

# Transportation Research Methods: A Guide to Searching for Funding Opportunities

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Opportunity Number	Opportunity Title	Agency	Opportunity Status
1006	Social and Behavior Change Communication (SBCC) Activity	USAID-BAN	Posted
	Partnerships for International Research and Education	NSF	Posted
	Cooperative Studies Of The Earth's Deep Interior	NSF	Posted
	Planning Grant for NINDS Morris K. Udall Parkinson's Disease Research Center Without Walls (R34)	HHS-NIH11	Posted
	BLM CO Northwest District Hazardous Fuels and Forest Management Activities.	DOI-BLM	Posted
10823	Trail Stabilization at Wrangell-St. Elias National Park & Preserve	DOI	Posted

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# TR201615: Transportation Research Methods Training

A Guide to Searching for Funding Opportunities. Suzanna Long, PhD, PEM,  
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## Executive Summary

The objective of this project is to provide a summary of research search engines and sites that may be useful for transportation-related projects. Research is essential for a strong, resilient transportation network; effective search processes and tools to discover relevant funding opportunities are essential elements for providing good stewardship of available resources.

This project focused on three related tasks designed to introduce beginning researchers to the process commonly used to identify funding opportunities and craft a strong proposal.

**Task 1:** Comprehensive Literature Review and Funding Environment Analysis. A review of the relevant literature related to transportation grantsmanship best practices was conducted. This review identified trends and expectations in recent funding from both a regional and national perspective.

**Task 2:** Proposal Basics-Hands-on Tutorials. These interactive tutorials covered search basics, partnerships, and review guidelines for red teaming.

Task 2.1: Tutorial 1—Funding Search Basics

Task 2.2: Tutorial 2—Collaborative Partnerships: Building a Winning Team

Task 2.3: Tutorial 3—Proposal Design Basics

Task 2.4: Tutorial 4—Proposal “red teaming”

**Task 3:** Research Methods Handbook/Final Report. This final report summarizes tasks 1 and 2 and provides a practical research methods handbook detailing findings, tutorial materials, and best practices for securing targeted transportation funding.

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# 1 General Proposal Terminology

Understanding the type of research outlined in the Request for Proposals (RFP) is the first step in being fully responsive in a proposal submission. Shared definitions and terminology common to most RFPs are defined below in text and in summary form in Table 1.

Technology Readiness Level (TRL) is often used to represent the maturity of a novel technology. As shown in **Table 1** [1], it ranges from 1 to 9 with increasing maturity from the basic principles and research to technology refined and adopted. Each technology can be evaluated against the parameters associated with various TRLs and is then assigned a TRL rating based on the project progress.

**Table 1 Technology Readiness Levels (TRL)**

	TRL	Description	To achieve the given TRL, you must answer yes to Every question. Discuss any uncertain answers
Basic Research	1	Basic principles and research	<ul style="list-style-type: none"> <li>• Do basic scientific principles support the concept?</li> <li>• Has the technology development methodology or approach been developed?</li> </ul>
	2	Application formulated	<ul style="list-style-type: none"> <li>• Are potential system applications identified?</li> <li>• Are system components and the user interface at least partly described?</li> <li>• Do preliminary analyses or experiments confirm that the application might meet the user need?</li> </ul>
	3	Proof of concept	<ul style="list-style-type: none"> <li>• Are system performance metrics established?</li> <li>• Is system feasibility fully established?</li> <li>• Do experiments or modeling and simulation validate performance predictions of system capability?</li> <li>• Does the technology address a need or introduce an innovation in the field of transportation?</li> </ul>
Applied Research	4	Components validated in laboratory environment	<ul style="list-style-type: none"> <li>• Are end-user requirements documented?</li> <li>• Does a plausible draft integration plan exist, and is component compatibility demonstrated?</li> <li>• Were individual components successfully tested in a laboratory environment (i.e., a fully controlled test environment where a limited number of critical functions are tested)?</li> </ul>
	5	Integrated components demonstrated in laboratory environment	<ul style="list-style-type: none"> <li>• Are external and internal system interfaces documented?</li> <li>• Are target and minimum operational requirements developed?</li> <li>• Is component integration demonstrated in a laboratory environment (i.e., a fully controlled setting)?</li> </ul>
Development	6	Prototype demonstrated in relevant environment	<ul style="list-style-type: none"> <li>• Is the operational environment fully known (i.e., user community, physical environment, and input data characteristics as appropriate)?</li> <li>• Was the prototype tested in a realistic environment outside of the laboratory (i.e., a relevant environment)?</li> <li>• Does the prototype satisfy all operational requirements when confronted with realistic problems?</li> </ul>
	7	Prototype demonstrated in relevant environment	<ul style="list-style-type: none"> <li>• Are available components representative of production components?</li> <li>• Is the fully integrated prototype demonstrated in an operational environment (i.e., real world conditions, including the user community)?</li> <li>• Are all interfaces tested individually under stressed and anomalous conditions?</li> </ul>

	8	Technology proven in operational environment	<ul style="list-style-type: none"> <li>• Are all system components' form, fit, and function compatible with each other and with the operational environment?</li> <li>• Is the technology proven in an operational environment (i.e., does it meet target performance measures)?</li> <li>• Was a rigorous test and evaluation process completed successfully?</li> <li>• Does the technology meet its stated purpose and functionality as designed?</li> </ul>
Implementation	9	Technology refined and adopted	<ul style="list-style-type: none"> <li>• Is the technology deployed in its intended operational environment?</li> <li>• Is information about the technology disseminated to the user community?</li> <li>• Is the technology adopted by the user community?</li> </ul>

## 2 Preparation for Funding Search

### 2.1 Search parameters identification

Before looking for funding to support an organization or a specific program, it is important to identify some critical parameters. Some sample questions are as follows:

- 1) What types of funding is needed? For example, is it for research or education?
- 2) How much amount is sufficient to support work activities?
- 3) When will the funding be needed?

Based on the answers to the above questions, a funding opportunity plan can be developed in terms of funding types, amount, and critical dates to guide future funding search.

### 2.2 Search tools setup

Upon completing the funding opportunity plan, relevant topics related to interested research areas or needed grant types are thus collected. Some wish list topics gathered from different divisions and districts at Missouri Department of Transportation (MoDOT) are shown in **Table 2** of *Section 2.2.1*.

#### 2.2.1 Wish list topics

**Table 2 Wish list topics collected from MoDOT**

Road to Tomorrow		<ul style="list-style-type: none"> <li>• Energy production on the right of ways: a) Solar; b) Wind; c) Energy portfolio analysis.</li> <li>• Smart highways: a) Pre-cast concrete with integrated sensors; b) Placement of EV charging stations.</li> <li>• Internet of things (IoT): a) Optimization of telecommunication infrastructure placement.</li> <li>• Alternative transportation ideas.</li> </ul>
SW	Becky	<ul style="list-style-type: none"> <li>• I-49, last 5 miles in Missouri, does not have enough rural funding match for TIGER and the new freight program.</li> <li>• Solar roadways.</li> </ul>
MC	Kelly & Scott	<ul style="list-style-type: none"> <li>• Any type of roadside electronic screening or data capture (will have to be careful here).</li> <li>• Cover weigh station facility-type things in general.</li> <li>• Any available funding for truck parking including equipment like cameras or counters.</li> <li>• HD mapping of roadways.</li> </ul>

EC R	Title VI Team	<ul style="list-style-type: none"> <li>• Grants to help fund LEP activities (limited English proficiency).</li> </ul>
TP	Michelle	<ul style="list-style-type: none"> <li>• Planning.</li> <li>• Data.</li> <li>• Performance management.</li> </ul>
	Chris Rutledge	<ul style="list-style-type: none"> <li>• Life-cycle cost effectiveness of aluminum-coated corrugated steel pipe.</li> <li>• Pavement installation and maintenance strategies for roadway pavement with high-swell clay subgrades.</li> <li>• LED roadway lighting.</li> <li>• Solar powered signals.</li> </ul>

### 2.2.2 Keywords

Searching keywords or phrases in each wish list topic is more efficient and effective than searching the whole topic. Identify keywords that are most relevant to the entire list of wish list topics. Take the wish list topic ‘*Energy production on the right of ways: a) Solar; b) Wind; c) Energy portfolio analysis*’ as an example. Keywords can be selected to best identify topics of interest, such as ‘*renewable*’, ‘*energy*’, ‘*solar*’, ‘*wind*’, ‘*analysis*’, ‘*highway*’, ‘*transportation*’, etc.

### 2.2.3 Funding opportunity organization

Keeping a detailed record of funding opportunities in proper manner is helpful and convenient for future review on the deadline, funding opportunity number, and so on. **Table 3** gives an example of funding opportunity organization, consisting of *funding agency, opportunity number/title, posted/close date, website, related wish list topic, status and outcome*. Other useful information can be added to the table as needed. *Writing scheduled, writing in progress, submitted or pending decision* can be placed under the heading of *status*. *Funded and rejected (closed)* could be added to the column of *outcome*. Note that even though a funding request wasn’t awarded, it is beneficial to contact the funding agency and request a debriefing on review comments and the proposal weaknesses for future improvement. Then, strengthen the weak sections of the proposal narrative and make it ready for a submission to other funding agencies or for resubmission to the same funding agency that rejected the first application. Funding agencies usually allow applicants to reapply in the next funding cycle (e.g., next year). Having a good relationship with the funding agency is also advantageous to find out funding opportunities prior to their public announcement.

**Table 3 An example of funding opportunity organization**

Num.	Agency	Opp. No.	Opp. Title	Posted Date	Deadline	Website	Wish List Topic	Status	Outcome
1	NSF	PD-15-7644	Energy for Sustainability	07/24	12/03	<a href="http://www.nsf.gov">http://www.nsf.gov</a>	Energy	Submitted	Funded

## 2.2.4 Records of search keywords and histories

For a specific wish list topic, there might be a large number of potential keywords to start with. Maintaining a good record of searched keywords, produced hits and valuable results will thus help improve or optimize keyword search for future searches. This can be done by creating a document manually or subscribing to the saved search service provided online.

Funding search is a long-term activity; therefore, it is worthwhile to document search histories (e.g. a spreadsheet listing *the date performing funding searches, wish list topics, keywords, websites, funding agencies, the number of hits, the date of newest funding opportunity, etc.*)

## 2.3 Common abbreviations

Table 4 shows some common abbreviations used during funding search.

**Table 4 Common abbreviations**

Abbreviation	Full name
FOA	Funding opportunity announcement
FFO/FFA	Federal funding opportunity (or announcement)
RFP	Request for proposals
RFA	Request for applications
RFI	Request for Information
NOFO	Notice of funding opportunity
NOI	Notice of Intent to publish FOA
Notice	Information about FOA

## 3 Potential Funding Sources

### 3.1 Two forms

Potential funding takes two forms: either generating an idea in response to a funder's request or finding a funder to support the funding seeker's idea. Methods of looking for funding opportunities will be illustrated in *Section 4*.

### 3.2 Categories of funding sources

There are two categories of funding sources: public and private sectors. Public sectors include 26 grant-making agencies of the federal government and a large number of state, county and local government agencies. Private sectors include more than 100,000 foundations, direct corporations, and philanthropists.

### **3.3 Types of funding mechanisms**

#### **3.3.1 Grant (agreement)**

The principal purpose is the transfer of funds from the funding agency to recipients to carry out a public purpose (research). A grant (agreement) is distinguished from a cooperative agreement in that it does not require substantial involvement of the federal awarding agency in carrying out various activities summarized in the federal award.

#### **3.3.2 Cooperative agreement**

A cooperative agreement is similar to a grant (agreement) except that a substantial programmatic involvement of the federal awarding agency as the agreement is being executed. A distinguishing factor between the grant (agreement) and the cooperative agreement is the degree of federal participation or involvement during the performance of various funding-supported activities.

#### **3.3.3 Procurement contract**

The principal purpose of a procurement contract is to provide the prescribed service or “good” for direct benefit or use of funder.

#### **3.3.4 Others for financial assistance**

Other types of financial assistances are also available. For example, subaward, technical (consulting) assistances and endowments are widely used in academic environments.

## **4 Search of Funding Information**

Funding information is commonly published through formal grant announcements & solicitations in printing or electronic media such as LISTSERVs, newsletters and online databases. LISTSERV emails & newsletters and online databases provide information about new, modified and deleted funding opportunities rapidly. Therefore, they constitute most of the opportunities during funding search. LISTSERV emails & newsletters can be received by subscribing to a specific funding opportunity, all funding opportunities, or keywords from certain websites. Online databases will be illustrated in the following sections.

## 4.1 Overview of online databases

Corresponding to public and private funding sources, there are two main categories of online databases: public and private. As shown in **Figure 1**, government websites and non-government websites constitute the public databases.

Government websites include *GRANTS.GOV*, *FEDBIZOPPS.GOV* and *Federal Register*. *GRANTS.GOV* is a one-stop funding search engine from 26 grant-making federal agencies and other institutions and administrations. *FEDBIZOPPS.GOV* is mainly for official federal government procurement opportunities, allowing contractors to retrieve services posted by government buyers. *Federal Register* is the official daily publication for government agency rules, proposed rules, and public notices, as well as executive orders and other presidential documents. Most funding agencies post funding opportunities on their own websites, such as *National Science Foundation (NSF)*, *U.S. Department of Transportation (DOT)*, *Department of Energy (DOE)*, *National Institute of Standards and Technology (NIST)*, *National Aeronautics and Space Administration (NASA)*, and so on.

Non-government databases contain *FederalGrants*, which is free to the public, and *GrantSelect* and *GrantForward*, which require paid online subscriptions to access. The most powerful database for private source search is *Foundation Center*. Other common web-based databases include *SPIN*, *pivot*, *\*Research Professional*, and so forth. Other than the above databases, *Google* is another search engine worthy to explore.



**Figure 1** Overview of online databases

## 4.2 Databases for public sectors

### 4.2.1 GRANTS.GOV

#### 4.2.1.1 Keyword search tips

Keyword search is composed of two components: words and operators. Two types of words will be used, single word (e.g. *renewable*) and phrases (e.g. *renewable energy*). Common operators are listed in **Table 5** [2]. Note that AND, OR, and NOT must be in ALL CAPS. Otherwise, they are interpreted as search words. At the beginning of a funding search, the number of funding opportunities might be overwhelming. Thus, it is practical to use several keywords to narrow down search results. However, when getting acquainted with funding search, use as few keywords as possible to produce more results.

**Table 5 Common operators used during keyword search**

Operator	Description	Example
" "	Exact phrase: To search for an exact phrase match.	<i>"renewable energy"</i> This searches for opportunities that contain the exact phrase of <i>renewable energy</i> .
OR or	This is the default conjunction operator. If there is no operator between two words, the operator is used. The operator links two words and if either or both of the words exist then display them in the results. This is equivalent to a union of sets.	<i>renewable energy</i> This searches for opportunities that contain <i>renewable, energy, or both</i> .
AND or &&	The operator finds results where both words exist. This is equivalent to an intersection using sets.	Ex. 1: <i>energy AND solar</i> This searches for opportunities that contain <i>energy and solar</i> . Ex. 2: <i>"renewable energy" AND solar</i> This searches for opportunities that contain the exact phrase of <i>renewable energy and solar</i> .
NOT or !	Exclude opportunities that contain the word after this operator. This is equivalent to a difference using sets. Note: The NOT operator cannot be used with just one word or exact phrase. For example, the following search will return no results: NOT <i>"renewable energy"</i>	<i>energy NOT bioenergy</i> This searches for opportunities that contain <i>energy</i> but not <i>bioenergy</i> .
+	Require that the word or exact phrase after the operator exists.	<i>+solar highway</i> This searches for opportunities that must contain <i>solar</i> and may or may not contain <i>highway</i> .



#### 4.2.1.2 Step-by-step guide

The central database of federal research grants is *GRANTS.GOV*, which can be accessed at <http://www.grants.gov/>. *GRANTS.GOV* is managed by the Department of Health and Human Services. It enables users to find federal grants, apply for federal grants, and follow up on submitted federal grant applications. It houses information on more than 1,000 grant programs from 26 federal grant-making agencies. On the homepage as shown in **Figure 2**, there are four methods to look for grant opportunities.

