Systems

Topic Area 7 – Design Innovative Cybersecurity Solutions into Current or Anticipated Projects Related to Energy Delivery

Topic Area 8 – Address Research Gaps Identified in the Roadmap

TOPIC AREA 1 – *Cybersecurity for Renewable and/or Distributed Energy Resources*

Research, develop and demonstrate technology or techniques that strengthen cybersecurity for renewable energy, such as solar or wind, and/or distributed energy resources. For the purposes of this research call, distributed energy resources include “behind-the-meter” power generation, energy storage systems, the interface where plug-in hybrid vehicles interact with the utility, the interface where building management systems interact with the utility to support, for instance but not limited to, energy efficiency or demand response, and microgrids that separate from, and reintegrate with, the bulk power grid as needed for reliability.

TOPIC AREA 2 – *Cryptographic Key Management for Distribution-Level Devices*

Research, develop and demonstrate technology or techniques for cryptographic key management to strengthen cybersecurity for distribution-level energy infrastructure. This should include, but is not limited to, device-level authentication for identity trust management. The research can consider one or more of the challenges associated with cryptographic key management for the growing number of distribution-level devices that interact with energy utilities, such as (but not limited to) smart meters. Example research areas could address, but are not limited to, alternatives to the placement of cryptographic key material onboard the distribution-level device where it could be subjected to physical tampering; ways to manage the secure establishment, renewal or revocation of key material across potentially millions of smart meters or other residential or commercial building devices that interact with the utility; or strengthening cybersecurity to support the work of energy sector field personnel who use mobile devices for maintenance or operation of energy infrastructure.

TOPIC AREA 3 – *Cybersecurity for Forecast Data That Can Affect Energy Operations*

Research, develop and demonstrate technology or techniques to detect attempts to compromise short-term and very short-term load forecasting data, weather forecasting data and fuel price data that are required for optimization of the performance of the energy sector. The research can consider impacts to distributed energy resources (DER), customer load, and economic dispatch.

The technology and techniques will be used by utility staff to ensure the integrity of short-term and very short-term forecasting data used in operations scheduling.

TOPIC AREA 4 – *Cybersecurity for Cloud Use in Energy Delivery*

Research, develop and demonstrate technology or techniques that enhance cybersecurity for energy sector personnel who access energy delivery infrastructure using the cloud, as defined in <http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>. The research can consider cybersecurity technology or techniques that protect against a cyber attack that intends to compromise the use of the cloud for efficient management, maintenance or operation of energy delivery infrastructure. This could include, but is not limited to, cyber-defenses that detect, contain and eradicate attempts to compromise use of the cloud for energy delivery infrastructure.

TOPIC AREA 5 – *Detect Compromise of Hardware, Firmware or Software in the Supply Chain and Restore Integrity*

Research, develop and demonstrate technology or techniques to detect the presence of undesired functionality inserted in the supply-chain then restore the integrity of the compromised energy delivery system or component. The research can consider one or more of hardware, firmware or software, including third party. The technology and techniques developed are to be used, by one or more of, the supplier during component development, the system integrator, and/or by the energy asset owner or operator following procurement of the component or system.

TOPIC AREA 6 – *Detect, Contain and Eradicate Cyber-Attack on Embedded Devices Used in Energy Delivery Systems*

Research, develop and demonstrate technology or techniques that detect, contain and eradicate cyber-attacks on embedded devices in real-time while sustaining critical energy delivery functions. The research should consider that energy delivery control systems are comprised of complex network architectures that may contain hundreds of specialized embedded devices, from a diversity of suppliers, and may extend across wide geographic regions.

TOPIC AREA 7 – *Design Innovative Cybersecurity Solutions into Current or Anticipated Projects Related to Energy Delivery*

Research, develop and demonstrate innovative cybersecurity technology or techniques that address next-generation cybersecurity needs associated with a current or anticipated project that involves energy delivery systems, regardless of the funding source(s) for that project. It must be demonstrated through letters of intent that all parties involved have been consulted and are in agreement with the proposed effort. For instance, applicants responding to the Grid Modernization Lab Consortium (GMLC) Research Call may consider submitting a separate application to the CEDS Research Call, Topic Area 7, proposing associated cybersecurity research. This topic is not intended to deploy existing cybersecurity technologies or techniques.

TOPIC AREA 8 – *Address Research Gaps Identified in the Roadmap*

The 2011 Roadmap to Achieve Energy Delivery Systems Cybersecurity provides a strategic framework that directs research and development of cybersecurity solutions for the energy sector. The energy sector cybersecurity landscape is dynamic. New technologies are being rapidly deployed and legacy technologies are being used in ways that were not previously envisioned, introducing new security considerations. This area of interest requests a proposal that

identifies, and proposes a technical solution to address, a research gap that, if addressed, could enhance coverage of the Roadmap goals.

