



# SMART GRID SUMMARY

By: Debbie Swanstrom, Partner  
Patton Boggs LLP

## I. WHAT IS SMART GRID?

Simply stated, Smart Grid involves technologies to improve the way electricity is supplied, transmitted, distributed, stored and consumed, including, for example, new sensor, communication and information-sharing technologies.

In the Energy Independence and Security Act of 2007 (EISA), Congress declared that it is the policy of the United States to support the modernization of the nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand, growth and to achieve each of the following, which together characterize a smart grid:

- Increased use of digital information and control technologies
- Dynamic optimization of grid operations and resources with full cyber security
- Integration of distributed resources including renewables
- Incorporation of demand response, demand-side resources and energy efficiency
- Deployment of real-time, automated, interactive technologies for metering, communications and distribution automation
- Integration of smart appliances and consumer devices
- Integration of electricity storage and peak shaving technologies including plug-in electric vehicles and thermal storage air conditioning
- Provision of timely information and control options to consumers
- Development of standards for interoperability
- Lowering of unnecessary barriers to smart grid technologies, practices and services

As described by the Federal Energy Regulatory Commission (FERC) in a proposed Smart Grid policy statement:

Smart Grid advancements will apply digital technologies to the grid, and enable real-time coordination of information from generation supply resources, demand resources and distributed energy resources . . . . This will bring new efficiencies to the electric system through improved communication and coordination between utilities and with the grid, which will translate into savings in the provision of electric service. Ultimately the Smart Grid will facilitate consumer transactions and allow consumers to better manage their electric energy costs. These technologies will also enhance the ability to ensure the reliability of the bulk-power system.

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The Smart Grid concept envisions a power system architecture that permits two-way communication between the grid and essentially all devices that connect to it, ultimately all the way down to large consumer appliances.

(Proposed Policy Statement and Action Plan, *Smart Grid Policy*, FERC Docket No. PL09-4-000, at P 1, P 19 n. 23 (2009)).

## II. WHAT OPPORTUNITIES EXIST TO OBTAIN FEDERAL FUNDING FROM DOE FOR SMART GRID?

Two significant funding opportunity announcements (FOAs) were issued by the Department of Energy (DOE), on June 25, 2003, for: (1) Smart Grid Investment Grants (No. DE-FOA-0000058); and (2) Smart Grid Demonstrations (No. DE-FOA-0000036).

### A. Smart Grid Investment Grants

The Smart Grid Investment Grant (SGIG) program is authorized by EISA, Title XIII, Section 1306 as amended by the Recovery Act. The SGIG FOA is intended to provide grants of up to one-half of qualifying Smart Grid investments to support the manufacturing, purchasing and installation of Smart Grid devices and related technologies, tools and techniques for immediate commercial use in electric system and customer-side applications including electric transmission systems, electric distribution systems, building systems, advanced metering, appliances and equipment. The ultimate aim is to enable smart grid functions on the electric system as soon as possible.

As stated in the SGIG FOA, the overall purpose is to accelerate the modernization of the nation's electric transmission and distribution systems and promote investments in Smart Grid technologies, tools and techniques which increase flexibility, functionality, interoperability, cyber-security, situational awareness and operational efficiency. The financial assistance provided is intended to enable measurable improvements that can result from accelerated achievement of a modernized electric transmission and distribution system, including:

- Reliability of the electric power system
- Electric power system costs and peak demand
- Consumer electricity costs, bills and environmental impacts
- Clean energy development and greenhouse gas emissions
- Economic opportunities for businesses and new jobs for workers

The goals of the SGIG program include the following accomplishments:

- Enabling informed participation by consumers in retail and wholesale electricity markets
- Accommodating all types of central and distributed electric generation and storage options
- Enabling new products, services and markets
- Providing for power quality for a range of needs by all types of consumers
- Optimizing asset utilization and operating efficiency of the electric power system
- Anticipating and responding to system disturbances
- Operating resiliently to attacks and natural disasters

Projects that accomplish the purpose and goals of the SGIG will be those that help implement necessary digital upgrades to electric transmission and distribution systems, large and small, and to residential, commercial, industrial, and public buildings, appliances, and equipment that connect with those systems. Such projects will support the two-way flow of both electric power and information between electric power companies and electricity consumers and will include methods and capabilities addressing interoperability, which is the capability of two or more networks, systems, devices, applications, or



components to share and readily use information securely and effectively with little or no inconvenience to the user. Easing the integration effort to achieve interoperability is an important enabling aspect of Smart Grid deployments and SGIG projects are expected to recognize and address this.