The first one is *quick search*. By entering keywords under *Grant Opportunities* and clicking *Go* button or pressing *enter key* on computer keyboards, loads of hits will appear in the new page.

The second method is to *browse opportunities* by different classifications, such as *the newest opportunities*, *funding categories*, *funding agencies* and *eligibilities (intended recipients)*. It is straightforward to view recently posted grant opportunities under *Browse Newest* tab. *Funding Categories* is comprised of arts, education, energy, transportation, and so on. Clicking a category will yield relevant grant opportunities from different funding agencies. To dig into grant opportunities from a particular federal agency (e.g. *DOE*), simply click the tab of *Browse Agencies* and then hit *Department of Energy*. Browsing grant opportunities by *eligibility* will list grant opportunities for which an institution, organization or individual is eligible. For example, some grants are for small businesses or state governments only. Each number in the brackets at the end of each link indicates the number of forecasted or posted opportunities excluding closed and archived ones.

4. E-mail/RSS subscription

1. Quick search

2. Browse opportunities

3. Full search

Opportunity Number	Opportunity Title	Agency	Opportunity Status
RFA-388-16-000006	Social and Behavior Change Communication (SBCC) Activity	USAID-BAN	Posted
16-571	Partnerships for International Research and Education	NSF	Posted
16-572	Cooperative Studies Of The Earth's Deep Interior	NSF	Posted
RFA-NS-16-024	Planning Grant for NINDS Morris K. Udall Parkinson's Disease Research Center Without Walls (R34)	HHS-NIH11	Posted
L16AS00204	BLM CO Northwest District Hazardous Fuels and Forest Management Activities.	DOI-BLM	Posted
NPS-DOIP16AC00823	Trail Stabilization at Wrangell-St. Elias National Park & Preserve.	DOI-NPS	Posted
NPS-DOIP16AC00822	Conservation Crew for Trail Stabilization at Wrangell-St. Elias National Park & Preserve	DOI-NPS	Posted

**Figure 2 Homepage of GRANTS.GOV**

The third one is *full search* (Figure 3). *Full search* is based on three criteria: *keyword(s)*, *opportunity number* and *CFDA*. *Keywords search* is similar to *quick search* and search tips are illustrated in Section 4.2.1.1. If further information, relative documents or submission of a particular opportunity is needed, searching with *opportunity number* will come in handy. The *Catalog of Federal Domestic Assistance (CFDA)* number is a government-wide compendium of federal programs, projects, services, and activities that provide assistances or benefits to the American public. As the basic reference source of federal programs, the primary purpose of the *Catalog* is to assist users to identify programs that meet specific objectives of the potential applicant, and to obtain general information on federal assistance programs. In addition, the intent of the *Catalog* is to improve coordination and communication between the federal government and state and local governments. It is a five-digit number assigned in the awarding document, identifying the federal grant-making agency and subagency distributing the grant or cooperative agreement funds. For more information about *CFDA number*, visit <https://www.cfda.gov/>.

The last one is *E-mail alerts* or *RSS subscriptions*. Anyone who is interested in a potential opportunity in a certain area can sign up and be subscribed to receive email and other notifications of funding availability.

The screenshot displays the GRANTS.GOV search results page. The top navigation bar includes links for HELP, MANAGE SUBSCRIPTIONS, REGISTER, and LOGIN. A search bar at the top right contains the text 'Grant Opportunities' and a 'GO' button. The main navigation menu includes HOME, LEARN GRANTS, SEARCH GRANTS, APPLICANTS, GRANTORS, SYSTEM-TO-SYSTEM, FORMS, OUTREACH, and SUPPORT.

The search results page is titled 'SEARCH GRANTS' and shows '1 - 25 OF 248 MATCHING RESULTS:'. The search criteria on the left include:
 

- Keyword(s): renewable energy
- Opportunity Number: [empty]
- CFDA: [empty]
- OPPORTUNITY STATUS:
  - Forecasted (0)
  - Posted (248)
  - Closed (415)
  - Archived (4,479)
- FUNDING INSTRUMENT TYPE:
  - All Funding Instruments
  - Cooperative Agreement (122)
  - Grant (156)
  - Other (22)
  - Procurement Contract (23)
- ELIGIBILITY:
  - All Eligibilities
  - City or township governments (22)
  - County governments (21)
  - For profit organizations other than small businesses (17)
- CATEGORY:
  - All Categories
  - Agriculture (16)
  - Business and Commerce (11)

The table of results has the following columns: Opportunity Number, Opportunity Title, Agency, Opportunity Status, Posted Date, and Close Date. The first few rows are:
 

Opportunity Number	Opportunity Title	Agency	Opportunity Status	Posted Date	Close Date
RDBCP-REAP-RES-EEI-2016	Renewable Energy Systems and Energy Efficiency Improvements Program	USDA-RBCS	Posted	10/13/2015	
C-NOFO-16-100	U.S.-South India Renewable Energy Innovation Challenge	DOS-IND	Posted	04/28/2016	06/28/2016
DE-FOA-0001520	Notice of Intent (NOI) Solar Energy Evolution and Diffusion Studies II – State Energy Strategies	DOE-GFO	Posted	01/27/2016	07/22/2016

**Figure 3 Full search page of GRANTS.GOV**

As shown in **Figure 4**, *GRANTS.GOV* offers a variety of filters to refine search results, such as *opportunity status*, *funding instrument type*, *eligibility*, *category*, and *funding agency*. For example, under *opportunity status*, search results can be narrowed down by checking boxes of *forecasted*, *posted*, *closed*, or *archived*. *Forecasted* and *posted* can be checked for upcoming and current funding opportunities. *Closed* or *archived* opportunities are also of great importance. If a past program seems interesting, contact can be made with the grantor to check whether that program will be funded again in the future.

**SEARCH GRANTS**

BASIC SEARCH CRITERIA:  
 Keyword(s): renewable energy  
 Opportunity Number:  
 CFDA:

Search Tips | Export Detailed Data

SORT BY: Relevance (Descending) Update Sort DATE RANGE: All Available Update Date Range

1 - 25 OF 248 MATCHING RESULTS: < Previous 1 2 3 4 5 6 ... 10 Next >

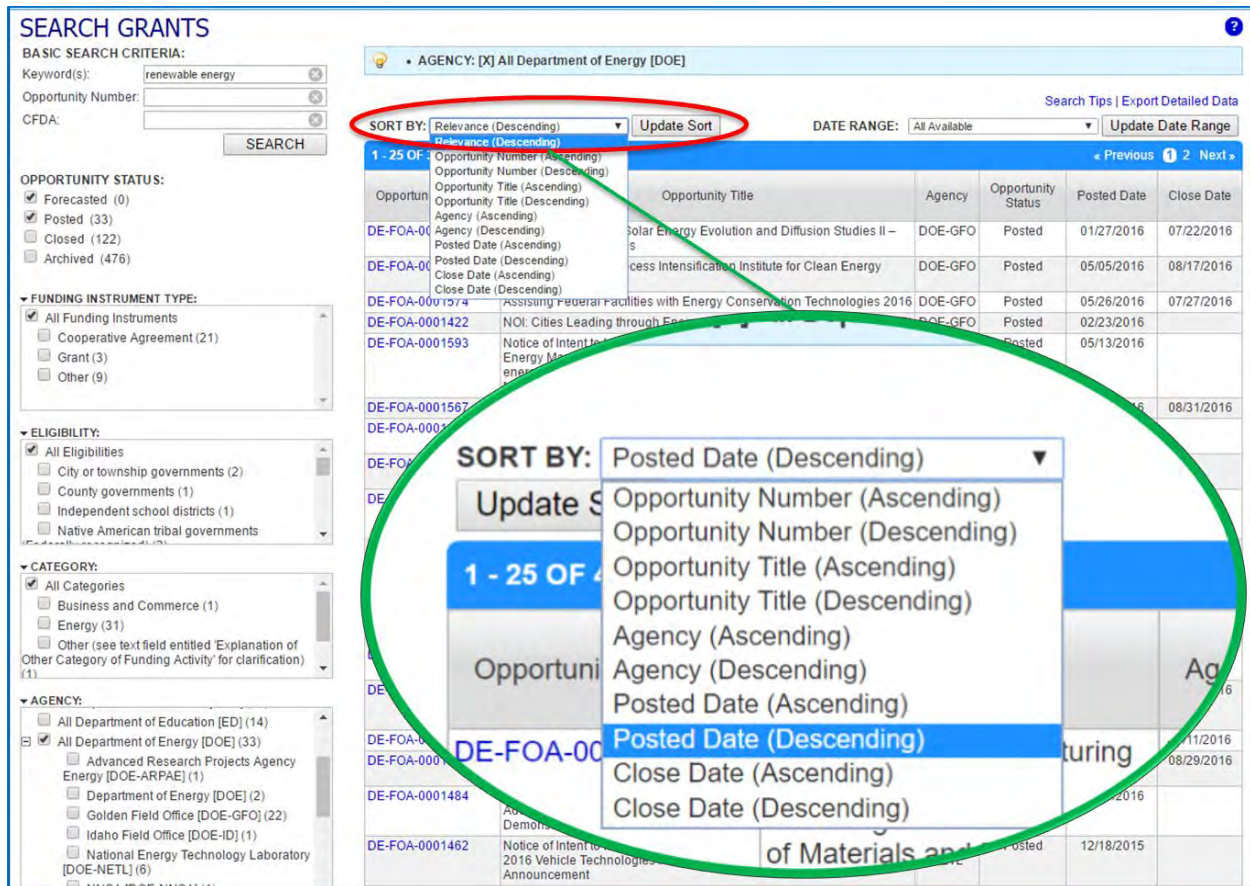
Opportunity Number	Opportunity Title	Agency	Opportunity Status	Posted Date	Close Date
RDBCP-REAP-RES-EEI-2016	Renewable Energy Systems and Energy Efficiency Improvements	USDA-	Posted	10/13/2015	
C-NOFO-16-100	Pro...	U.S.			2016
DE-FOA-0001520	Noti...				2016
PD-16-7644	Ene...				2016
DE-FOA-0001578	Mod...				2016
DE-FOA-0001574	Ass...				2016
DE-FOA-0001422	NOI (Cit...				2016
PD-16-7607	Ene...				2016
DE-FOA-0001593	Noti...				2016
DE-FOA-0001567	Clean Energy Manufacturing Innovation Institute for Reducing Embodied-energy And Decreasing Emissions (REMADE) in Materials Manufacturing				08/31/2016
DE-FOA-0001479	Remote...				
DE-FOA-0001573	Notice of Energy E...				
DE-FOA-0001577	Assisting Technol...				
DE-FOA-0001577	Notice of Modular Energy M...				
DE-FOA-0001587	Wind En...				
DE-FOA-0001403	Testing C...				06/23/2016
BIA-FA-16-EMDP-0002	Cities Le...				07/08/2016
DE-FOA-0001495	ENERGY...				
DE-FOA-0001466	Notice of DE-FOA-Efficien...				
PD-15-1403	Notice of Industria...				10/20/2016
DE-FOA-0001232	Process Thermod...				07/22/2016
	Funding 0001232 Demons...				
	Biopower (PD2B3)				

**OPPORTUNITY STATUS:**  
 Forecasted (0)  
 Posted (248)  
 Closed (411)  
 Archived (4,483)

**AGENCY:**  
 All Agencies  
 All Agency for International Development [USAID] (19)  
 All Department of Agriculture [USDA] (15)  
 All Department of Commerce [DOC] (7)  
 All Department of Defense [DOD] (40)  
 All Department of Education [ED] (14)  
 All Department of Energy [DOE] (33)  
 All Department of Energy - Office of Science [PAMS] (4)

**Figure 4 Options to refine search results on full search page of GRANTS.GOV**

Figure 5 illustrates different options to sort search results, including *relevance*, *opportunity number*, *opportunity title*, *agency*, *posted date* and *close date* in ascending or descending order. According to personal preference, appropriate options can be selected to sort search results that can then be browsed.



**Figure 5 Options to sort search results on full search page of GRANTS.GOV**

By clicking on an opportunity number in blue, *View Grant Opportunity* page (**Figure 6**) will appear. *Opportunity number/ title* and *funding agency* are listed on the top of the page. Under the tab of *Synopsis*, *general information*, *eligibility* and *additional information* are presented. *Opportunity number/title* can also be found in *General Information* section, together with *funding instrument type*, *CFDA numbers*, *posted/closing dates*, and *funding amount*. More information about in-depth funding description, funding agency and contact details can be found in *Additional Information* section. All updates or modification about the grant opportunity is available under *Version History* tab. Relevant documents and submission packages can be found under *Related Documents* tab and *Package* tab.

**VIEW GRANT OPPORTUNITY** ← Back | Link

DE-FOA-0001587 **Opportunity Number**  
 Wind Energy – Eagle Impact Minimization Technologies and Field Testing Opportunities **Opportunity Title**  
 Department of Energy  
 Golden Field Office **Funding Agency**

SYNOPSIS | VERSION HISTORY | RELATED DOCUMENTS | PACKAGE

Print Synopsis Details ?

If you would like to receive email notifications of changes to this grant opportunity click send me change notification emails. You only need to provide your email address.

**General Information**

Document Type: Grants Notice	Version: Synopsis 1
Funding Opportunity Number: DE-FOA-0001587	Posted Date: May 04, 2016
Funding Opportunity Title: Wind Energy – Eagle Impact Minimization Technologies and Field Testing Opportunities	Last Updated Date: May 04, 2016
Opportunity Category: Discretionary	Original Closing Date for Applications: This is a Notice of Intent
Opportunity Category Explanation:	Current Closing Date for Applications: This is a Notice of Intent
Funding Instrument Type: Cooperative Agreement	Archive Date: Aug 04, 2016
Category of Funding Activity: Energy	Estimated Total Program Funding: \$0
Category Explanation:	Award Ceiling: \$2
Expected Number of Awards: 0	Award Floor: \$1
CFDA Number(s): 81.087 -- Renewable Energy Research and Development	
Cost Sharing or Matching Requirement: No	

**Eligibility**

Eligible Applicants: Unrestricted (i.e., open to any type of entity above), subject to any clarification in text field entitled "Additional Information on Eligibility"

Additional Information on Eligibility:

**Additional Information**

Agency Name: Golden Field Office

Description: The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Wind and Water Power Technology Office, a Funding Opportunity Announcement (FOA) titled "Wind Energy – Eagle Impact Minimization Technologies and Field Testing Opportunities". This FOA aims to advance the technical readiness of eagle detection, classification, and impact minimization technologies in order to 1) expand the scientific basis of and number of technical options available for further development and testing (Topic Areas 1 & 2), and 2) support the field testing and evaluation of near-commercial technologies (Topic Area 3), which, if successful, will provide wind plant owner-operators with viable and cost effective tools to reduce eagle impact risks and ease regulatory hurdles. The complete Notice of Intent can be viewed on the EERE Exchange website - <https://eere-exchange.energy.gov> This is a Notice of Intent only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different from the FOA described herein, or EERE may not issue a FOA at all. NO APPLICATIONS WILL BE ACCEPTED THROUGH THIS NOI. Please do not submit questions or respond to this NOI. Prospective applicants to the FOA should begin developing partnerships, formulating ideas, and gathering data in anticipation of the issuance of this FOA. It is anticipated that this FOA will be posted to the EERE Exchange website in the near term.

Link to Additional Information: <https://eere-exchange.energy.gov/Default.aspx?FoalIda233533c-0875-4adb-b264-9de0500586ff>

Grantor Contact Information: If you have difficulty accessing the full announcement electronically, please contact:  
 Andrew Simmons EERE-ExchangeSupport@hq.doe.gov  
 EERE-ExchangeSupport@hq.doe.gov

**Figure 6 View grant opportunity page of GRANTS.GOV**

After a thorough review of funding opportunities, the “best fit” opportunity is picked up, and added to the opportunity list in the form of a spreadsheet. A comparison is made between each funding opportunity and initially developed funding plan (e.g. the amount of funding and critical dates) to decide which one will be responded to. Meanwhile, notes on comments or conclusions of each funding opportunity can be taken for future reference.

