

Notice of Intent to Issue

Funding Opportunity Announcement (FOA) No.: DE-PS36-09GO99023

The Department of Energy's (DOE) Golden Field Office (GO) intends to issue, on behalf of the DOE Office of Energy Efficiency and Renewable Energy (EERE), Industrial Technologies Program (ITP), a Funding Opportunity Announcement (FOA) entitled **"Information and Communication Facility Energy Efficiency"**

Title IV of the American Recovery and Reinvestment Act of 2009 directs DOE to support research to increase the efficiency of information and communication technology and improve standards.

The goal and scope of the proposed FOA are broadly described in the Energy Independence and Security Act of 2007 (EISA), Title IV - Energy Savings in Buildings and Industry, Subtitle D – Industrial Energy Efficiency, Section 452 "ENERGY-INTENSIVE INDUSTRIES PROGRAM", Section 453 "ENERGY EFFICIENCY FOR DATA CENTER BUILDINGS" and in the Energy Policy Act of 2005, Title IX – RESEARCH AND DEVELOPMENT, Subtitle B – Distributed Energy and Electric Energy Systems, Section 922 - "HIGH POWER DENSITY INDUSTRY PROGRAM".

There are two broad areas of interest. Each proposal must address only one of these areas of interest. The areas of interest are:

A. Information and Communications Technologies Research & Development For Energy Efficiency

The energy used by our nation's vital telecommunications and data centers is growing at an alarming rate. As information technology and communications services continue to slowly converge, the data center and telecommunications industries face increasingly similar challenges to control the power usage of their microprocessors or servers and supporting power and cooling systems. The electricity consumed in data centers and telecom systems is already three percent of the U.S. total and growing rapidly. In the face of growing global energy demand, uncertain energy supplies, and volatile energy prices, innovative solutions are needed to radically advance the energy efficiency of these systems, which represent the engine of the American economy today. Enhanced energy efficiency in the central offices and data centers supporting our information, communications technology (ICT) systems will enhance U.S. energy and economic security.

Proposals for research and development in the following areas are sought:

1. Equipment Hardware and Software

Computing hardware and software are the functioning components of server-based data and telecommunications centers and largely determine power and cooling requirements. Achieving high levels of energy performance will require novel approaches

to the design and management of these hardware and software systems. The key theme and approach in this area is to minimize heat generation. Thus, energy will be saved by developing novel systems that generate less heat (i.e., new electronic circuitry which will use less energy by increasing chip output per unit of power used) or are impervious to heat, or by the use of optics only. These include, but are not limited to:

- Develop all-optical systems to increase energy efficiency.
- Advanced ultra-low power circuits like charge recycling multi-phase clock circuits to increase energy efficiency.
- Utilize ultra-efficient nano-electronic circuitry, including nano-based information storage devices, wires and graphene-based systems. The latter is expected to make possible the replacement of silicon in future electronic devices, and may make possible the incorporation of spintronic devices in future server-based ICT systems.
- Create hardened electronic equipment which can withstand temperature, humidity and particulate conditions outside the boundary of current generation electronics. Thus server-based systems can operate without air conditioning in environments worldwide, even high temperature environments.

2. Cooling

Cooling is believed to account for a third of all power consumed by information technology, telecommunications, and data centers. The cooling of server-based telephone central offices and data centers can be made more energy efficient by the following, but are not limited to:

- Create advanced component level cooling technologies
- Develop mitigation techniques to reduce the probability of failures associated with “free” cooling.
- Identify and create effective uses of low-quality waste heat generated.

3. Power Supply Efficiency

Data and telecommunications centers require large quantities of electricity to be conditioned, converted, and delivered to the diverse components, including servers, switches, routers, and hard drives. The power supply chain can include electricity purchased from the grid, backup power, onsite-power generation, switchgear, UPS's, power distribution systems, rack-level and unit-level power supplies, and power management technology. Traditionally, data centers have used AC power distribution systems and telecommunications centers have used DC power. The R&D proposals for power supply energy efficiency may address the following, but are not limited to:

- Research and develop high-efficiency power conversion circuits which optimize server-based data center and telecom equipment.

- Develop special purpose chips, multiphase clocking, ternary/other processing modes, lower-power chips (noted in part under hardware and software).
- Research the use of optical switching to eliminate many conversion steps & losses (Also noted under hardware and software).
- Conduct RD&D of superconducting components.
- Research the use of piezoelectrics to incorporate into micro-mechanical air conditioning for point of load cooling
- Efficiency optimized control systems for power conversion.

Each proposal MUST include organizational participants capable of and experienced in 1) research, 2) manufacturing the technology proposed, 3) bringing the technology to the end user through sales and marketing, and 4) serving as an end user of the technology proposed.

Each R&D project will be funded for maximum of three (2) years, with one or more budget periods.

B. Demonstration and Field Testing of Highly Energy Efficient and Pre-commercial Technologies in Data Center or Telecommunication Facilities

DOE is interested in field testing and independently validating the energy performance of pre-commercial technologies that show the potential to improve energy efficiency while not compromising data center or telecommunication reliability. The demonstration sites will be early adopters of the technologies and must be willing to share information about the cost-benefit results of the field-tested technology projects so as to encourage more rapid market acceptance of the technologies. Accordingly, DOE will work with the demonstration teams to develop case studies of the technology projects using measured and verified results so as to reduce market and technology risk.