DOE expects that SGIG projects will also enable the entire electricity supply and delivery chain – as a whole or in part – (including power plants, transmission lines, substations, distribution lines, meters and customer systems) to operate in a more reliable, efficient, secure and affordable manner through operational improvements in areas such as outage detection, equipment maintenance and asset deferral and at a higher level of environmental protection through increased capabilities for cost-effectively integrating renewable, energy efficient and less carbon intensive technologies. Such projects will also provide an economic stimulus to local areas, states and regions through investment in electric infrastructure, expansion of economic opportunities for businesses, creation of jobs for American workers and enhancements of worker skills.

DOE expects that approximately \$3.4 billion in federal funds will be available for new SGIG awards. The federal funds for this program are divided into two categories:

- Smaller projects in which the federal share would be in the range of \$300,000 to \$20 million.
- Larger projects in which the federal share would be in the range of \$20 to \$200 million.

DOE currently envisions that approximately 40 percent of SGIG funding will be allocated for smaller projects, while approximately 60 percent will be allocated for larger projects. But, DOE reserves the right to revise these allocations depending on the quantity and quality of applications received.

## **B. Smart Grid Demonstrations**

The Smart Grid Demonstration Program (SGDP) is authorized by EISA, Title XIII, Section 1304 as amended by the Recovery Act. The SGDP FOA is intended to provide financial support, up to one-half of the total project cost, to demonstrate how a suite of existing and emerging Smart Grid technologies can be innovatively applied and integrated to prove technical, operational and business-model feasibility. The ultimate aim is to demonstrate new and more cost-effective Smart Grid technologies, tools, techniques and system configurations that significantly improve upon the ones that are either in common practice today or are likely to be proposed in the SGIG Program. Furthermore, these demonstration projects should serve as models for other entities to readily adapt and replicate across the country.

The goal of the SGDP FOA is to demonstrate technologies in regions across the States, Districts, and Territories of the United States of America that embody essential and salient characteristics of each region and present a suite of use cases for national implementation and replication. From these use cases, the goal is to collect and provide the optimal amount of information necessary for customers, distributors, and generators to change their behavior in a way that reduces system demands and costs, increases energy efficiency, optimally allocates and matches demand and resources to meet that demand, and increases the reliability of the grid. The social benefits of a Smart Grid are reduced emissions, lower costs, increased reliability, greater security and flexibility to accommodate new energy technologies, including renewable, intermittent and distributed sources.

There are two specific program areas of interest covered by the SGDP FOA:

### **1. Smart Grid (Program Area of Interest 1)**

An objective of this program area is to support regionally unique demonstration projects to quantify Smart Grid costs, benefits and cost-effectiveness, verify Smart Grid technology viability and validate new Smart Grid business models at a scale that can be readily adapted and replicated around the country. Smart Grid technologies of interest include advanced



digital technologies for use in planning and operations of the electric power system and the electricity markets such as microprocessor-based measurement and control, communications, computing and information. These demonstration projects directly support the Smart Grid Regional Demonstration Initiative, as described under section 1304 (b) (2) (A)-(E) of EISA, which is intended to provide regional solutions and best practices in implementing Smart Grid technologies. Implementation of the initiative will take into consideration regional differences in electric and market operations and regulatory environment. Each regionally-unique demonstration project should represent the common elements that are characteristic of the region. Collectively, DOE anticipates that these regional projects should embody the essential and salient characteristic of the entire nation to arrive at a suite of use cases for national implementation and replication.

## 2. Energy Storage (Program Area of Interest 2)

An objective of this program area is to support demonstration projects for major, utility-scale, energy storage installations. The projects will help to establish costs and benefits, verify technical performance and validate system reliability and durability at scales that can be readily adapted and replicated across the United States. Energy storage systems include the following technologies: advanced battery systems (including flow batteries), ultra-capacitors, flywheels and compressed air energy systems. Application areas include wind and photovoltaic (PV) integration with the grid, upgrade deferral of transmission and distribution assets, congestion relief and system regulation. Applications are also sought to demonstrate promising utility scale storage technologies to rapidly advance their market readiness in the United States.