Grant applications can be submitted directly through *GRANTS.GOV* after the *Apply for Grants* link under the *Applicants* tab on the homepage (Figure 2) has been reviewed and the registration process has been completed. Note that registration must be finished before any grant application packages can be uploaded.

A complete application process includes preparing to apply for grants; accessing active grant application packages; downloading, completing, and submitting grant application packages online through the e-grant system portal; and tracking the status of an application submitted via *GRANTS.GOV*.

#### **4.2.2 FEBBIZOPPS.GOV**

A second federal site, *FEBBIZOPPS.GOV* (<https://www.fbo.gov/>), also provides a comprehensive listing of RFPs for larger research projects and initiatives, and for a range of other services and goods by investigators. It is the single government point-of-entry for federal government procurement opportunities over \$25,000. Most research opportunities listed in *FEBBIZOPPS.GOV* are also listed at *GRANTS.GOV*. In particular, DOE is most likely to post opportunities announcements in *FEBBIZOPPS.GOV*.

Browsing funding opportunities on *FEBBIZOPPS.GOV* is similar to *GRANTS.GOV*. It provides more search criteria (**Figure 7**), for instance, *posted date*, *set-aside code*, *place of performance*, *type*, *keyword/solicitation #* and *agency*. Additional search criteria (e.g. *NAICS code*) and multiple selections are available through *advanced search*. *Set-aside code* is the designator for the type of set aside determined for the contract action. A “set-aside for small business” means an acquisition exclusively for participation by small business. A small business set-aside may be open to all small businesses. A small business set-aside of a single acquisition or a class of acquisitions may be in entirety or in part. The set-aside code of a business helps identify special traits the business has to the government.[3] More information can be found at <https://www.fbo.gov/index?static=faqs&s=getstart&mode=list&tab=list&tabmode=list#q3a-13>.



**Figure 7 Homepage of FEBBIZOPPS.GOV**

### 4.2.3 Federal Register

*Federal Register* (<https://www.federalregister.gov/>) is published by the Office of the Federal Register, National Archives and Records Administration (NARA). It is developed to make it easier for American citizens and communities to understand the regulatory process and to participate in Government decision-making. The homepage of *Federal Register* is shown in **Figure 8**. Any Notice of Funding Opportunity (NOFO) that is published in *Federal Register* will also be posted in *GRANTS.GOV*. DOE typically publishes its grant announcements in *Federal Register* in addition to *GRANTS.GOV*.



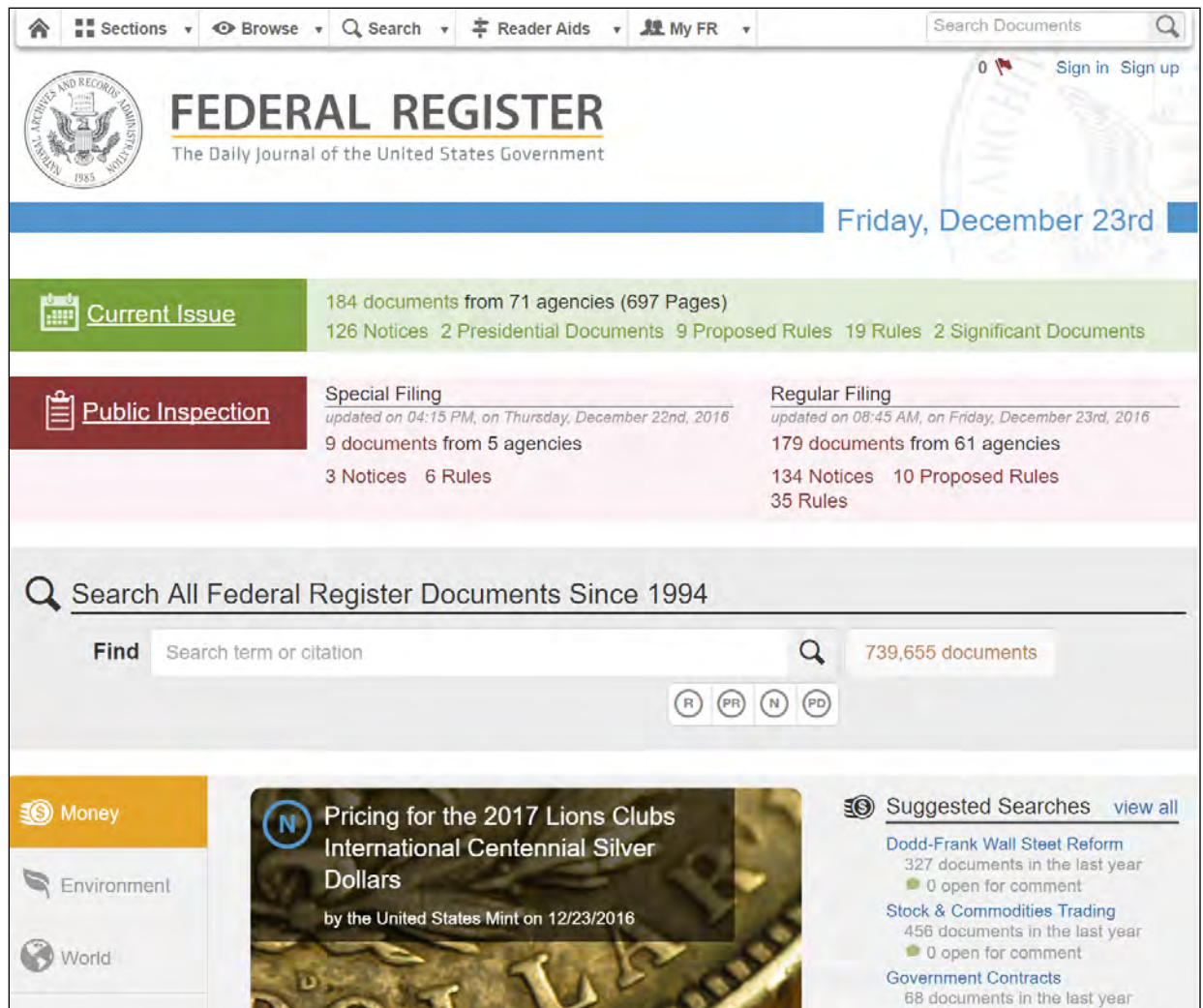


Figure 8 Homepage of Federal Register

#### 4.2.4 Other all-in-one databases for public sectors

*FederalGrants* (<http://www.federalgrants.com/>), *GrantSelect* (<http://www.grantselect.com/>) and *GrantForward* (<https://www.grantforward.com/index>) are non-government grant search engines. They function in the same way as *GRANTS.GOV* and search tips and procedures may refer to those of *GRANTS.GOV*.

*FederalGrants* contains nearly 50,000 U.S. grants from 2004 to 2016 and provides free federal grant search. Access to the *GrantSelect* database, however, is only available to paid subscribers and their users. The Grant Research Team at *GrantSelect* compiles information on grant programs from sponsors located both in the U.S. and other parts of the world. Records are updated daily, ensuring grant information is

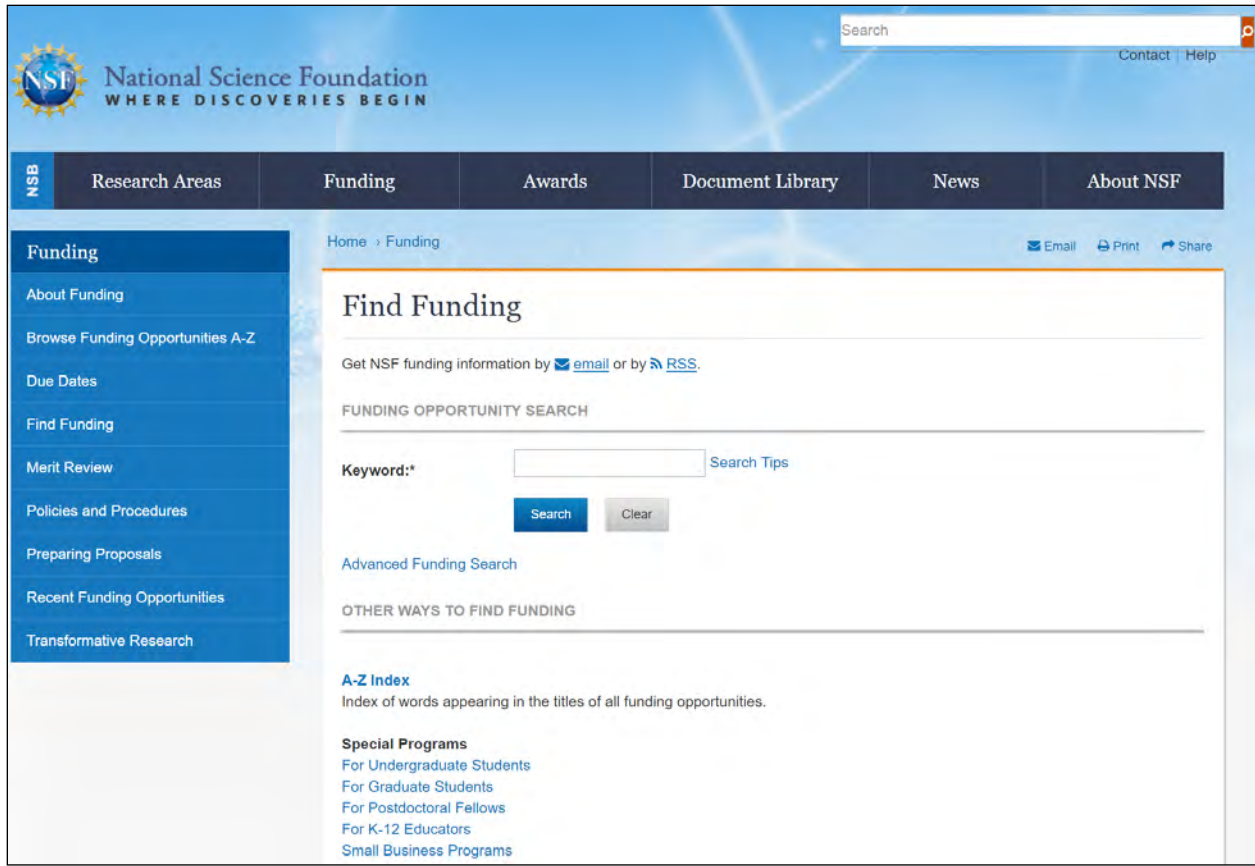
timely and relevant. Sponsoring organizations include federal government agencies, foundations and other nonprofit organizations, corporations and corporate foundations, research institutes, state agencies, and universities. Like *GrantSelect*, *GrantForward* is only available through paid online subscription. It gathers thousands of grant opportunities from over 9,000 U.S. sponsors. Every grant opportunity is thoroughly analyzed and then verified by their team of specialists to ensure accuracy. Based on users' research interests, publications, and other profile information, the best-fitting grant opportunities are delivered to subscribed users through *GrantForward*'s recommendation services.

#### **4.2.5 Federal agency's own sponsored research portal**

Most federal agencies maintain their own sponsored research web portals which list sponsored competitions, provide guidelines and documentation, and often offer their own email alert services. In the near future, federal agencies will be transferring many of their funding opportunity listings and application procedures to *GRANTS.GOV*. However, researchers seeking funding from NSF or the National Institutes of Health (NIH) should continue to use those agencies' own websites as well.

##### *4.2.5.1 NSF*

The homepage of *Find Funding* of NSF (<http://www.nsf.gov/funding/>) is shown in **Figure 9**. *Keyword search* is like *GRANTS.GOV*. Note that *search tips* (e.g. *words* and *operators*) might be different from website to website. Make sure to get familiarized with them before using. *Email alert* and *RSS subscription* are also available. On the left of the web page, other tabs might be useful and convenient, such as *A-Z index of funding opportunities*, *recent funding opportunities*, *upcoming due dates*, and so forth. There are also loads of information about *merit review* and *preparing proposals*.



**Figure 9 Find Funding page of NSF**

### 1) RESEARCH.GOV

*Research.gov* (<http://www.research.gov/>) is the NSF's grant management system that provides easy access to research-related information and grant management services in one location. **Figure 10** shows the homepage of *Research.gov*. It improves customer service for the research community by increasing access to information and services while streamlining and standardizing business processes among partner agencies. It is also a transparent source for information about federal research spending and outcomes for the general public. Services from *Research.gov* for grantees are *application submission web service*, *award cash management service (ACM\$)*, *notifications & requests*, *project reports*, *proposal status*, *public access and user management*. *Research.gov* is the modernization of *FastLane*, providing the next generation of grant management capabilities for the research community.

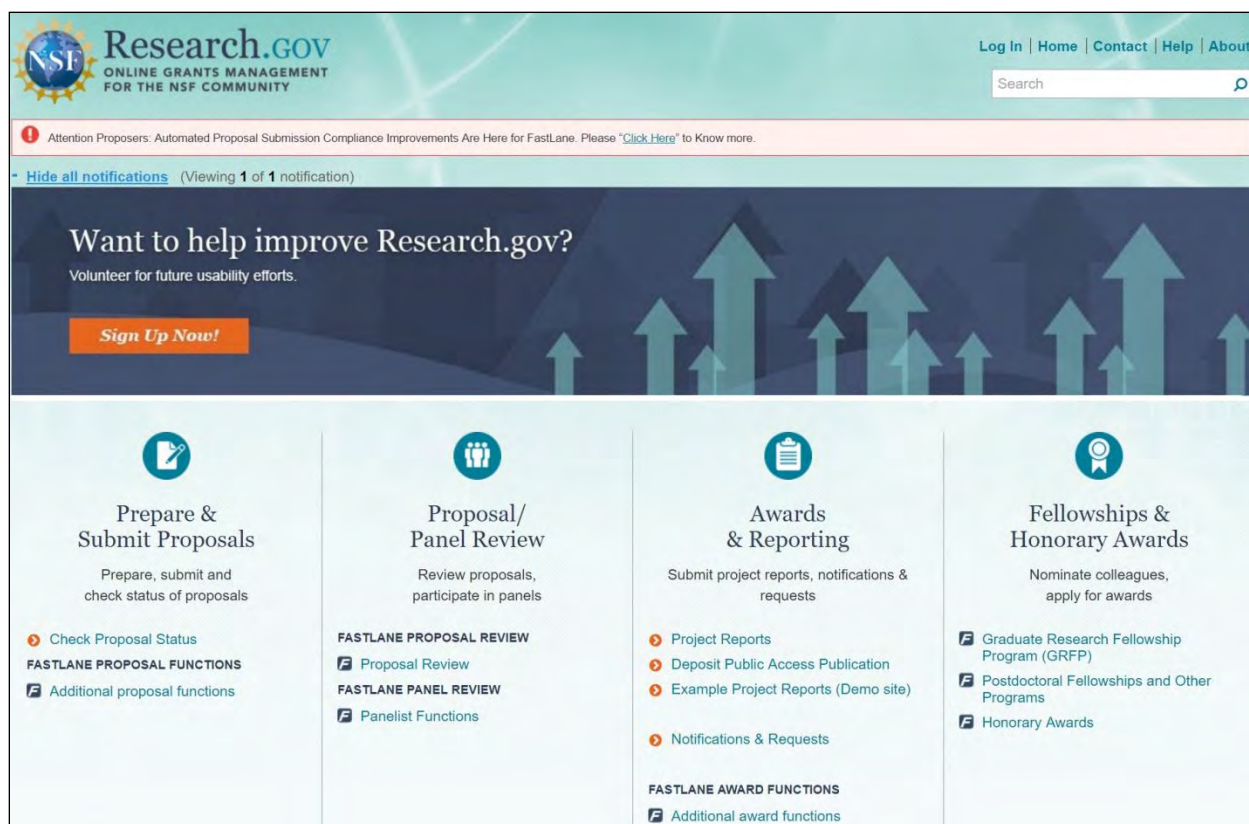


Figure 10 Homepage of Research.gov

## 2) FASTLANE

*FastLane* (<https://www.fastlane.nsf.gov/>) is NSF's online website through which they conduct their relationship to researchers and potential researchers, reviewers, and research administrators and their organizations. The *FastLane* modules include *proposals, awards, and status; proposal review; panelist functions; research administration; financial functions; honorary awards; graduate research fellowship program; postdoctoral fellowship and other programs*, as shown in **Figure 11**.

