

# **RFSOQ/RFO 1515 Statement of Objectives**

## **Technology Innovation**

### **Spring 2010 Agency Research and Development**

### **Project Solicitation**

#### **Part A. General**

##### **A.1 Background Information on Bonneville's Research and Development Efforts**

The Bonneville Power Administration (BPA) is a federal power marketing agency that transmits and markets the power from 31 federal dams and one nuclear power plant. BPA also purchases power from several wind farms.

In support of its research, operation, and maintenance goals, BPA has its own set of nationally recognized Laboratories. The Labs are located at BPA's Ross Complex in Vancouver. Laboratory capabilities for high voltage, high current, mechanical, chemical, environmental field testing services, and staged system fault services are specifically tailored for BPA system needs. The Labs provide services that are important to ensuring regional system reliability and provide a conduit for the development and demonstration of new technologies needed to modernize the electrical energy infrastructure and to ensure safe and efficient operation of the power system.

In 2005 BPA implemented a new program to meet its strategic needs to reinvigorate and focus its research and development (R&D) agenda. As part of this effort, BPA created the Office of Technology Innovation (T/I) and appointed its first Chief Technology Innovation Officer. This is the third year the T/I office has put forth an annual cycle of research and development funding based on agency guidance and various "technology RoadMaps." Previous efforts funded R&D efforts covering the areas of Energy Efficiency and Demand Response, Power Operations (Hydro), Renewable Energy, Physical Security, and Transmission Services.

Technology road-mapping is a form of technology planning that will be used to inform and guide the Agency's research and development agenda. The main benefit of technology road-mapping is that it provides information to make better technology investment decisions by identifying technologies and technology gaps that are critical to improving BPA's power delivery system. The RoadMaps are then used to identify ways to leverage Agency R&D investments to bridge these gaps. Technology RoadMaps have been developed in the above mentioned operational areas.

##### **A.2 Acronyms and definitions**

- ❖ BPA – Bonneville Power Administration
- ❖ FCRPS – Federal Columbia River Power System
- ❖ Gap – utility need that is not met today or will not be met in the future with the technology currently in service
- ❖ PNW – Pacific Northwest (as defined by the Northwest Power Act, 16 U.S.C. § 839a(14)) section 3(14), "the area consisting of the states of Oregon, Washington, and Idaho, the portion of the State of Montana west of the Continental Divide, and such portions of the States of Nevada, Utah, and Wyoming as are within the Columbia River drainage basin and

any contiguous areas, not in excess of seventy-five air miles from the area referred to in (the Act), which are a part of the service area of a rural electric cooperative customer served by the (BPA) Administrator.”

- ❖ R&D – Research and Development investigations in the following areas
  - Basic Research - research directed toward increasing knowledge in science. The primary aim of basic research is to develop a more complete understanding of the subject under study.
  - Applied Research – is the effort that normally follows basic research. It attempts to determine and exploit the potential of scientific discoveries or improvements in technology, materials, processes, methods, devices or techniques. It attempts to advance the state of the art.
  - Advanced Development - all effort directed toward projects that have moved into development of hardware for test. The prime result of this type of effort is proof of design concept rather than the development of hardware for service use.
  - Demonstration – field tests
- ❖ RFO – Request for Offers
- ❖ RFSOQ – Request for Statements of Qualifications
- ❖ Stage Gate
  - A Project Stage Gate is a critical GO/NO-GO/Hold decision point. It occurs at least once before the end of a project. Its occurrence is based upon the essential performance elements (breakthroughs) that have to happen for the rest of the project to be worth doing and before the project can go any further.
  - A Portfolio Stage Gate is a critical GO/NO-GO/Hold decision point for determining whether or not a project should stay in the portfolio. Each year’s R&D Portfolio has 2 stage gates: These Stage Gate reviews will occur in February and July when BPA’s Technology Confirmation/Innovation Council meets to review the progress on all the projects and makes decisions to Prune the Portfolio and select new projects to refresh the Portfolio. All projects in the Portfolio are subject to the decisions made at these Portfolio Stage Gates.