SECTION II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates providing funding for selected projects to Federally Funded Research and Development Centers (FFRDCs) such as the DOE-Sponsored National Laboratories. Any project awarded as a result of the Research Call will be processed through NETL as a Field Work Proposal, an Inter Entity Work Order, Interagency Agreement or any other allowable method deemed appropriate by the Government.

B. ESTIMATED FUNDING

Approximately \$6 Million is expected to be available for awards under this announcement. This will fund up to 2 years of the multi year (up to 5 years) award. Funding for all awards and future budget periods are contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority.

C. EXPECTED NUMBER OF AWARDS

DOE anticipates making up to 8 awards under this announcement. The Government reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this Research Call and will award that number of instruments which serves the public purpose and is in the best interest of the Government.

D. PROJECT TEAM REQUIREMENT AND ANTICIPATED AWARD SIZE

DOE anticipates that it will issue several awards of varying size with up to \$1,500,000 per laboratory participant and limited to \$300,000 for each year of up to 5 years of performance. A multi laboratory project team is required, and must be documented with formal letters of commitment provided as part of the initial application to this Research Call. A minimum of 2 laboratories is required per award. Collaboration with one or more energy sector stakeholders, such as but not limited to, suppliers and integrators of energy delivery control systems and components, energy utilities, or energy asset owners and operators is required, and must be documented with formal letters of commitment soon after the award. However, no more than 25% of the funding in total can be provided to the non-Federal participants. This information is for estimating purposes only and in no way commits the Government.

For example:

Project ABC

Participant: YZNL (primary), WXNL (partner) and Utility A (partner)

Period of Performance: 5 Years

Funding:

YZNL - \$1.5M @ \$300K/Year

WXNL - \$1M @ \$200K/ Year

Utility A - \$500K

E. PERFORMANCE PERIOD

DOE anticipates making awards within 120 days from the date of release of this Research Call with an anticipated performance period not to exceed 5 years. Projects must be divided into phases, with go/no-go decision points at end of each phase. A decision will be made by DOE regarding continuation, redirection, or termination of the project at each decision point.

F. TYPE OF PROPOSAL

Projects awarded from previous CEDS Research Calls will not be considered for renewal or continuation.

SECTION III – ELIGIBILITY INFORMATION

A. ELIGIBLE OFFERORS

Only FFRDC's such as National Laboratories are eligible to apply as primary recipient. Collaboration involving, at a minimum, at least 2 DOE National Laboratories is required. In addition, collaboration with one or more energy sector stakeholders, such as but not limited to, suppliers and integrators of energy delivery control systems and components, energy utilities, or energy asset owners and operators is required.

Letters of commitment must be provided by FFRDC team members as part of the initial application. Letters of commitment must be provided for private energy sector team members soon after the award.

SECTION IV – SUBMISSION REQUIREMENTS

A. SUBMISSION INSTRUCTIONS

Proposals shall be submitted electronically to the following email address no later than May, 15 2015 at 3:00 PM Eastern Daylight Time:

CEDSLabCall@netl.doe.gov

Phone: 304-285-5229

Fax: 304-285-4403

Due to e-mail attachments constraint, please ensure that the emails including the attachments are less than 25 Megabyte. The applicant is encouraged to request a return notification to verify receipt of proposal.

SECTION V – EVALUATION AND SELECTION

A. INITIAL REVIEW CRITERIA

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for an award; (2) the information required by the Research Call has been submitted; (3) all mandatory requirements are satisfied; and (4) the proposed project is responsive to the objectives of the Research Call. Proposals that do not meet the initial criteria may be excluded from review.

B. MERIT REVIEW CRITERIA

Proposals submitted in response to this Research Call will be evaluated and scored in accordance with the criteria and weights listed below:

Criterion 1: Technical Approach and Project Management (45%)

This criterion will evaluate the approach taken by the applicant and the degree to which the proposed technology or technique meets the stated objectives of the research call. In addition, the application must demonstrate that it is within the FFRDC's complementary role in nurturing innovative technology until it is ready for hand-off to the private sector.

- Feasibility that the proposed technology or product will address the need or problem.
- Soundness of the proposed approach and likelihood of success as demonstrated through scientific or engineering merit of the proposed approach.
- Reasonableness and completeness of the proposed Field Work Proposal (FWP) to achieve project objectives and measure success.
- Adequacy, appropriateness, and reasonableness of the budget. This includes the labor distribution, purchases, and effort by work breakdown budget structure to accomplish the stated objectives.
- Degree to which the applicant demonstrates sound management principles, and plans for project oversight in the Extended Field Work Proposal to achieve the project objectives on time and within budget.

Criterion 2: Industry Impact (40%)

This criterion will evaluate the degree to which the proposed technology or techniques will impact the energy infrastructure cybersecurity industry.

- Significance of the benefits and impact of the proposed technology or technique compared with state-of-the-art technologies, products or practices.