*FastLane* is used by over 250,000 scientists, educators, technology experts, and administrators, including the nation's top researchers. NSF has been recognized for *FastLane*'s exemplary performance. While NSF has achieved success with *FastLane*, the development of the system started in 1994 and is currently in need of modernization.

*Research.gov* is an opportunity to modernize and evolve NSF's grant management systems to increase the quality and scope of services for the research community. The modernization includes moving legacy *FastLane* capabilities to a new, modern portal platform.

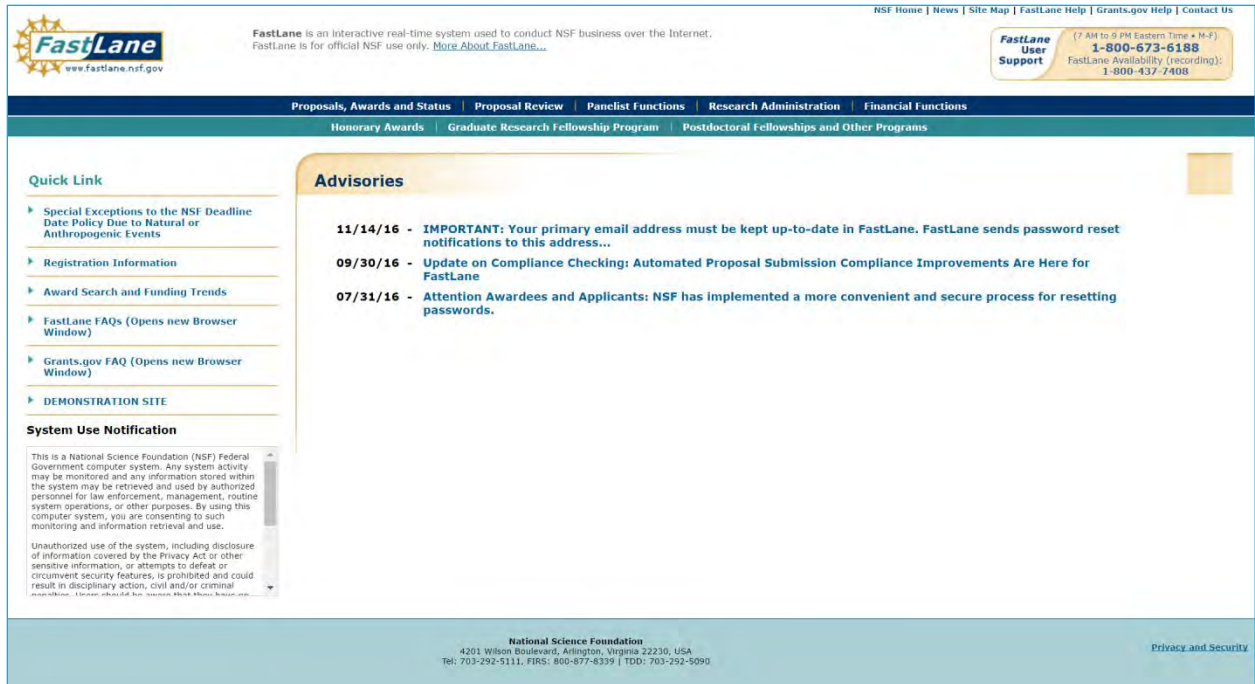


Figure 11 Homepage of FastLane

#### 4.2.5.2 U.S. DOT

Figure 12 presents the homepage of Grants under DOT (<https://www.transportation.gov/grants>). Popular in grants and grant announcements can be found on the lower part of the web page. There are also tons of information about regulations; research, statistics and technology; legislation; and current initiatives under *Our Activities* tab. By clicking on *Areas of Focus* tab, categorized resources by eligibility and subjects are accessible, together with some special topics.



**Figure 12 Homepage of Grants under DOT**

**1) Fixing America’s Surface Transportation Act (FAST Act)**

Some large, important and long-term projects have also been posted on their own websites. Tracking funding opportunities at those websites is effective and time-efficient. Funding information is sometimes posted even earlier than other public databases (e.g. *GRANTS.GOV*). For instance, **Figure 13** shows the homepage (<http://www.fhwa.dot.gov/fastact/>) of FAST Act from the Federal Highway Administration (FHWA), a division of DOT. Information about competitive grants and NOFO are listed at the *Funding* tab on the left of the web page. In-depth information can be viewed by selecting each opportunity title.



**Figure 13** Homepage of FAST Act under DOT/FHWA

#### 4.2.5.3 NASA

**Figure 14** gives the web page of research opportunities from NASA (<http://www.nasa.gov/about/research/index.html>). A wide variety of opportunities is offered by NASA offices and field centers for researchers. NASA also accept unsolicited proposals. More information about research opportunities can be explored by clicking on *Find out more* in blue. For example, *NASA solicitation and proposal integrated review and evaluation system (NSPIRES)* (**Figure 15**), provide information about past, open and future solicitations.

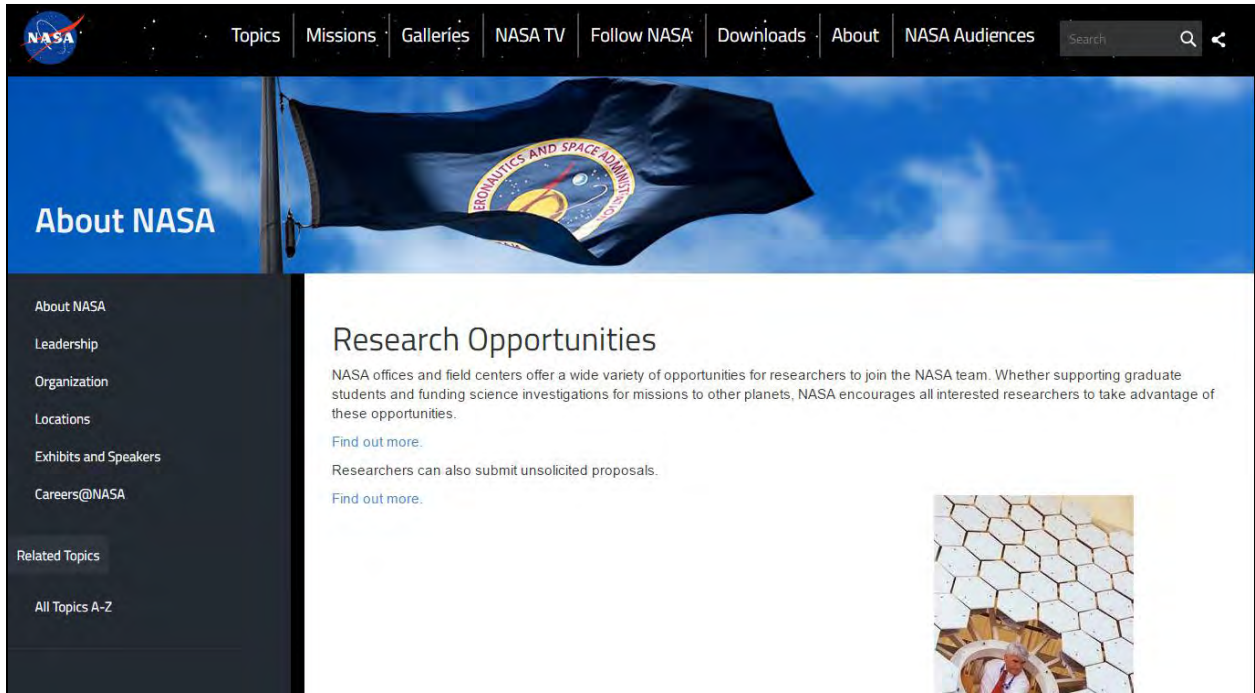


Figure 14 Information about research opportunities of NASA

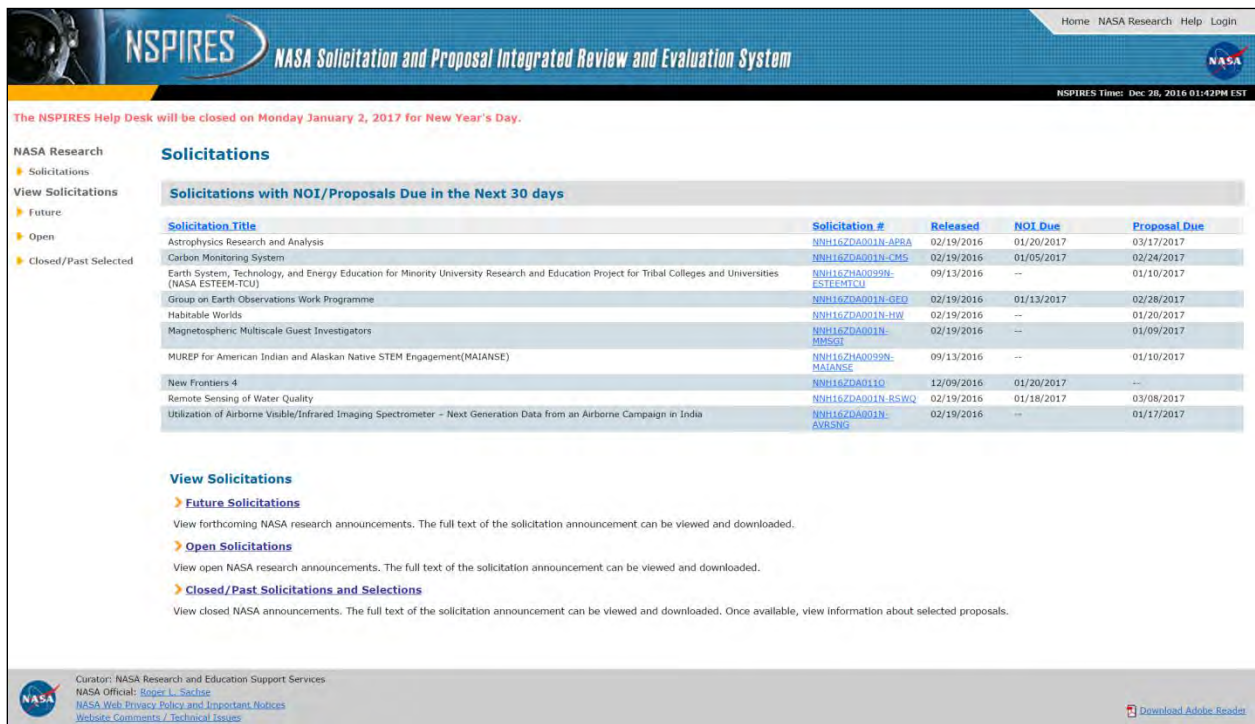
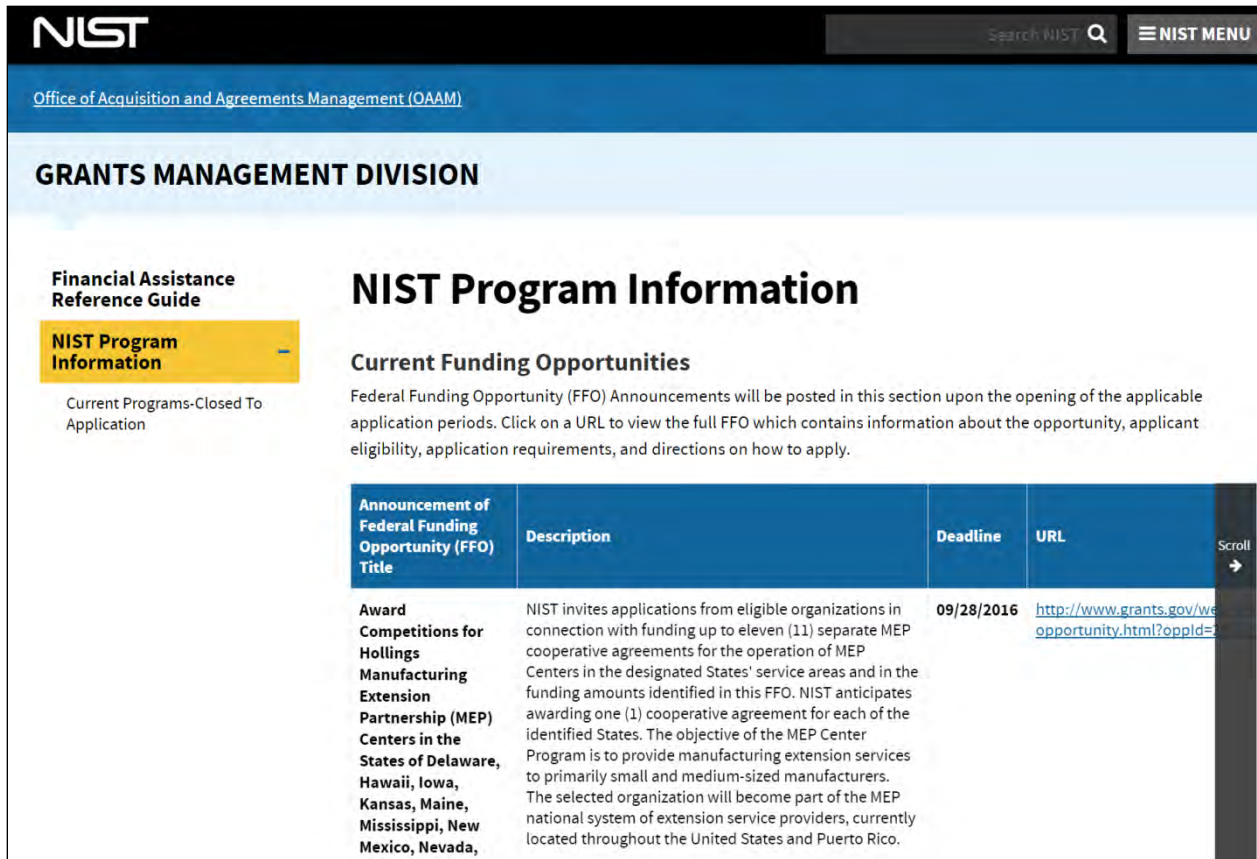


Figure 15 Web page of NSPIRES



#### 4.2.5.4 NIST

Program information from NIST can be accessed by the following link: <https://www2.nist.gov/about-nist/work-nist/funding-opportunities>. FFO announcements, description, deadline, and URL are provided for current funding opportunities, active or closed to application, as shown in Figure 16. The full FFO can be accessed by clicking on a URL.



The screenshot shows the NIST website's Grants Management Division page. At the top, there is a search bar and a 'NIST MENU' button. Below the header, the page is titled 'GRANTS MANAGEMENT DIVISION' and 'NIST Program Information'. A sidebar on the left contains a 'Financial Assistance Reference Guide' and a highlighted 'NIST Program Information' section with a sub-link for 'Current Programs-Closed To Application'. The main content area features a section for 'Current Funding Opportunities' with a brief description. Below this is a table with the following data:

Announcement of Federal Funding Opportunity (FFO) Title	Description	Deadline	URL
Award Competitions for Hollings Manufacturing Extension Partnership (MEP) Centers in the States of Delaware, Hawaii, Iowa, Kansas, Maine, Mississippi, New Mexico, Nevada,	NIST invites applications from eligible organizations in connection with funding up to eleven (11) separate MEP cooperative agreements for the operation of MEP Centers in the designated States' service areas and in the funding amounts identified in this FFO. NIST anticipates awarding one (1) cooperative agreement for each of the identified States. The objective of the MEP Center Program is to provide manufacturing extension services to primarily small and medium-sized manufacturers. The selected organization will become part of the MEP national system of extension service providers, currently located throughout the United States and Puerto Rico.	09/28/2016	<a href="http://www.grants.gov/web/opportunity.html?oppld=">http://www.grants.gov/web/opportunity.html?oppld=</a>

Figure 16 Web page of NIST program information

#### 4.2.5.5 DOE

Funding & financing from DOE can be reviewed at the homepage of their website address of <http://energy.gov/public-services/funding-financing>, as presented in Figure 17. DOE supports a number of grants, loans and financing programs for small businesses, companies, and state, local or tribal governments. Further information about featured funding & financing opportunities, resources for small businesses, funding at energy and unsolicited proposals can be accessed on the homepage.