DOE expects approximately \$615 million in federal funds to be available for new SGDP awards. The size and number of awards anticipated are as follows:

### Estimated Number of Selections Anticipated:

1 Smart Grid Demonstrations 8-12 Total

2 Energy Storage 12-19 Total

- 2.1 Battery Storage for Utility Load Shifting or for Wind Farm Diurnal Operations and Ramping Control 1-2
- 2.2 Frequency Regulation Ancillary Services 1-2
- 2.3 Distributed Energy Storage for Grid Support 4-5
- 2.4 Compressed Air Energy Storage (CAES) 1-4
- 2.5 Demonstration of Promising Energy Storage Technologies 5-6

### Award Size Anticipated:

1 Smart Grid Demonstrations Up to \$100 Million

2 Energy Storage (See below)

- 2.1 Battery Storage for Utility Load Shifting or for Wind Farm Diurnal Operations and Ramping Control \$40 to \$50 Million total
- 2.2 Frequency Regulation Ancillary Services \$40 to \$50 Million total
- 2.3 Distributed Energy Storage for Grid Support \$25 Million total
- 2.4 Compressed Air Energy Storage (CAES) \$50 to \$60 Million total
- 2.5 Demonstration of Promising Energy Storage Technologies \$25 Million total



### III. WHAT TYPES OF ENTITIES ARE ELIGIBLE TO APPLY FOR THIS FEDERAL FUNDING?

The SGIG FOA generally provides, subject to some exceptions, that eligible applicants include individual entities (lead organizations or “primes”) or teams of entities (lead and supporting organizations or “lower tier” applicants), such as:

- Electric power companies
  - o Investor-owned utilities
  - o Municipal utilities and public utility districts
  - o Electric cooperatives
  - o Other types of load-serving entities
  - o Regional organizations, such as independent system operators, transmission organizations and coordinating councils or national-level utility organizations
- State, county, local, or municipal government agencies
- Universities and colleges
- Electricity consumers singly or aggregated together, including residential, commercial, industrial and agricultural customer classes
- Appliance manufacturers, electrical equipment manufacturers, software providers and communications and information services providers
- Other private companies, including but not limited to, retail electricity suppliers, energy services companies, independent power producers, demand response services providers, metering services providers, project developers, electricity marketers and consultants

The SGDP FOA generally provides, subject to some exceptions, that all types of domestic entities are eligible to apply as a prime applicant (including but not limited to state government agencies, local government agencies, institutions of higher education, other nonprofit organizations and for project organizations).

Notably, there are restrictions on the ability of entities to submit multiple applications or to serve in lead or prime roles. Therefore, the FOAs should be read carefully before any application is submitted.

### IV. WHAT TYPE OF PROJECTS QUALIFY FOR THIS FEDERAL FUNDING?

The SGIG FOA states that eligible projects are required to support or advance one or more of the Smart Grid functions listed in EISA, Section 1306 (d), including:

- The ability to develop, store, send and receive digital information concerning electricity use, costs, prices, time of use, nature of use, storage or other information relevant to device, grid or utility operations, to or from or by means of the electric utility system, through one or a combination of devices and technologies.
- The ability to develop, store, send and receive digital information concerning electricity use, costs, prices, time of use, nature of use, storage or other information relevant to device, grid, or utility operations to or from a computer or other control device.
- The ability to measure or monitor electricity use as a function of time of day, power quality characteristics, such as voltage level, current, cycles per second or source or type of generation and to store, synthesize or report that information by digital means.
- The ability to sense and localize disruptions or changes in power flows on the grid and communicate such information instantaneously and automatically for purposes of enabling automatic protective responses to sustain reliability and security of grid operations.



- The ability to detect, prevent, communicate with regard to, respond to or recover from system security threats, including cyber-security threats and terrorism, using digital information, media and devices.
- The ability of any appliance or machine to respond to such signals, measurements or communications automatically or in a manner programmed by its owner or operator without independent human intervention.
- The ability to use digital information to operate functionalities on the electric utility grid that were previously electro-mechanical or manual.
- The ability to use digital controls to manage and modify electricity demand, enable congestion management, assist in voltage control, provide operating reserves and provide frequency regulation.