- Extent to which the proposed effort meets a gap in the state-of-the art and is not in direct competition with the private sector.
- Completeness and soundness of discussion regarding related technologies or techniques already available to, or being developed by, the private sector, how the proposed activity differs, and how the proposed activity requires research appropriate to a national laboratory role.
- Extent to which the benefits and impact of anticipated performance improvements, including technical, operational and environmental performance; cost savings; societal benefits; and potential for the project to meet or exceed the DOE program goals or program vision, as articulated in the energy sector's Roadmap

Criterion 3: Collaboration (15%)

This criterion will evaluate the effectiveness of the proposed collaboration that is required to include, at a minimum, at least 2 DOE National Laboratories. In addition, collaboration with one or more energy sector stakeholders, such as but not limited to, suppliers and integrators of energy delivery control systems and components, energy utilities, or energy asset owners and operators is also required.

- Reasonableness of the proposed approach to provide a path for industry acceptance and commercialization.
- Effectiveness of the strategic approach, including reasonableness and clarity of roles and responsibilities, to manage the proposed partnership.
- Extent to which the Applicant's approach would lead to dissemination of lessons learned and foster collaboration with entities not immediately involved with the project.
- Degree to which commitment of the collaboration to the proposed project is demonstrated by including letters of commitment from all proposed FFRDC team members.
- Degree to which supporting documentation is included to demonstrate the commitment of private energy sector team members to the project, and clarity of plans for obtaining formal commitment letters from private energy sector team members soon after the award.

Program Policy Factors

The following Program Policy Factors may be used by the Selection Official to assist in determining which of the ranked applications shall receive DOE funding support:

1. It may be desirable to select project(s) with collaborative efforts among national laboratories, FFRDC's, academia, energy sector suppliers and utilities that provide a

balanced program portfolio.

2. It may be desirable to select project(s) that demonstrate solutions that are scalable and cost-effective with a clear industry acceptance for commercialization that provides a balanced program portfolio.
3. It may be desirable to select complementary project(s) and/or duplicative efforts or projects, which, when taken together, will best achieve the program research goals and objectives.
4. It may be desirable to select a group of projects that represent a diversity of technologies and Topic Areas in order to provide a balanced programmatic effort and a variety of different technical perspectives.
5. It may be desirable to select project(s) of less technical merit than other project(s) if such a selection will optimize use of available funds by allowing more projects to be supported and not be detrimental to the overall objectives of the program.

C. SUBMISSIONS FROM SUCCESSFUL OFFERORS

If selected for award, DOE reserves the right to request additional or clarifying information for any reason deemed necessary, including, but not limited to:

- Indirect cost information;
- Other budget information;
- Name and contact information of the Contracting Officer.
- Other supporting documentations

SECTION VI – PROPOSAL PREPARATION

A. PREPARATION

It is requested that the Extended Field Work proposal not exceed 25 pages (excluding the resume file and commitment letters) be single spaced, 1" margins (top, bottom, left, right), and when printed will fit on size 8 1/2" by 11" paper. The type must be legible and not smaller than 11 point. Evaluators will review only the number of pages specified. Therefore, any proposals exceeding these limitations may result in a lower overall score due to the lack of review of excess proposal pages. In order to produce a comprehensive proposal for this Research Call, the applicant shall address, at a minimum, the areas listed in the Table of Contents below. The applicant shall use the following Table of Contents:

Section	Page
Table of Contents	I
List of Tables (if applicable)	II
List of Figures (if applicable)	III
List of Acronyms (if applicable)	IV
Project Narrative	#

Extended Field Work Proposal	#
Resume File	#
Commitment Letters	#

- The entire proposal, that includes all materials included in the Table of Contents, should be saved as a single PDF file under the following file name: “*Lab Name* - *PI*”, e.g., “NETL – Smith”

B. EXTENDED FIELD WORK PROPOSAL

The applicants under this research call shall prepare an Extended Field Work Proposal. See **Attachment 1 – NL Extended Field Work Proposal and Attachment 2 – Budget Justification**

C. RESUME FILE

Provide a resume for each key person proposed, including subawardees and consultants if they meet the definition of key person. A key person is any individual who contributes in a substantive, measurable way to the execution of the project.

Each resume must not exceed 2 pages when printed on 8.5” by 11” paper with 1” margins (top, bottom, left, and right) with font not smaller than 11 point and should include the following information, if applicable:

Education and Training: Undergraduate, graduate and postdoctoral training, including institution, major/area, degree and year.

Professional Experience: Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications: Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or instead of publications.

Synergistic Activities: List no more than 5 professional and scholarly activities related to the effort proposed.

D. COMMITMENT LETTERS

Commitment Letter from partnership with Federally Funded Research and Development Centers (FFRDCs) and other participating entities, if applicable

SECTION VII – OTHER INFORMATION

A. MODIFICATIONS

Notices of any modifications to this Research Call will be sent via e-mail directly to the National Laboratories. The e-mail will contain a web link to the modified version located at NETL and OE website.

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE reserves the right, without qualification, to reject any or all proposals received in response to this Announcement and to select any proposal, in whole or in part, as a basis for negotiation and/or award.

C. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its proposal, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing a proposal. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

D. NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

Eligible activities under this program include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.