**Figure 17 Homepage of DOE**

**1) The Advanced Research Projects Agency-Energy (ARPA-E)**

ARPA-E is one of DOE’s agencies. It advances high-potential, high-impact energy technologies that are too early for private-sector investment and empowers America’s energy researchers with funding, technical assistance, and market readiness. ARPA-E issues periodic FOAs, which are focused on overcoming specific technical barriers around a specific energy area. It also issues periodic OPEN FOAs to identify high-potential projects that address the full range of energy-related technologies, as well as funding solicitations aimed at supporting America’s small business innovators. ARPA-E funds technology-focused, applied research and development aimed at creating real-world solutions to important problems in energy creation, distribution, and use. Information on ARPA-E’s current FOAs and detailed information on the ARPA-E funding application process is available at ARPA-E *Funding Opportunity Exchange* system, as shown in **Figure 18**. Note that only applicants who have successfully

submitted a concept paper in *eXCHANGE* by the published deadline are eligible to submit a full application to a FOA. Concept paper and full application can only be submitted through *eXCHANGE*, and those submitted through *GRANTS.GOV* are not valid.

The screenshot shows the ARPA-E Funding Opportunity Exchange website. The main heading is "ARPA-E FUNDING OPPORTUNITY ANNOUNCEMENTS". Below this is a table with columns: FOA Number, FOA Title, Announcement Type, NOI Deadline, CP Deadline, and FA Deadline. The table lists several funding opportunities, including "INNOVATIVE DEVELOPMENT IN ENERGY-RELATED APPLIED SCIENCE (IDEAS)", "INTEGRATION AND OPTIMIZATION OF NOVEL ION CONDUCTING SOLIDS (IONICS)", and "RENEWABLE ENERGY TO FUELS THROUGH UTILIZATION OF ENERGY-DENSE LIQUIDS (REFUEL)".

FOA Number	FOA Title	Announcement Type	NOI Deadline	CP Deadline	FA Deadline
DE-FOA-0001428	INNOVATIVE DEVELOPMENT IN ENERGY-RELATED APPLIED SCIENCE (IDEAS)	Funding Opportunity Announcement (FOA)		9/30/2016 05:00 PM ET	TBD
DE-FOA-0001002	INNOVATIVE DEVELOPMENT IN ENERGY-RELATED APPLIED SCIENCE (IDEAS)	Funding Opportunity Announcement (FOA)		9/28/2015 05:00 PM ET	TBD
DE-FOA-0001478	INTEGRATION AND OPTIMIZATION OF NOVEL ION CONDUCTING SOLIDS (IONICS)	Funding Opportunity Announcement (FOA)		3/28/2016 05:00 PM ET	6/27/2016 05:00 PM ET
DE-FOA-0001562	RENEWABLE ENERGY TO FUELS THROUGH UTILIZATION OF ENERGY-DENSE LIQUIDS (REFUEL)	Funding Opportunity Announcement (FOA)		6/1/2016 05:00 PM ET	TBD
DE-FOA-0001563	RENEWABLE ENERGY TO FUELS THROUGH UTILIZATION OF ENERGY-DENSE LIQUIDS (REFUEL) - SBIR/STTR	Funding Opportunity Announcement (FOA)		6/1/2016 05:00 PM ET	TBD
DE-FOA-0001564	NEXT-GENERATION ENERGY TECHNOLOGIES FOR CONNECTED AND AUTOMATED ON-ROAD VEHICLES (NEXTCAR)	Funding Opportunity Announcement (FOA)		5/24/2016 05:00 PM ET	TBD
DE-FOA-0001565	RHIZOSPHERE OBSERVATIONS OPTIMIZING TERRESTRIAL SEQUESTRATION (ROOTS)	Funding Opportunity Announcement (FOA)		6/1/2016 05:00 PM ET	TBD
DE-FOA-0001566	ENERGY-EFFICIENT LIGHT-WAVE INTEGRATED TECHNOLOGY ENABLING NETWORKS THAT ENHANCE DATACENTERS (ENLITENED)	Funding Opportunity Announcement (FOA)		7/25/2016 05:00 PM ET	TBD
RFI-0000019	Announcement of Teaming Partner List for an upcoming Funding Opportunity Announcement: SOLID ION CONDUCTORS FOR ELECTROCHEMICAL ENERGY TECHNOLOGIES	Teaming Partner List			
RFI-0000020	Announcement of Teaming Partner List for an upcoming Funding Opportunity Announcement: PLANT ROOT PHENOTYPING FOR SOIL CARBON SEQUESTRATION	Teaming Partner List			
RFI-0000021	Announcement of Teaming Partner List for a potential Funding Opportunity Announcement	Teaming Partner List			

Figure 18 Web page of ARPA-E Funding Opportunity Exchange system

## 2) Office of Energy Efficiency & Renewable Energy (EERE)

The office of EERE is another one of DOE's agencies, providing information on financial opportunities for energy efficiency and renewable energy projects. The mission of EERE is to create and sustain American leadership in the transition to a global clean energy economy. Its vision is a strong and prosperous America powered by clean, affordable, and secure energy. All FOAs, both open and closed, are posted on two primary websites: *GRANTS.GOV* and *EERE Exchange system*. However, *GRANTS.GOV* does not accept application submissions. Figure 19 shows the homepage (<https://eere-exchange.energy.gov/>) of *EERE Exchange System*. It provides full FOA listings and manages application submissions. EERE can only consider applications submitted through *EERE Exchange System*.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy | EERE Home | Programs & Offices | Consumer Information

## EERE Funding Opportunity Exchange

Funding Opportunities

EERE » Financial Opportunities » Funding Opportunity Exchange Printable Version

**Frequently Asked Questions**  
Do you have questions specific to your FOA? Applicants are encouraged to review the [Question & Answer](#) tab of your FOA to see if your question has already been asked.

**Reminder to Applicants and Reviewers**  
You must [log in](#) to Exchange in order to view FOA notifications and status changes for your submissions.

**EERE FUNDING OPPORTUNITY ANNOUNCEMENTS**

Jump to a FOA:

FOA Number	FOA Title	Announcement Type	Program	LOI Deadline	CP Deadline	FA Deadline
<a href="#">BTOLHR0001719</a>	<a href="#">Buildings Technology Office Lab Merit Review FY17-FY19</a>	Lab Call (LC)	Buildings	2/16/2016 05:00 PM ET		3/7/2016 05:00 PM ET
<a href="#">DE-FOA-0001001</a>	<a href="#">EERE Commercialisation</a>	Request for Information (RFI)	Strategic Programs			TBD
<a href="#">DE-FOA-0001070</a>	<a href="#">RFI - Net Benefits and Costs of Distributed Solar Energy and Innovative Solar Deployment Models</a>	Request for Information (RFI)	Solar			TBD
<a href="#">DE-FOA-0001122</a>	<a href="#">RFI - Clean Energy Manufacturing Topics Suitable for Establishment of a Manufacturing Institute</a>	Request for Information (RFI)	Advanced Manufacturing (Industrial)			TBD
<a href="#">DE-FOA-0001126</a>	<a href="#">SUNSHOT CATALYST PRIZE</a>	Other	Solar			TBD
<a href="#">DE-FOA-0001133</a>	<a href="#">RFI - Research and Development Needs and Technical Barriers for Fuel Cells</a>	Request for Information (RFI)	Hydrogen and Fuel Cells			TBD
			Advanced			

Figure 19 Web page of EERE Funding Opportunity Exchange system

### 3) SunShot Initiative

SunShot Initiative, funded by the office of EERE, supports cooperative research, development, demonstration, and deployment projects by private companies, universities, state and local governments, non-profit organizations, and national laboratories to drive down the cost of solar electricity. It is comprised of five subprograms: photovoltaics, concentrating solar power, systems integration, soft costs and technology to market. The homepage (<http://energy.gov/eere/sunshot/sunshot-initiative>) of SunShot Initiative funding opportunities is shown in **Figure 20**. It lists information about open funding opportunities, requests for information, closed funding opportunities and other funding opportunities. The full FOA can be viewed by clicking on the funding opportunity title.

**ENERGY.GOV**  
Office of Energy Efficiency & Renewable Energy

Search Energy.gov

SERVICES EFFICIENCY RENEWABLES TRANSPORTATION ABOUT US OFFICES >

Home » Funding Opportunities

## FUNDING OPPORTUNITIES

**SunShot Home**  
[About the SunShot Initiative](#)  
[Concentrating Solar Power](#)  
[Photovoltaics](#)  
[Systems Integration](#)  
[Soft Costs](#)  
[Technology to Market](#)  
[Projects Map](#)  
[Success Stories](#)  
**Funding Opportunities**  
[Information Resources](#)  
[News](#)  
[Contact Us](#)

To accomplish the goals of the SunShot Initiative, the U.S. Department of Energy Solar Energy Technologies Office supports funding opportunities on photovoltaics, concentrating solar power, systems integration, technology to market, and soft costs projects. Following an open, competitive solicitation process, these funding opportunities encourage collaborative partnerships among industry, universities, national laboratories, federal, state, and local governments and non-government agencies and advocacy groups. Solicitations may include financial or technical assistance.

To receive notice of new funding opportunities from SunShot, please subscribe to our [email newsletter mailing list](#).

**STAY UPDATED**  
Sign up for our [e-newsletter](#). Submit your email address below.

**SUBSCRIBE**

### OPEN FUNDING OPPORTUNITIES

- [Funding Opportunity Announcement: Solar Forecasting 2](#) - Concept papers due December 30, 2016
- [Funding Opportunity Announcement: Small Business Innovation Research and Small Business Technology Transfer \(SBIR/STTR\) - 2017 Phase 1, Release 2](#) - Applications due February 7, 2017
- [Funding Opportunity Announcement: Technology to Market 3 \(Incubator 12, SolarMat 5\)](#) - Applications due February 21, 2017
- [Funding Opportunity Announcement: Photovoltaics Research and Development 2: Modules and Systems \(PVRD2\)](#) - Applications due March 3, 2017
- [Prize Competition: Solar in Your Community Challenge](#) - Applications due March 17, 2017

### REQUESTS FOR INFORMATION

- [Request for Information: Catalyst Energy Innovation Prize to Empower Top Entrepreneurs](#) - Responses due January 15, 2017

**Figure 20 Funding opportunities page of SunShot Initiative**

## 4.3 Databases for private sectors

### 4.3.1 Foundation Center

*Foundation Center* (<http://foundationcenter.org/>) provides comprehensive information about funders (foundations or corporations) and funding sources. The homepage of *Foundation Center* is shown in **Figure 21**. Two main sources from *Foundation Center* to look for funding opportunities are *Foundation Directory Online (FDO)* and *Philanthropy - RFP*, which will be illustrated in *Sections 4.3.1.1* and *4.3.1.2*, respectively.

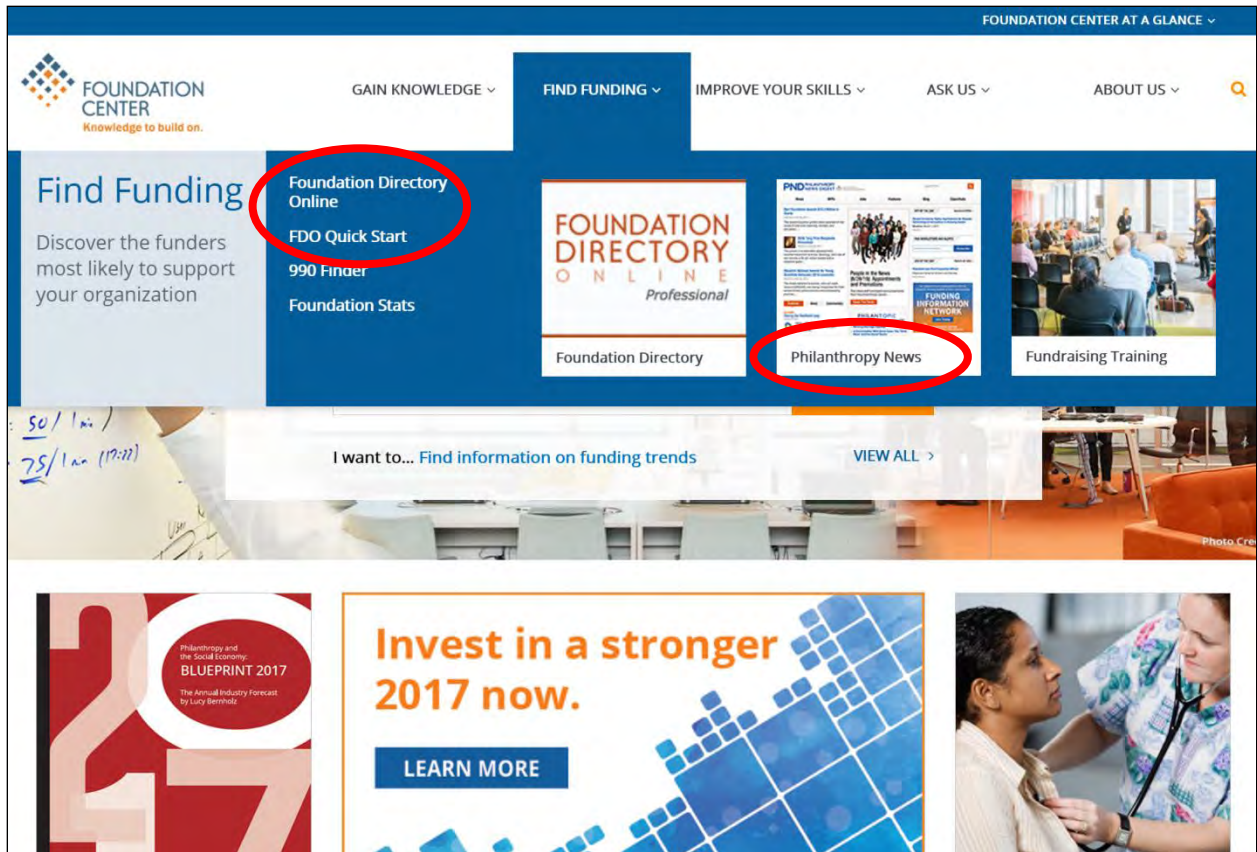


Figure 21 Homepage of Foundation Center

#### 4.3.1.1 FDO

*FDO Quick Start* (Figure 22) is free for public access to essential information about over 100,000 foundations and over 250,000 IRS Forms 990-PF. Profiles of funders include address and contact information, fields of interest, program areas, fiscal information, and so on.