### **A.3 Goal of this RFSOQ/RFO**

This Agency Research and Development RFSOQ/RFO is for projects beginning in BPA’s Fiscal Year 2011, which runs from October 1, 2010 through September 30, 2011. If appropriate and possible, projects may be funded as soon as possible after they’ve been selected in the summer of 2010. This research and development effort is based on 5 Technology RoadMaps in the areas of Energy Efficiency and Demand Response, Power Operations (Hydro), Renewable Energy, Physical Security, and Transmission Services, see <http://www.bpa.gov/corporate/business/innovation/>. The RoadMaps identify the technology gaps of where BPA should make its R&D investments.

The goal of this RFSOQ/RFO is to select R&D projects in the above mentioned areas which enhance our ability to maximize the Federal Columbia River Power Systems (FCRPS) asset value and that do so by improving our ability to monitor, control and use all of BPA’s FCRPS assets in an integrated manner. This RFSOQ/RFO is intended to produce R&D projects that are in addition to those already undertaken by BPA and other interests. This RFSOQ/RFO does not purchase power nor imply any commitment to purchase power from any resource(s) for BPA.

This Statement of Objectives highlights the key objectives of the program which will enable the offerors to propose a Contractor Statement of Work. This will then be incorporated into the awarded contract.

#### **A.4 Solicitation Guidance**

BPA is interested in research projects that investigate the technologies, technology gaps, topics and issues identified in five technology RoadMaps: Energy Efficiency and Demand Response, Power Operations (Hydro), Renewable Energy, Physical Security, and Transmission Services.

As noted earlier, the Technology RoadMaps identify technology areas, drivers, technology gaps, and issues that BPA could research to enhance its ability to maximize FCRPS asset value and that do so by enhancing the ability to monitor, control and use all of BPA's FCRPS assets in an integrated manner. Some of these research activities can focus on advancing the fundamental science and engineering of a particular resource technology, others may focus on demonstration projects that enhance the commercial viability and acceptance of the technology, and some may concentrate on solving technical challenges associated with the particular areas of interest. In particular, BPA will be interested in research projects in the following technology areas.

#### **Energy Efficiency and Demand Response**

This area covers residential and commercial sectors and a very limited exploration of the industrial sector. BPA is especially interested in energy efficiency, load management, and demand response technologies and practices with potential significant impact in the Pacific Northwest.

#### **Power Services (Hydro)**

This RoadMap represents hydro power services covering disciplines including power system operations, planning facility design, and maintenance. It addresses the technological challenges as well as long term needs. The following critical technologies have been identified that best support the agency technology innovation strategy:

- Situational awareness & visualization tools for operations
- Software tools for system performance & online real time operations,
- Health check systems to monitor equipment operation
- Flow measurement at the power plants
- Power electronics and energy storage solutions
- Advanced maintenance & diagnostic technologies
- Advanced governor technology
- Turbine runner environmental improvements
- Turbine runner efficiency improvements, and
- Environmentally benign lubricants
- Tools to mitigate wind integration
- Advanced Forecasting, Invasive Species and Hydraulic Coatings

#### **Renewable Energy**

BPA wants to select or monitor R&D projects for the following transmission grid connected renewables: wind, ocean wave and in-stream tidal technologies.

From the Renewable Energy Technology RoadMap the needs identified by BPA are (for example, but not exclusive to):

1. Utility management of grid connected intermittent energy to include: the reduction of forecasting and scheduling error, reduce reserve (capacity) requirements, technology that makes renewables smaller consumers of ancillary services (regulation, load following), congestion management, renewable facility redispatch and output control, tools to manage intermittency, optimization of generation and transmission assets, etc.;
2. Technologies that reduce renewable energy distributed generation impacts on low voltage systems, or reduce or mitigate load variability and support ancillary services in the management of intermittency.

The following table summarizes some examples of the kinds of R&D proposals that might be appropriate. It is a broad list of ongoing and proposed R&D activities in wind, ocean wave and in-stream tidal that BPA may elect to co-sponsor and fund, sponsor and lead, participate in demonstration projects, or monitor for future consideration (not fund at the present time).