Also, the SGIG FOA lists eligible investments for SGIG funds as including the following (per EISA, Section 1306 (b)):

- In the case of appliances covered for purposes of establishing energy conservation standards under part B of title III of the Energy Policy and Conservation Act of 1975 (42 U.S.C. 6291 et seq.), the documented expenditures incurred by a manufacturer of such appliances associated with purchasing or designing, creating the ability to manufacture and manufacturing and installing for one calendar year, internal devices that allow the appliance to engage in Smart Grid functions.
- In the case of specialized electricity-using equipment, including motors and drivers, installed in industrial or commercial applications, the documented expenditures incurred by its owner or its manufacturer of installing devices or modifying that equipment to engage in Smart Grid functions.
- In the case of transmission and distribution equipment fitted with monitoring and communications devices to enable Smart Grid functions, the documented expenditures incurred by the electric utility to purchase and install such monitoring and communications devices.
- In the case of metering devices, sensors, control devices and other devices integrated with and attached to an electric utility system or retail distributor or marketer of electricity that are capable of engaging in Smart Grid functions, the documented expenditures incurred by the electric utility, distributor or marketer and its customers to purchase and install such devices.
- In the case of software that enables devices or computers to engage in Smart Grid functions, the documented purchase costs of the software.
- In the case of entities that operate or coordinate operations of regional electric grids, the documented expenditures for purchasing and installing such equipment that allows Smart Grid functions to operate and be combined or coordinated among multiple electric utilities and between that region and other regions.
- In the case of persons and entities other than electric utilities owning and operating a distributed electricity generator, the documented expenditures of enabling that generator to be monitored, controlled, or otherwise integrated into grid operations and electricity flows on the grid utilizing Smart Grid functions.
- In the case of electric or hybrid-electric vehicles, the documented expenses for devices that allow the vehicle to engage in Smart Grid functions (but not the costs of electricity storage for the vehicle).
- The documented expenditures related to purchasing and implementing Smart Grid functions in other cases as the secretary shall identify.



Several types of investments are not eligible. Thus, the FOA should be read carefully. For example, funding will not be provided for, among other things:

- Investments or expenditures for Smart Grid technologies, devices or equipment that utilize specific tax credits or deductions under the Internal Revenue Code, as amended.
- After the final date for state consideration of the Smart Grid Information Standard under section 1307 (paragraph (17) of Section 111(d) of the Public Utility Regulatory Policies Act of 1978), an investment that is not in compliance with such standard.
- After the development and publication by the Institute of protocols and model standards for interoperability of Smart Grid devices and technologies, an investment that fails to incorporate any of such applicable protocols or model standards.
- Expenditures for travel, lodging, meals or other personnel costs.

The types of demonstration projects eligible for funding under the SGDP FOA are generally described in Section I.B. of this summary above. Please note that the SGDP FOA includes a highly-detailed list of criteria and metrics that must be addressed by each applicant. Also, this FOA warns that “[d]emonstration projects proposed shall not represent marginal improvements of commercial technology or previously demonstrated technology.” Instead, projects proposed should be of a scale and scope sufficient to significantly advance Smart Grid deployments throughout the United States toward the vision of a 21st century grid.

## V. WHAT ARE THE DEADLINES FOR APPLICATIONS?

In the SGIG FOA, DOE established three phases of staggered application deadlines: (1) August 6, 2009, at 8:00 p.m. EST; (2) November 4, 2009, at 8:00 p.m. EST; and (3) March 3, 2010, at 8:00 p.m. EST. DOE cannot predict, at this time, whether funds will remain available beyond the awards provided in the first phase. Thus, entities interested in applying for funds may want to ensure their applications are submitted by the first deadline of August 6, 2009.

DOE also is requesting letters of intent to submit applications for SGIGs. For those planning to submit applications by August 6, 2009, a letter of intent should be submitted by July 16, 2009. For those planning to submit applications by November 4, 2009, a letter of intent should be submitted by October 23, 2009. Finally, for those planning to submit applications by March 3, 2010, a letter of intent should be submitted by February 10, 2010.

In the SGDP FOA, DOE established an application deadline of August 26, 2009, at 3:00 p.m. EST. DOE did not request letters of intent in the SGDP FOA.

With respect to both FOAs, there are many steps that need to be taken well in advance of the deadlines to prepare for the submission of an application. For example, applicants must, among other things, obtain a Dun and Bradstreet Universal Numbering System (DUNS) number and register with both the Central Contractor Registration (CRR) and FedConnect. Also, advanced planning is needed to comply with other application requirements. For example, if an SGIG project needs approval from state, local, regional and/or federal agencies, the applicant must not only describe how and when those approvals will be obtained, but also include correspondence from the relevant regulatory agency indicating when the approval process will begin and outlining the likely timeline.



## VI. WHEN DOES DOE INTEND TO MAKE THE AWARDS?

With respect to awards of federal funding, the SGIG FOA states: "DOE anticipates notifying applicants selected for award within 90 days after the applicable application deadline."

The SGDP FOA states: "DOE anticipates notifying Applicants selected for award by early November 2009, and making awards beginning in December 2009/January 2010."