**FOUNDATION DIRECTORY ONLINE**  
Quick Start

Search Grantmakers   Search Grants   Search Companies   Search 990s   Pathways   Power Search

Q Search Form   Search Results

**Your Search**

Grantmaker Location:  
United States

**Filter Your Results**

★ Favorites Only

Add Keyword

+

**Grantmakers**

**COUNTRY**  
[Prev 10 | Next 10]  
 United States (103353)

**STATE/PROVINCE**  
[Prev 10 | Next 10]  
 New York (11575)  
 California (9903)  
 Pennsylvania (7306)  
 Florida (6355)  
 Illinois (5991)  
 Texas (5878)  
 Ohio (4194)  
 North Carolina (3927)  
 Massachusetts (2538)

Results: 1-100 of 103353

★ Grantmaker Name	City, State / Country	Total Assets	Total Giving ↕ ⓘ
★ Gates Foundation, Bill & Melinda	Seattle, WA	\$44,320,862,806	\$3,439,671,894
★ Abbvie Patient Assistance Foundation, The	North Chicago, IL	\$52,915,068	\$853,356,401
★ Silicon Valley Community Foundation	Mountain View, CA	\$7,306,552,000	\$821,119,000
★ Johnson & Johnson Patient Assistance Foundation, Inc.	New Brunswick, NJ	\$83,399,810	\$711,632,110
★ Merck Patient Assistance Program, Inc.	Whitehouse Station, NJ	\$11,124,231	\$686,800,564
★ Genentech Access To Care Foundation	South San Francisco, CA	\$56,516,388	\$680,278,040
★ Bristol-Myers Squibb Patient Assistance Foundation, Inc., The	New York City, NY	\$35,233,726	\$643,161,255
★ GlaxoSmithKline Patient Access Programs Foundation	Philadelphia, PA	\$51,392,697	\$625,427,284
★ Sanofi Foundation for North America	Bridgewater, NJ	\$4,728,395	\$617,927,313
★ Ford Foundation	New York City, NY	\$12,513,640,379	\$524,470,533

**Figure 22 FDO Quick Start**

To help researchers to dig more into grantmakers and grant databases, *FDO* offers subscribed services of different levels (*FDO enterprise*, *FDO essential*, *FDO preferred* and *FDO professional*). Through subscribed services, more comprehensive information regarding more than 120,000 foundations and corporate donors, 3 million recent grants, and more than half a million key decision makers are accessible. With the aid of dozens of searchable fields, exact information about grants and grantmakers can be found quickly and easily.

*FDO professional* (Figure 23) is the most exhaustive and up-to-date knowledge and insight on the social sector to fuel any fundraising mission and provides expanded, in-depth profiles of each grantmaker plus inside looks at the grants they've actually made. It supports 54 search fields including *keyword search*,

"MyFDO" to manage saved searches, funder application information, and more. It can also provide a tool to map and chart 10 years of grant information.

The screenshot shows the 'FOUNDATION DIRECTORY ONLINE Professional' website. The header includes navigation links: HOME, HELP, FEEDBACK, LOGOUT, and CHAT NOW. Below the header, there are search filters: 'Power Search', 'Search Grantmakers', 'Search Companies', 'Search Grants', and 'Search 990s'. The main content area displays search results for 'Grantmaker Location: United States', showing 1-100 of 118,976 results. The results are presented in a table with columns: Add to Workspace, Grantmaker Name, City, State / Country, Total Assets, and Total Giving. The table lists four grantmakers: President and Fellows of Harvard Corporation, Gates Foundation, Bill & Melinda, Kaiser Foundation Hospitals, and Hughes Medical Institute, Howard.

Add to Workspace	Grantmaker Name	City, State / Country	Total Assets	Total Giving
<input type="checkbox"/>	President and Fellows of Harvard Corporation	Cambridge, MA	\$72,763,619,000	\$651,074,543
<input type="checkbox"/>	Gates Foundation, Bill & Melinda	Seattle, WA	\$44,320,862,806	\$3,439,671,894
<input type="checkbox"/>	Kaiser Foundation Hospitals	Oakland, CA	\$39,709,611,780	\$138,464,888
<input type="checkbox"/>	Hughes Medical Institute, Howard	Chevy Chase, MD	\$21,693,736,000	\$85,000,000

Figure 23 Web page of FDO professional

#### 4.3.1.2 Philanthropy - RFP

RFPs and notices of awards are published by *Philanthropy News Digest* as a free service. Viewing the opportunities by subjects or searching by keywords are available, as shown in **Figure 24**. Information about foundation title, description, deadline and the link to a complete RFP is provided.



The screenshot shows the PND Philanthropy News Digest website. At the top, there is a navigation menu with links for News, RFPs, Jobs, Features, Blog, and Classifieds. A search bar is located in the top right corner. Below the navigation, the page is titled 'RFPs' and includes a brief description of the service. A sidebar on the right contains a 'PND NEWSLETTERS AND ALERTS' section with a 'Subscribe' button, and a 'SEARCH RFPs' section with 'Subject' and 'Keyword' search fields. The main content area lists several RFPs, including 'RISD Museum Accepting Applications for Artist Fellowship' and 'Shubert Foundation Accepting Applications for Performing Arts Grants'. A red circle highlights the search fields in the sidebar.

Figure 24 Web page of Philanthropy - RFP

#### 4.4 Other possible search engines

There are also other websites that possess a complete funding search, such as *SPIN: Sponsored Programs Information Network* (<https://spin.infoedglobal.com/Authorize/Login>), *Pivot* (<http://pivot.cos.com/home/index>), *\*Research Professional* (<http://info.researchprofessional.com/>) and *Google* (<https://www.google.com/>). Except *Google*, the other three search engines require paid subscriptions to their services.

*SPIN* is one of the world's largest funding opportunities databases. It is a product of and is maintained by InfoEd Global. *SPIN* award types include grants and fellowships from federal, private, and non-profit sponsors. Opportunity descriptions are provided directly by the sponsors. It features for one-time searching and automated matching to more than 40,000 opportunities sourced from more than 10,000 sponsors across the globe. It supports basic, advanced, or keyword-based searches. Users can perform ad hoc searches or subscribe to receive automated e-mail messages of opportunities, based on user-selected

keywords and other parameters. Notices of new opportunities are sent shortly after being announced by sponsors. Ongoing programs are announced annually.

*Pivot* claims it hosts an estimated \$44 billion worth of grants, fellowships, awards, and more, accessed by more than 3 million scholars worldwide. It has access to the most comprehensive source of global funding opportunities; researcher expertise identification from within or outside of one's organization; searching for a funding opportunity that is directly linked to matched faculty from inside or outside their institution; adding internal deadlines to critical funding opportunities and sending weekly updates on saved searches; sending alerts to users whenever new matching opportunities are posted that match their saved searches; creating groups for sharing on-going funding opportunities; enhancing communication, monitoring, and tracking amongst individual faculty, teams, or researchers and the Research Development office.

*\*Research Professional* manages a database of funding opportunities covering all disciplines that have been chosen by leading universities for its coverage, accuracy, relevance and reliability. It has national data sets covering Australia, Canada, Denmark, Finland, Ireland, the Netherlands, New Zealand, Nigeria, South Africa, Sweden and the United Kingdom and also goes down to the regional level. On top of this, it has a European data set that covers all Pan-European funding, both from the European Commission and other funders. *\*Research Professional* also provides *news service*, reporting on new directions in research funding every step of the way as they trickle down from governments to research councils to programs and final calls for proposal. *Funding insight service*, aiding in decision making and glances at past winners, and *personalization service* are also available.

On top of all those search engines, *Google* is another powerful and free tool worth mentioning. By typing a related topic plus grant or funding (e.g. *renewable energy grant*) in search bar, a large number of hits will appear. Note that it is better to look at search tips (e.g. search operators) before performing any funding searches since they may be different from other websites.

## **5 Evaluating Proposal Responsiveness-Red Team Review**

### **5.1 General guidelines**

Crafting a winning proposal begins with a systems view of the scope of request for proposals. Investigators must create a skeleton of required elements, along with process notes on format and submission requirements. Funding agencies are seeing a dramatic increase in the number of submissions as resources shrink. This has led to stronger compliance checks at the front-end of the review and many more rejections for issues other than lack of technical merit.

The completeness of the proposal is an essential first step. The proposal should include named sections that cover all key components. Moreover, format requirements should be confirmed for each section.

## **5.2 Intellectual merit**

The technical approach of the proposal needs to fit the requested scope of work outlined in the proposal. Although the methods and approach are rarely proscribed, reviewers expect that the proposed work will fit the needs of the project and that the work proposed will have strong intellectual merit based on current best practices and findings. Descriptions within the sections need to convey

1. State of the literature
2. Team Expertise
3. Relevant Experience
4. Proposed approach
5. Potential for transformative research

Reviewers will consider all of the above in their assessment of a proposal. Most will categorize their findings as either a strength or a weakness of the proposed scope of work and of the team.

## **5.3 Broader impacts**

Funding agencies are increasingly aware that research must be relevant and useful to society. As such, the importance of detailing the broader impacts of a proposed project cannot be stressed enough. Winning proposals will cover some the following key points:

1. Can the proposed work create systemic change?
2. How will the proposed work benefit society?
3. Will this broaden participation of any underrepresented groups in the workforce or communities?
4. How will the results of the work be disseminated?

Although proposals need not address all of these elements, teams should consider which of these will provide sources of greatest societal impact. Impact must be quantifiable on some levels to review well. Target numbers for outreach to underrepresented groups or access to services for underrepresented groups are one example of a type of quantifiable metric.

Reviewers need to see transfer mechanisms to assure that project results will be disseminated broadly. Research findings must be shared beyond the academic community in order to meet dissemination requirements for broader impacts. Workshops, outreach for students and educators from K-12, etc., are

examples of dissemination that are often considered a good fit. Considerations of novelty and impact should be addressed as part of the project narrative.

## **5.4 Red team basics**

Once a proposal draft is compiled, an independent review is a good mechanism to make sure that all requirements are met. These reviews, often called red teaming, should include internal stakeholders with relevant expertise to verify the efficacy of the intellectual merit and proposed scope of work. Team members should also include individuals with strong writing skills, especially logical flow and grammar. Finally, red teams should have at least one member with fine attention to detail. These team mates should be assigned compliance check responsibilities to assure that all required format elements and sections are well crafted in the proposal submission.

## **5.5 Red team exercise example**

Ideally, a red team should not be a member of the proposal team. In some cases, expertise may not exist outside of the submission group. If that exists, pull some members out of the writing team and hold them in reserve to provide a hybrid red team component.

A thorough red team exercise will take at least three days and should be built into the submission timeline. There are four stages of the red team exercise: requirements analysis, responsiveness review of proposed technical and broader impacts, discussion of strengths and weaknesses, and presentation of red team findings.

Red team results should be communicated both verbally and in writing to proposal teams. This allows for greater information exchange and will allow key concerns to be well-described to the submission team.

A summary of key steps is detailed below in items 1-9.

1. Carefully read the RFP before beginning the review.
2. Create an outline of required sections and elements.
3. Review the proposal draft using the proposal basics associated with compliance, intellectual merit and broader impacts.
4. Refer often to the RFP to map out requirements and identify missing elements or sections that are handled well.
5. Note strengths and weaknesses for both intellectual merit and broader impacts
6. Rate the proposal!
  - a. Excellent

- b. Very Good
  - c. Good
  - d. Fair
  - e. Poor
7. Discuss your findings with your team
  8. Select a scribe to make notes for your team.
  9. Create a summary of your collective findings
    - a. This may take some time if different opinions exist!
    - b. Decide collectively on a common rating
    - c. Fund or not? Why!!

## References

- [1] USDOT. Evaluation Considerations. Retrieved from [http://www.rita.dot.gov/publications/novel\\_surface\\_transportation\\_modes/part\\_two/evaluation](http://www.rita.dot.gov/publications/novel_surface_transportation_modes/part_two/evaluation)
- [2] GRANTS.GOV. Search tips. Retrieved from <http://www.grants.gov/search-tips.html>
- [3] Bidspeed. What is a set-aside code. Retrieved from : <http://www.fedbidspeed.com/set-aside/#sthash.hILGvIAI.2OTRDwvo.dpuf>

## Appendix A - Lists of RFP Opportunities

### A.1 RFP opportunities from FAST Act

Num.	Agency	Opp. Num.	Opp. Title	Posted Date	Deadline	Website
1	DOT/ FTA	FTA-2016-003-TPM	Low or No Emission Program	03/29/16	05/13/16	<a href="https://www.federalregister.gov/articles/2016/03/29/2016-07027/fy16-competitive-funding-opportunity-grants-for-buses-and-bus-facilities-and-low-or-no-emission">https://www.federalregister.gov/articles/2016/03/29/2016-07027/fy16-competitive-funding-opportunity-grants-for-buses-and-bus-facilities-and-low-or-no-emission</a>
2	DOT	NSFHP-16-FASTLANE16	FastLane Grants	03/15/16	04/14/16	<a href="https://www.transportation.gov/FASTLANEgrants">https://www.transportation.gov/FASTLANEgrants</a>
3	DOT/ FHWA	DTFH6116RA00012	Advanced Transportation and Congestion Management Technologies Deployment Initiative	03/22/16	06/03/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=282433">http://www.grants.gov/web/grants/view-opportunity.html?oppId=282433</a>
4	DOT/ FHWA	DTFH6116RA00013	Surface Transportation System Funding Alternatives	04/04/16	05/20/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=282434">http://www.grants.gov/web/grants/view-opportunity.html?oppId=282434</a>
5	DOT/ FHWA	2016-16875	Notice of Funding Opportunity for the Tribal Transportation Program Safety Funding	07/18/16	09/16/16	<a href="https://www.federalregister.gov/documents/2016/07/18/2016-16875/notice-of-funding-opportunity-for-the-tribal-transportation-program-safety-funding">https://www.federalregister.gov/documents/2016/07/18/2016-16875/notice-of-funding-opportunity-for-the-tribal-transportation-program-safety-funding</a>
6	DOT	NSFHP-17-FASTLANE17	FASTLANE Grants (Second Call)	11/14/16	12/15/16	<a href="https://www.transportation.gov/build-america/fastlane/fastlane-ii-notice-funding-opportunity">https://www.transportation.gov/build-america/fastlane/fastlane-ii-notice-funding-opportunity</a>

## A.2 RFP opportunities from SunShot Initiative

Num.	Agency	Opp. Num.	Opp. Title	Posted Date	Deadline	Website
1	DOE/GFO	DE-FOA-0001496	Solar Energy Evolution and Diffusion Studies II - State Energy Strategies (SEEDSII-SES)	02/05/16	05/02/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=281385">http://www.grants.gov/web/grants/view-opportunity.html?oppId=281385</a>
2	DOE/GFO	DE-FOA-0001495	ENabling Extreme Real-time Grid Integration of Solar Energy (ENERGISE)	05/02/16	6/17/16	<a href="https://energy.gov/eere/sunshot/funding-opportunity-announcement-enabling-extreme-real-time-grid-integration-solar">https://energy.gov/eere/sunshot/funding-opportunity-announcement-enabling-extreme-real-time-grid-integration-solar</a>
3	DOE/GFO	DE-FOA-0001649	Solar Forecasting II Funding Opportunity Announcement	11/14/16	03/24/17	<a href="https://energy.gov/eere/sunshot/funding-opportunity-announcement-solar-forecasting-2">https://energy.gov/eere/sunshot/funding-opportunity-announcement-solar-forecasting-2</a>
4	DOE/SC	DE-FOA-0001619	FY 2017 Phase I Release 2 SBIR/STTR	11/28/16	02/07/17	<a href="https://energy.gov/eere/sunshot/funding-opportunity-announcement-small-business-innovation-research-and-small-business">https://energy.gov/eere/sunshot/funding-opportunity-announcement-small-business-innovation-research-and-small-business</a>
5	DOE	DE-FOA-0001640	Technology to Market 3 (Incubator 12, Solarmat 5)	11/14/16	02/21/17	<a href="https://energy.gov/eere/sunshot/funding-opportunity-announcement-technology-market-3-incubator-12-solarmat-5">https://energy.gov/eere/sunshot/funding-opportunity-announcement-technology-market-3-incubator-12-solarmat-5</a>
6	DOE	DE-FOA-0001654	Photovoltaics Research and Development 2: Modules and Systems (PVRD2)	11/14/16	03/03/17	<a href="https://energy.gov/eere/sunshot/funding-opportunity-announcement-photovoltaics-research-and-development-2-modules-and">https://energy.gov/eere/sunshot/funding-opportunity-announcement-photovoltaics-research-and-development-2-modules-and</a>