### Potential R&D Activities for Wind, Ocean Wave and In-Stream Tidal Resources

Area of R&D Activity (document location)	Recommended BPA R&D Actions	Reference Material
Wind integration research – Examples include R&D aspects of BPA/NWPCC Northwest Wind Integration Action Plan <a href="http://www.nwcouncil.org/energy/Win/Default.asp">http://www.nwcouncil.org/energy/Win/Default.asp</a> , CEC sponsored PIER Intermittency Analysis Project <a href="http://www.energy.ca.gov/pier/confere/nces+seminars/2006-08-15_RPS_workshop/index.html">http://www.energy.ca.gov/pier/confere/nces+seminars/2006-08-15_RPS_workshop/index.html</a> , and wind forecasting for PBL and TBL wind projects.	Support research (lead), technical approaches and demonstration projects to support this emerging critical area of integration, impact mitigation and utility optimization of intermittent resources (see pg. 6)	RETR - Pages 20-27
Ocean Wave Projects	Monitor research, technical approaches and demonstration projects	RETR - Pages 35-38
In-Stream Tidal Project	Monitor research and technical approaches	RETR - Pages 45-55
Demand response technologies that support active load shaping techniques, which facilitate integration of intermittent renewable resources.	Identify optimal mix of EE R&D activities, Energy challenges, potential costs, etc., that support integration of intermittent resources.	Efficiency RoadMap
Transmission technologies that enhance communication with and provide direct control of renewable resources	Identify optimal mix of Transmission R&D activities, challenges, potential costs, etc., that support integration of intermittent resources.	Transmission RoadMap
Short term storage technologies that can load factor short term fluctuations in power from intermittent resources. Technologies may include: super-capacitors, flywheels, batteries, super	Identify optimal mix of R&D activities, potential costs, etc., that support short term storage capabilities and the integration of intermittent resources. Any project in this area needs to be very closely connected to the focus area on intermittent	Pages 24-27, Appendix C & Transmission RoadMap

conducting magnetic energy storage generation.  
(SMES).

### **Physical Security**

BPA wants to improve designs and expanded applications of technological security systems to augment the system operations activities, help mitigate risks to the transmission system and contribute to better safety of the workforce. BPA would like to facilitate design of security related technology to insure compatibility with power system applications, and enhance its leadership in the region relative to security and operations technologies.

### **Transmission Services**

BPA wants to improve its increasingly complex transmission system through design, operation, and management with real time intelligence and control to maintain system reliability, increase transmission capacity, and maximize asset use in an environmentally sound manner. The following targets were established:

- Enhance the future grid's reliability, interoperability and extreme event protection for an increasingly complex system operation.
- Increase the transmission transfer capabilities and control of power flows.
- Use efficient, cost-effective, environmentally sound energy supply and demand.
- Maximize asset use.

The Transmission RoadMap identified critical technologies that have the potential to enable real time, system wide operation, relieve congestion, reduce peak load, reduce frequency and duration of operational disturbances and planned outages, enhance grid stability, increase operational transfer capacity, increase asset utilization, and harden infrastructure to detect, prevent, and mitigate extreme events to the grid. These technologies are described on pages 20 – 40 of the Technology RoadMap.

The RoadMap also identified major technology gaps within a 20 year timeframe. These are also listed in the Transmission RoadMap starting on page 41.

Some of these activities can focus on advancing the fundamental science and engineering of a particular resource technology, others may focus on demonstration projects that enhance the commercial viability and acceptance of the technology, and some may concentrate on solving technical challenges associated with these areas.

### **A.5 Areas of Particular Interest for the Spring 2010 R&D Solicitation**

BPA is interested in research projects that investigate the technologies, technology gaps, topics and issues identified in the five technology RoadMaps. Any project addressing the areas identified in these RoadMaps is eligible for consideration in this year's R&D Solicitation. Within all of the technologies identified in the above mentioned RoadMaps, we are particularly interested in those that concentrate on the following areas:

1. [Advancing the Grid and](#)
2. [Renewable Energy Integration.](#)

BPA is especially interested in any project proposals addressing the following investigative areas. We will give particular attention to these proposals when evaluating and selecting projects for funding.

1. **Advancing the Grid:** Information technology convergence around creating a better grid system network as well as the data architecture, and control schemes that make use of synchrophasors, high speed and IPv6 communications, power electronics, and other tools that

make the grid more efficient and easier to understand, operate, or dispatch. BPA's goal is to achieve real time state awareness, visualization and control of the grid.

BPA will not fund projects already directly addressed in the WECC Synchrophasor Project and the NW Smart Grid Demonstration Project. Each proposal must address why the proposed project is not duplicative by including an assessment of projects planned or underway within the Western Interconnect and the proposed project's differentiation.