The applicants must show a plan for the technologies to be demonstrated and the adoption of other best energy management practices to improve a data/telecommunication center's energy intensity performance (energy consumed for a given level of useful computational work) by more than 25 percent and have a Data Center Infrastructure Efficiency (DCIE = IT energy / total facility energy usage) of 0.80 or greater.

New and innovative technologies that are not currently widely commercial and that improve the following parts of a data center or telecommunication facility will be considered for DOE's cost sharing:

- Information Technology (IT) Optimization. This could include, but not be limited to: server virtualization, data storage and networking optimization schemes, methods in connecting multiple data centers (e.g., "cloud computing") or any technology and IT optimization system that will result in less heat generation for a given amount computational work load.

- Energy efficient electrical power distribution and supply. This could include, but not be limited to, more energy efficient electrical power supply to the IT or telecommunication equipment through new power transformation and back up technologies by reducing overall power distribution supply and IT system energy losses.
- Energy efficient cooling schemes. This could include, but not be limited to, more energy efficient cooling of IT/telecommunication equipment by more optimally delivering and/or controlling cooling to IT equipment with, for example, wireless sensors or IT systems that require less cooling while not compromising equipment lifetime.
- Distributed generation or alternative power technologies. New innovative combined heat and power or renewable energy technologies that are optimized for data center/telecommunication facilities and reduce overall source energy consumption and carbon emissions are desired to be demonstrated.

Technology demonstrations must be able to be widely replicated in other data centers throughout the United States and not be niche applications.

The demonstration teams must be willing to cooperate with DOE to perform an independent performance validation and to create case studies. Demonstration teams must also be willing to conduct public tours of the demonstration site(s) for up to 2 years after the technology demonstration case study is prepared.

Partnerships between the technology development teams and Federal facilities building new or retrofitting existing data center/telecommunication facilities, as well as other host sites, should be formed.

C. General Information

DOE envisions awarding multiple financial assistance/grant awards on a competitive basis. These awards will require cost shares in accordance with the Energy Policy Act of 2005. Details about cost share requirements will be included in the FOA along with the details of technical areas of interest, proposal preparation instructions and application merit review and evaluation criteria.

DOE plans to release the FOA in March, 2009. The FOA will be available for viewing at Grants.gov (<http://www.grants.gov>) and at the DOE's Industry Interactive Procurement Systems (IIPS) or "e-center" (<https://e-center.doe.gov>). Applicants are strongly encouraged to register at these sites to receive notification of announcements posted by DOE Golden Field Office. When the FOA is released, applications will only be received through Grants.gov.

In anticipation of the FOA being released shortly, there are several one-time actions prospective applicants must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with

FedConnect, register with the credential provider, and register with Grants.gov). Due to the likelihood of a short response period, interested applicants are strongly encouraged to ensure these requirements have been met. Detailed information on the DUNS and CCR process is presented at <http://www.grants.gov/GetStarted>. Applicants may use the Grants.gov Organization Registration Checklist at <http://www.grants.gov/assets/OrganizationRegCheck.pdf> to guide them through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants not yet registered with CCR and Grants.gov, should allow at least 21 days to complete these requirements. It is strongly recommended that the process be started as soon as possible.

If your organization does not have a DUNS number, go to the Dun & Bradstreet (D&B) online registration located at <http://fedgov.dnb.com/webform/displayHomePage.do> to receive a number free of charge or call 1-866-705-5711.

The Central Contractor Registration (CCR) collects, validates, stores, and disseminates business information about the Federal Government's trading partners in support of the contract award, grants, and the electronic payment processes.

To see if your organization is already registered with CCR, check the CCR website located at <http://www.bpn.gov/ccrinq/scripts/search.asp>. You will be able to search CCR by using either your organization's DUNS Number or legal business name. If your organization is already registered, take note of who is listed as the organization's E-Business Point of Contact (E-Business POC). This person will be responsible for registering in FedConnect.

To register in FedConnect, go to <https://www.FedConnect.net/FedConnect/> or contact the FedConnect Helpdesk at support@fedconnect.net Please note that the system functionality of FedConnect requires organizations to be registered with the CCR before registering with FedConnect. (FedConnect 'Quick Start Guide': https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf)

If your organization is not registered in CCR, go to the CCR Website at www.ccr.gov and select the "Start New Registration" option to begin the registration process. Please allow up to 7 days for processing of your registration which includes the IRS validating your Employer Identification Number (Taxpayer Identification Number or Social Security Number). The organization's E-Business POC will be designated during the CCR registrations process. A special Marketing Partner ID Number (MPIN) is established as a password to verify the E-Business POC.

The DOE will not entertain questions at this time. Once a FOA has been released, a "submit questions" feature will be defined.

DISCLAIMER

This Notice is issued so that interested parties are aware of the DOE's intention to issue this FOA. DOE reserves the right to change the requirements of any proposed FOA, issue a FOA involving only a portion of the elements listed, or not issue a FOA at all. Any of the information contained in this Notice is subject to change. Any amounts proposed for funding are subject to the availability of funding.