### A.3 Other RFP opportunities

Num.	Agency	Opp. Num.	Opp. Title	Posted Date	Deadline	Website	Wish List Topic
1	NSF	PD-15-7644	Energy for Sustainability	07/24/15	10/20/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501026">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501026</a>	Energy on the Right of Way
2	DOE/GFO	DE-FOA-0001403	Cities Leading through Energy Analysis and Planning (Cities-LEAP)	04/06/16	06/23/16	<a href="https://eere-exchange.energy.gov/#FoaId624fc0da-a7e6-4bf6-b7ce-2228542b0013">https://eere-exchange.energy.gov/#FoaId624fc0da-a7e6-4bf6-b7ce-2228542b0013</a>	Energy on the Right of Way
3	DOI	EIC-2016	OIA Empowering Insular Communities Program	02/11/16	04/20/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=281476">http://www.grants.gov/web/grants/view-opportunity.html?oppId=281476</a>	Energy on the Right of Way
4	DOE/ARPA E	DE-FOA-0001562	REFUEL FOA	04/26/16	05/25/16	<a href="https://arpa-e-foa.energy.gov/#FoaId1f46538f-5fae-45c0-a12d-59cbe2e6992e">https://arpa-e-foa.energy.gov/#FoaId1f46538f-5fae-45c0-a12d-59cbe2e6992e</a>	Energy on the Right of Way
5	NSF	PD-13-7607	Energy, Power, Control and Networks	01/14/16	11/01/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13380">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13380</a>	Internet of Things
6	NSF	16-549	Cyber-Physical Systems	03/15/16	06/07/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503286</a>	Internet of Things
7	NSF	PD-13-7564	Communications, Circuits, and Sensing-Systems	03/15/16	11/01/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13381">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13381</a>	Internet of Things
8	DoD	W912HZ-16-BAA-01	2016 Broad Agency Announcement	01/29/16	01/31/17	<a href="https://www.fbo.gov/spg/USA/COE/329/W912HZ-16-BAA-01/listing.html">https://www.fbo.gov/spg/USA/COE/329/W912HZ-16-BAA-01/listing.html</a>	Internet of Things
9	NSF	PD-16-7607	Energy, Power, Control, and Networks	04/25/16	11/01/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505249">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505249</a>	Internet of Things
10	NSF	PD-16-7564	Communications, Circuits, and Sensing-Systems	04/27/16	11/01/16	<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505248">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505248</a>	Internet of Things
11	DOT	DTFH6116RA00002	Beyond Traffic: The Smart City Challenge	03/29/16	05/24/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=280384">http://www.grants.gov/web/grants/view-opportunity.html?oppId=280384</a>	Smart Highways
12	NIST	2016-NIST-RSCT-01	Replicable Smart City Technologies Cooperative Agreement Program	02/19/16	05/12/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=281680">http://www.grants.gov/web/grants/view-opportunity.html?oppId=281680</a>	Smart Highways
13	DOT/FRA	FR-STP-16-001	FY16 Surface Transportation Program (STP)	04/11/16	04/21/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=282918">http://www.grants.gov/web/grants/view-opportunity.html?oppId=282918</a>	Smart Highways

14	DOT/FTA	FTA-2016-006-TRI	Mobility on Demand (MOD) Sandbox Program	05/03/16	07/05/16	<a href="https://www.transit.dot.gov/funding/applying/notices-funding/mobility-demand-mod-sandbox-program">https://www.transit.dot.gov/funding/applying/notices-funding/mobility-demand-mod-sandbox-program</a>	Smart Highways
15	DOE/NETL	DE-FOA-0001535	Fiscal Year (FY) 2016 Vehicle Technologies Multi-Topic Funding Opportunity Announcement	06/06/16	08/29/16	<a href="https://eere-exchange.energy.gov/#FoaIdc2b9de5a-fedd-4fea-8a56-02d9c5d5d914">https://eere-exchange.energy.gov/#FoaIdc2b9de5a-fedd-4fea-8a56-02d9c5d5d914</a>	Smart Highways
16	PACENation (Property Assessed Clean Energy)	-	-	-	-	<a href="http://www.pacenation.us/resources/all-programs/">http://www.pacenation.us/resources/all-programs/</a>	LED Roadway Lighting
17	DOE/NETL	DE-FOA-0001558	Lighting Alternatives Maximizing Performance & Suitability (LAMPS)	04/21/16	05/06/16	<a href="https://eere-exchange.energy.gov/#FoaIda1ce1963-a1bf-491c-94a0-9dbbaa20da67">https://eere-exchange.energy.gov/#FoaIda1ce1963-a1bf-491c-94a0-9dbbaa20da67</a>	LED Roadway Lighting
18	DOE/GFO	DE-FOA-0001574	Assisting Federal Facilities with Energy Conservation Technologies 2016	05/26/16	07/27/16	<a href="https://eere-exchange.energy.gov/Default.aspx?Search=DE-FOA-0001574&amp;SearchType=#FoaIda389212b-f2dd-47b5-9c11-c2f2ee85bd4b">https://eere-exchange.energy.gov/Default.aspx?Search=DE-FOA-0001574&amp;SearchType=#FoaIda389212b-f2dd-47b5-9c11-c2f2ee85bd4b</a>	LED Roadway Lighting
19	DOT/FHWA	DTFH6116RA00010	Transportation Workforce Strategic Initiative	05/05/16	07/05/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=283592">http://www.grants.gov/web/grants/view-opportunity.html?oppId=283592</a>	Limited English Proficiency
20	DOE/ARPA E	DE-FOA-0001566	Energy-Efficient Light-Wave Integrated Technology Enabling Networks that Enhance Datacenters (ENLITENED)	06/10/16	07/25/16	<a href="https://arpa-e-foa.energy.gov/#FoaIdcfe0d27-67fb-471b-95a5-d12a840c154f">https://arpa-e-foa.energy.gov/#FoaIdcfe0d27-67fb-471b-95a5-d12a840c154f</a>	Performance Management
21	DOT	DTOS59-16-RA-TIGER8	FY 2016 National Infrastructure Investments	02/26/16	04/29/16	<a href="https://www.transportation.gov/tiger">https://www.transportation.gov/tiger</a>	Others
22	DOT/FTA	FTA-2016-005-TPE	Pilot Program for Transit-Oriented Development (TOD) Planning	04/15/16	06/13/16	<a href="https://www.transit.dot.gov/funding/applying/notices-funding/pilot-program-transit-oriented-development-tod-planning">https://www.transit.dot.gov/funding/applying/notices-funding/pilot-program-transit-oriented-development-tod-planning</a>	Others
23	DOT/FHWA	FHWA-2016-21063	AID Demonstration	09/08/16	09/30/20	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppId=288651">http://www.grants.gov/web/grants/view-opportunity.html?oppId=288651</a>	the Patent of Braking System

24	DOT/FTA	FTA-2016-007-TRI-SRD	Solicitation Of Project Proposals For The Safety Research And Demonstration (SRD) Program	08/12/16	10/14/16	<a href="https://www.transit.dot.gov/funding/applying/notices-funding/safety-research-and-demonstration-srd-program">https://www.transit.dot.gov/funding/applying/notices-funding/safety-research-and-demonstration-srd-program</a>	the Patent of Braking System
25	DOE/NETL	DE-FOA-0001613	Solid State Lighting Advanced Technology R&D 2017	10/12/16	01/10/17	<a href="https://eere-exchange.energy.gov/#FoaId68693dde-c993-459d-8763-d3020ab40f6e">https://eere-exchange.energy.gov/#FoaId68693dde-c993-459d-8763-d3020ab40f6e</a>	LED Roadway Lighting
26	NSF	PD-17-1464	Engineering and Systems Design	09/23/16	01/13/17	<a href="https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13340">https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13340</a>	Internet of Things
27	DOE/GFO	DE-FOA-0001667	Assisting Federal Facilities with Energy Conservation Technologies (AFFECT) 2017	11/22/16	01/30/17	<a href="https://eere-exchange.energy.gov/#FoaIdfceb174-96f4-4036-a35f-186208c92d37">https://eere-exchange.energy.gov/#FoaIdfceb174-96f4-4036-a35f-186208c92d37</a>	Energy on the Right of Way
28	DOT/FTA	FTA-2017-001-TRI	Zero Emission Research Opportunity (ZERO)	11/28/16	02/21/17	<a href="https://www.transit.dot.gov/funding/grants/grant-programs/zero-emission-research-opportunity-zero">https://www.transit.dot.gov/funding/grants/grant-programs/zero-emission-research-opportunity-zero</a>	Energy
29	DOE/GFO	DE-FOA-0001632	Buildings Energy Efficiency Frontiers & Innovation Technologies (BENEFIT) – 2017	11/30/16	03/08/17	<a href="https://eere-exchange.energy.gov/#FoaId8e546c7c-c277-4c71-aae3-f62e15a95aef">https://eere-exchange.energy.gov/#FoaId8e546c7c-c277-4c71-aae3-f62e15a95aef</a>	Energy; Lighting
30	DOE/NETL	DE-FOA-0001629	Fiscal Year 2017 Vehicle Technologies Program Wide Funding Opportunity Announcement	12/15/16	03/24/17	<a href="https://eere-exchange.energy.gov/#FoaIdf8cec87c-b6eb-4723-8ba0-9f57c48f071c">https://eere-exchange.energy.gov/#FoaIdf8cec87c-b6eb-4723-8ba0-9f57c48f071c</a>	Alternative transportation ideas

## Appendix B - PPT of First Workshop at MoDOT



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# Finding Funding Opportunities - First Workshop at MoDOT

Tiantian Li, Suzanna Long, and Genda Chen  
Missouri University of Science and Technology (Missouri S&T)  
Email: [gchen@mst.edu](mailto:gchen@mst.edu)

June 24, 2016; Jefferson City



# OUTLINE

- Introduction
- Objectives
  - Identify public and private sources of grant announcements
  - Conduct initial grant search using online directories
- Preparing for funding opportunity search
- Identifying potential funding sources
- Looking for grant opportunities



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## INTRODUCTION

- Technology Readiness Level (TRL)

TRL	Description	To achieve the given TRL, you must answer yes to Every question. Discuss any uncertain answers
Basic Research	1 Basic principles and research	<ul style="list-style-type: none"> <li>*Do basic scientific principles support the concept?</li> <li>*Has the technology development methodology or approach been developed?</li> </ul>
	2 Application formulated	<ul style="list-style-type: none"> <li>*Are potential system applications identified?</li> <li>*Are system components and the user interface at least partly described?</li> <li>*Do preliminary analyses or experiments confirm that the application might meet the user need?</li> </ul>
	3 Proof of concept	<ul style="list-style-type: none"> <li>*Are system performance metrics established?</li> <li>*Is system feasibility fully established?</li> <li>*Do experiments or modeling and simulation validate performance predictions of system capability?</li> <li>*Does the technology address a need or introduce an innovation in the field of transportation?</li> </ul>
Applied Research	4 Components validated in laboratory environment	<ul style="list-style-type: none"> <li>*Are end-user requirements documented?</li> <li>*Does a plausible draft integration plan exist, and is component compatibility demonstrated?</li> <li>*Were individual components successfully tested in a laboratory environment (i.e., a fully controlled test environment where a limited number of critical functions are tested)?</li> </ul>
	5 Integrated components demonstrated in a laboratory environment	<ul style="list-style-type: none"> <li>*Are external and internal system interfaces documented?</li> <li>*Are target and minimum operational requirements developed?</li> <li>*Is component integration demonstrated in a laboratory environment (i.e., a fully controlled setting)?</li> </ul>
Development	6 Prototype demonstrated in relevant environment	<ul style="list-style-type: none"> <li>*Is the operational environment fully known (i.e., user community, physical environment, and input data characteristics as appropriate)?</li> <li>*Was the prototype tested in a realistic environment outside of the laboratory (i.e., a relevant environment)?</li> <li>*Does the prototype satisfy all operational requirements when confronted with realistic problems?</li> </ul>
	7 Prototype demonstrated in relevant environment	<ul style="list-style-type: none"> <li>*Are available components representative of production components?</li> <li>*Is the fully integrated prototype demonstrated in an operational environment (i.e., real world conditions, including the user community)?</li> <li>*Are all interfaces tested individually under stressed and anomalous conditions?</li> </ul>
Implementation	8 Technology proven in operational environment	<ul style="list-style-type: none"> <li>*Are all system components form, fit, and function compatible with each other and with the operational environment?</li> <li>*Is the technology proven in an operational environment (i.e., does it meet target performance measures)?</li> <li>*Was a rigorous test and evaluation process completed successfully?</li> <li>*Does the technology meet its stated purpose and functionality as designed?</li> </ul>
Implementation	9 Technology refined and adopted	<ul style="list-style-type: none"> <li>*Is the technology deployed in its intended operational environment?</li> <li>*Is information about the technology disseminated to the user community?</li> <li>*Is the technology adopted by the user community?</li> </ul>

## PREPARING FOR FUNDING SEARCH

- **Identify search parameters**
  - What types of funding? Research vs. education, construction vs. design, etc.
  - How much?
  - When?
- **Set up search tools**
  - Wish list topics
  - Keywords
  - Spreadsheet to help organize funding opportunities
  - Records of search keywords and search history



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## PREPARING FOR FUNDING SEARCH

- **Wish list topics**

Road To Tomorrow	<ol style="list-style-type: none"><li>1) Energy production on the right of ways: a) Solar; b) Wind; c) Energy portfolio analysis.</li><li>2) Smart Highways: a) Pre-cast concrete with integrated sensors; b) Placement of EV Charging Stations.</li><li>3) Internet of things (IoT): a) Optimization of telecommunication infrastructure placement.</li><li>4) Alternative transportation ideas.</li></ol>
SW Becky	<ol style="list-style-type: none"><li>1) I-49, last 5 miles in Missouri, does not have enough rural funding match for TIGER and the new freight program.</li><li>2) Solar Roadways.</li></ol>



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# PREPARING FOR FUNDING SEARCH

- **Wish list topics**

MC Kelly & Scott	1) Any type of roadside electronic screening or data capture (will have to be careful here) .
	2) Cover weigh station facility-type things in general.
	3) Any available funding for truck parking including equipment like cameras or counters.
	4) HD mapping of roadways.
ECR Title VI Team	1) Grants to help fund LEP activities (limited English proficiency).



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# PREPARING FOR FUNDING SEARCH

- **Wish list topics**

TP Machelle	1) Planning.
	2) Data.
	3) Performance management.
Chris Rutledge	1) Life-Cycle Cost Effectiveness of Aluminum-Coated Corrugated Steel Pipe.
	2) Pavement Installation and Maintenance Strategies for Roadway Pavement with High-Swell Clay Subgrades.
	3) LED Roadway Lighting.
	4) Solar Powered Signals.