Research elements of particular interest could include:

- a. Advanced control technologies, especially power electronics based and those particularly suited to a synchrophasor response-based control strategy, and those that can be used to assimilate intermittent renewable generation more effectively and make better use of storage capabilities and opportunities,.
  - b. Advanced grid data and control architectures, especially the merging of information technology, communications, and control systems while adhering to current standards and adapting to developing standards (NERC CIP and NIST Smart Grid Interoperability Panel Priority Action Projects, IPSEC, IPV6, et al).
2. **Renewable Energy Integration:** The Pacific Northwest has abundant carbon-free electric generation possibilities. However, the capability of the region to integrate these resources successfully depends on its ability to understand, adapt, and manage them and the system in which they fit as an integrated whole. Intermittency, both in periodicity and magnitude, is an essential challenge to that integration. These resources are attracting high levels of commercial interest and raising legitimate concerns regarding the ability of the power system to assimilate these technologies. BPA is particularly interested in Market and operational design solutions that BPA can apply that would support efficient integration of renewable energy resources, including:
- a. Simulation tools for locating and assessing the performance of intermittent resources and
  - b. Systems that minimize scheduling uncertainty and reduce reserve requirements.

#### **A.6 Project Location**

A requirement for an acceptable R&D proposal is that it fulfills BPA's objectives to be a leader in the application of technologies that provide benefits to BPA, its customers and the Region. Project sponsors will need to demonstrate that submitted projects are meeting the challenges of BPA. Consequently, R&D projects would need to directly benefit BPA, though supporting research can draw from a multitude of informational and technological resources worldwide.

#### **A.7 BPA Furnished Property or Services**

With the limited budget BPA has available for 2011, proposers should not expect BPA to support the purchase of substantial equipment (for example generation equipment such as buying an ocean buoy or wind turbine, control systems, cabling, transformation or interconnection to the BPA transmission system). BPA will review proposals in a timely manner. BPA may provide limited services needed for the successful completion of the project such as; access to a substation, field support, data collection, etc. The proposal must explicitly identify any government equipment or services that may be needed.

## **Part B. Proposal Approach/Tasks**

### **B.1 Requirements**

The Technology RoadMaps provide primary guidance for all R&D requirements.

### **B.2. Performance Reporting Requirements**

Each proposal should include the suggested number and timing of all Stage Gates. Not only does this include an appropriate number of project stage gates but also the Portfolio Stage Gates in February and July. A Stage Gate reporting format will be established for each proposal. As mentioned above, each proposal must have identifiable review criteria that match along its implementation timeline to help the Technology Innovation program determine if the project goals and requirements are being met. These Stage Gates will be used to assess the expected progress of each project and reach a go, no-go or hold decision. If the review criteria for each established Stage Gate are not met (as defined by the contract that is developed from the proposal), then the project will be tabled and not continued, unless the problem areas can be remedied to the satisfaction of BPA. At each Stage Gate (Project or Portfolio) it is BPA's sole discretion whether a project continues to receive funding from BPA.

### **B.3 Deliverables**

Along with proposal guidelines described in Attachment 1 to the RFO (and linked to the T/I Technology RoadMaps – see link in section A.3) each offeror must discuss the expected deliverables of the project, including but not limited to:

- All supporting data in an electronic format acceptable to BPA.
- Expected functionality and support of any hardware and/or software as applicable, along with full documentation of its use and repair, as acceptable to BPA.
- Expected performance standards.
- How the proposed project will be integrated into BPA's power delivery system.
- How established utility processes and procedures will be impacted.
- The appropriate testing and/or evaluation methodology if applicable.
- A final report including next steps for the project or potential follow-on projects.

BPA understands the unique nature of many R&D technologies. BPA believes meaningful metrics can be established to track a project's success even though an expected outcome is not always certain in a research and development effort. Therefore, BPA T/I staff and its peer review team will make every effort to consider R&D proposals that may have an uncertain outcome.

### **B.4 Time Schedule**

**Management Stage Gate reporting schedule:** Stage Gates will be project specific and identified in the contract.

**Part C      Inspection and Acceptance (Quality Assurance)**

Any potential problem jeopardizing the successful outcome of the project must be reported to BPA's Contracting Officer as soon as possible and substantially before the next Stage Gate or scheduled review.

(END OF STATEMENT OF OBJECTIVES)