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## PREPARING FOR FUNDING SEARCH

- Spreadsheet used to help organize funding opportunities
  - Including funding agency, opportunity number/ title, posted/ close date, website, status, outcome, etc.
  - Status: writing scheduled, writing in progress, submitted, pending decision, etc.
  - Outcome: funded, rejected (close or try next year)

Number	Agency	Opportunity Number	Opportunity Title	Posted Date	Deadline	Website	Wish List Topic	Status	Outcome
1	NSF	PD-15-7644	Energy for Sustainability	July 24		<a href="http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501026">http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=501026</a>	Energy on the right of way		
2	DOE/ Golden Field Office	DE-FOA-0001403	Cities Leading through Energy Analysis and Planning (Cities-LEAP)	April 6		<a href="https://eere-exchange.energy.gov/#Foald624fc0da-a7e6-4bf6-b7ce-2228542b0013">https://eere-exchange.energy.gov/#Foald624fc0da-a7e6-4bf6-b7ce-2228542b0013</a>	Energy on the right of way		



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## IDENTIFYING POTENTIAL FUNDING SOURCES

- Two forms:
  - Generating an idea in response to a grant sponsor's request
  - Finding a grant sponsor to fund the grant seeker's idea
- Types of funding sources
  - Public sectors
    - ✓ Federal, state, local government
    - ✓ 26 Federal Agencies
  - Private sectors
    - ✓ Foundations (second-largest source)
    - ✓ Direct corporations or philanthropists



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## IDENTIFYING POTENTIAL FUNDING SOURCES

- **Types of funding mechanisms**
  - **Grant**
    - ✓ *The principal purpose is the transfer of funds to recipients to carry out a public purpose (research).*
  - **Cooperative agreement**
    - ✓ *Similar to a grant, but substantial programmatic involvement of sponsor is anticipated.*
  - **Procurement contract**
    - ✓ *The principal purpose is to provide prescribed service or “good” for direct benefit or use of sponsor.*
  - **Others for financial assistance**



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## IDENTIFYING POTENTIAL FUNDING SOURCES

- **Common abbreviations used during funding search:**
  - **FOA: funding opportunity announcement**
  - **FFO: federal funding opportunity (or announcement)**
  - **RFP: request for proposals**
  - **RFA: request for applications**
  - **RFI: request for Information**
  - **NOFO: notice of funding opportunity**
  - **NOI: Notice of Intent to publish FOA**
  - **Notice: information about FOA**



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# LOOKING FOR GRANT INFORMATION

- Formal grant announcements & solicitations
- Printing directories
- **LISTSERVs & newsletters**
- **On-line directories**

- **Public sources**

- ✓ *Grants.gov*



- ✓ *FedBizOpps.gov*



- ✓ *Others: Federal grants, Grant Select, Grant Forward, ...*

- **Private sources**

- ✓ *Foundation center*

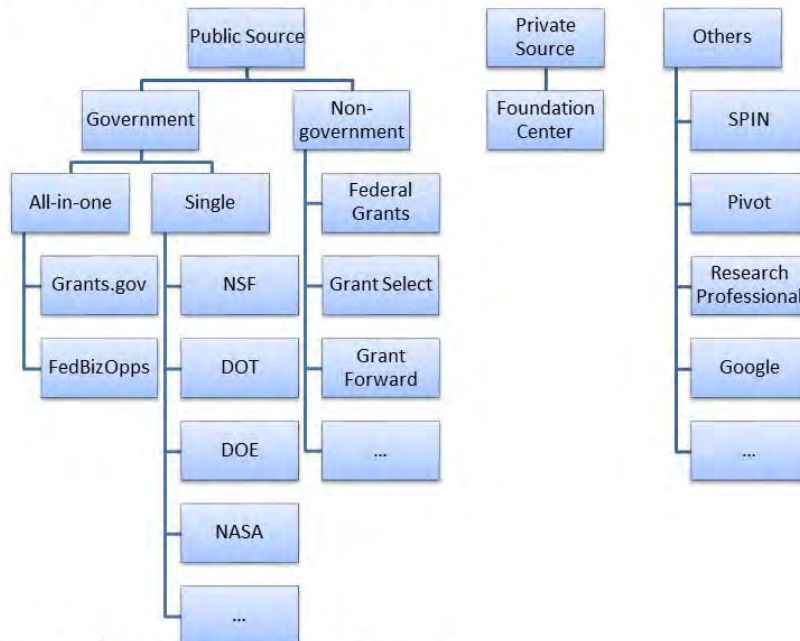


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## OVERVIEW OF FUNDING OPPORTUNITIES



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## GRANTS.GOV: SEARCH TIPS

- **Keyword search: words + operators**

Operator	Description	Example
" "	Exact phrase	"renewable energy"
OR or	Default conjunction operator where either word or both words exist in the search results	renewable energy This searches for opportunities that contain renewable, energy, or both.
AND or &&	Default combination operator where both words exist in the search results.	Ex. 1: space AND flight Ex. 2: "renewable energy" AND solar



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## GRANTS.GOV: SEARCH TIPS

- **Keyword search: words + operators**

Operator	Description	Example
NOT or !	Exclude opportunities that contain the word after this operator.	energy NOT bioenergy
+	Require that the word or exact phrase after the operator exists.	smart +highway

**Note: AND, OR, and NOT must be in ALL CAPS otherwise they are interpreted as search words.**



**No need to be too specific!**



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# OVERVIEW OF FUNDING OPPORTUNITIES

- First hands-on exercise



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## GRANTS.GOV

E-mail/RSS subscription

The screenshot shows the Grants.gov homepage. At the top, there are navigation links: HOME, LEARN GRANTS, **SEARCH GRANTS**, APPLICANTS, GRANTORS, SYSTEM-TO-SYSTEM, FORMS, OUTREACH, and SUPPORT. A search bar is located at the top right with the text "SEARCH: Grant Opportunities" and "Enter Keyword." Below the navigation, there are sections for "New Grants.gov Community Blog", "Find Grant Opportunities" (with sub-links: BROWSE NEWEST, BROWSE CATEGORIES, BROWSE AGENCIES, BROWSE ELIGIBILITIES), and "Browse opportunities". A table of grant opportunities is displayed, listing Opportunity Number, Opportunity Title, Agency, and Opportunity Status.

Opportunity Number	Opportunity Title	Agency	Opportunity Status
RFA-388-16-000006	Social and Behavior Change Communication (SBCC) Activity	USAID-BAN	Posted
16-571	Partnerships for International Research and Education	NSF	Posted
16-572	Cooperative Studies Of The Earth's Deep Interior	NSF	Posted
RFA-NS-16-024	Planning Grant for NINDS Morris K. Udall Parkinson's Disease Research Center Without Walls (R34)	HHS-NIH11	Posted
L16AS00204	BLM CO Northwest District Hazardous Fuels and Forest Management Activities	DOI-BLM	Posted
NPS-DOIP16AC00823	Trail Stabilization at Wrangell-St. Elias National Park & Preserve	DOI-NPS	Posted
NPS-DOIP16AC00822	Conservation Crew for Trail Stabilization at Wrangell-St. Elias National Park & Preserve	DOI-NPS	Posted



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# GRANTS.GOV: FULL SEARCH

The screenshot shows the Grants.gov search results for the keyword 'renewable energy'. The search criteria are: Keyword(s): renewable energy, Opportunity Number: (empty), CFDA: (empty). The results are sorted by Relevance (Descending) and show 248 matching results. The table lists various opportunity numbers, titles, agencies, and dates.

Opportunity Number	Opportunity Title	Agency	Opportunity Status	Posted Date	Close Date
RDBCP-REAP-RES-EEI-2016	Renewable Energy Systems and Energy Efficiency Improvements Program	USDA-RBCS	Posted	10/13/2015	
C-NOFO-16-100	U.S.-South India Renewable Energy Innovation Challenge	DOS-IND	Posted	04/28/2016	08/28/2016
DE-FOA-0001520	Notice of Intent (NOI) Solar Energy Evolution and Diffusion Studies II - State Energy Strategies	DOE-GFO	Posted	01/27/2016	07/22/2016
PD-15-7644	Energy for Sustainability	NSF	Posted	07/24/2015	10/20/2016
DE-FOA-0001578	Modular Chemical Process Intensification Institute for Clean Energy Manufacturing	DOE-GFO	Posted	05/05/2016	08/17/2016
DE-FOA-0001574	Assisting Federal Facilities with Energy Conservation Technologies 2016	DOE-GFO	Posted	05/26/2016	07/27/2016
DE-FOA-0001422	NOI: Cities Leading through Energy Analysis and Planning (Cities-LEAP)	DOE-GFO	Posted	02/23/2016	
PD-16-7607	Energy, Power, Control, and Networks	NSF	Posted	04/25/2016	11/01/2016
DE-FOA-0001593	Notice of Intent to Issue Funding Opportunity Announcement Clean Energy Manufacturing Innovation Institute for Reducing Embodied-energy And Decreasing Emissions (REMADE) in Materials Manufacturing	DOE-GFO	Posted	05/13/2016	
DE-FOA-0001567	Remote Alaskan Communities Energy Efficiency Competition	DOE-GFO	Posted	06/05/2016	08/31/2016
DE-FOA-0001479	Notice of Technical Assistance for Remote Alaska Communities Energy Efficiency Competition	DOE-GFO	Posted	12/18/2015	
DE-FOA-0001573	Assisting Federal Facilities with Energy Conservation Technologies, Fiscal Year 2016	DOE-GFO	Posted	05/12/2016	
DE-FOA-0001577	Notice of Intent to Issue Funding Opportunity Announcement Modular Chemical Process Intensification Institute for Clean Energy Manufacturing	DOE-GFO	Posted	04/08/2016	
DE-FOA-0001587	Wind Energy - Eagle Impact Minimization Technologies and Field	DOE-GFO	Posted	05/04/2016	



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# GRANTS.GOV: NARROW THE SEARCH

The screenshot shows the same search results as above, but with several filters applied to narrow the search. The filters are: Opportunity Status: Posted (248); Funding Instrument Type: All Funding Instruments; Eligibility: All Eligibilities; Category: All Categories; Agency: All Agencies. The table shows the results after these filters are applied.

Opportunity Number	Opportunity Title	Agency	Opportunity Status	Posted Date	Close Date
RDBCP-REAP-RES-EEI-2016	Renewable Energy Systems and Energy Efficiency Improvements Program	USDA-RBCS	Posted	10/13/2015	
C-NOFO-16-100	U.S.-South India Renewable Energy Innovation Challenge	DOS-IND	Posted	04/28/2016	08/28/2016
DE-FOA-0001520	Notice of Intent (NOI) Solar Energy Evolution and Diffusion Studies II - State Energy Strategies	DOE-GFO	Posted	01/27/2016	07/22/2016
PD-15-7644	Energy for Sustainability	NSF	Posted	07/24/2015	10/20/2016
DE-FOA-0001578	Modular Chemical Process Intensification Institute for Clean Energy Manufacturing	DOE-GFO	Posted	05/05/2016	08/17/2016
DE-FOA-0001574	Assisting Federal Facilities with Energy Conservation Technologies 2016	DOE-GFO	Posted	05/26/2016	07/27/2016
DE-FOA-0001422	NOI: Cities Leading through Energy Analysis and Planning (Cities-LEAP)	DOE-GFO	Posted	02/23/2016	
PD-16-7607	Energy, Power, Control, and Networks	NSF	Posted	04/25/2016	11/01/2016
DE-FOA-0001593	Notice of Intent to Issue Funding Opportunity Announcement Clean Energy Manufacturing Innovation Institute for Reducing Embodied-energy And Decreasing Emissions (REMADE) in Materials Manufacturing	DOE-GFO	Posted	05/13/2016	
DE-FOA-0001567	Remote Alaskan Communities Energy Efficiency Competition	DOE-GFO	Posted	06/05/2016	08/31/2016
DE-FOA-0001479	Notice of Technical Assistance for Remote Alaska Communities Energy Efficiency Competition	DOE-GFO	Posted	12/18/2015	
DE-FOA-0001573	Assisting Federal Facilities with Energy Conservation Technologies, Fiscal Year 2016	DOE-GFO	Posted	05/12/2016	
DE-FOA-0001577	Notice of Intent to Issue Funding Opportunity Announcement Modular Chemical Process Intensification Institute for Clean Energy Manufacturing	DOE-GFO	Posted	04/08/2016	
DE-FOA-0001587	Wind Energy - Eagle Impact Minimization Technologies and Field	DOE-GFO	Posted	05/04/2016	

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# GRANTS.GOV: SORT THE SEARCH

**SEARCH GRANTS**

BASIC SEARCH CRITERIA:  
 Keyword(s):   
 Opportunity Number:   
 CFDA:

AGENCY: [X] All Department of Energy (DOE)

Sort BY: Relevance (Descending) **Update Sort** | DATE RANGE: All Available | **Update Date Range**

1 - 25 OF 4

Opportunity Number (Descending)	Opportunity Title (Ascending)	Agency (Ascending)	Opportunity Status	Posted Date	Close Date
DE-FOA-0001587	Wind Energy - Eagle Impact Minimization Technologies and Field Testing Opportunities	DOE-GFO	Posted	01/27/2016	07/22/2016
DE-FOA-0001422	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	05/05/2016	08/17/2016
DE-FOA-0001593	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	05/26/2016	07/27/2016
DE-FOA-0001462	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	02/23/2016	
DE-FOA-0001587	Wind Energy - Eagle Impact Minimization Technologies and Field Testing Opportunities	DOE-GFO	Posted	05/13/2016	
DE-FOA-0001462	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	08/31/2016	
DE-FOA-0001462	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	08/29/2016	
DE-FOA-0001462	Notice of Intent to Solicit Proposals for Energy Conservation Technologies 2016	DOE-GFO	Posted	12/18/2015	

**Sort BY:** Posted Date (Descending) **Update Sort**

- Opportunity Number (Ascending)
- Opportunity Number (Descending)
- Opportunity Title (Ascending)
- Opportunity Title (Descending)
- Agency (Ascending)
- Agency (Descending)
- Posted Date (Ascending)
- Posted Date (Descending)
- Close Date (Ascending)
- Close Date (Descending)

# GRANTS.GOV: VIEWING AN OPPORTUNITY

**VIEW GRANT OPPORTUNITY**

DE-FOA-0001587 **Opportunity Number**  
 Wind Energy - Eagle Impact Minimization Technologies and Field Testing Opportunities **Opportunity Title**  
 Department of Energy  
 Golden Field Office **Funding Agency**

SYNOPSIS | VERSION HISTORY | RELATED DOCUMENTS | PACKAGE

**General Information**

Document Type: Grants Notice | Version: Synopsis 1  
 Funding Opportunity Number: DE-FOA-0001587 | Posted Date: May 04, 2016  
 Funding Opportunity Title: Wind Energy - Eagle Impact Minimization Technologies and Field Testing Opportunities | Last Updated Date: May 04, 2016  
 Opportunity Category: Discretionary | Original Closing Date for Applications: This is a Notice of Intent  
 Opportunity Category Explanation: | Current Closing Date for Applications: This is a Notice of Intent  
 Funding Instrument Type: Cooperative Agreement | Archive Date: Aug 04, 2016  
 Category of Funding Activity: Energy | Estimated Total Program Funding: \$0  
 Category Explanation: | Award Ceiling: \$2  
 Expected Number of Awards: 0 | Award Floor: \$1  
 CFDA Number(s): 81.087 - Renewable Energy Research and Development

Cost Sharing or Matching Requirement: No

**Eligibility**

Eligible Applicants: Unrestricted (i.e., open to any type of entity above), subject to any clarification in text field entitled "Additional Information on Eligibility"  
 Additional Information on Eligibility:



# GRANTS.GOV: VIEWING AN OPPORTUNITY

**Additional Information**

Agency Name: Golden Field Office

Description: The Office of Energy Efficiency and Renewable Energy (EERE) intends to issue, on behalf of the Wind and Water Power Technology Office, a Funding Opportunity Announcement (FOA) titled "Wind Energy - Eagle Impact Minimization Technologies and Field Testing Opportunities". This FOA aims to advance the technical readiness of eagle detection, classification, and impact minimization technologies in order to 1) expand the scientific basis of and number of technical options available for further development and testing (Topic Areas 1 & 2), and 2) support the field testing and evaluation of near-commercial technologies (Topic Area 3), which, if successful, will provide wind plant owner/operators with viable and cost-effective tools to reduce eagle impact risks and ease regulatory hurdles. The complete Notice of Intent can be viewed on the EERE Exchange website - <https://eere-exchange.energy.gov>. This is a Notice of intent only. EERE may issue a FOA as described herein, may issue a FOA that is significantly different from the FOA described herein, or EERE may not issue a FOA at all. NO APPLICATIONS WILL BE ACCEPTED THROUGH THIS NOI. Please do not submit questions or respond to this NOI. Prospective applicants to the FOA should begin developing partnerships, formulating ideas, and gathering data in anticipation of the issuance of this FOA. It is anticipated that this FOA will be posted to the EERE Exchange website in the near term.

Link to Additional Information: <https://eere-exchange.energy.gov/Default.aspx?Foaid=2233533c-0875-4adb-b264-9d805605888>

Grantor Contact Information: If you have difficulty accessing the full announcement electronically, please contact  
Andrew Simmons: [EERE-ExchangeSupport@hq.doe.gov](mailto:EERE-ExchangeSupport@hq.doe.gov)  
[EERE-ExchangeSupport@hq.doe.gov](mailto:EERE-ExchangeSupport@hq.doe.gov)

- Find the “best fit” opportunity, and add it to the opportunity list in the form of spreadsheet



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## OTHER WEBSITES FOR GRANT SEARCH

- **FebBizOpps.gov**  
– <https://www.fbo.gov/> 
- **Federal grants**  
– <http://www.federalgrants.com/> 
- **Grant Select**  
– <http://www.grantselect.com/> 
- **Grant Forward**  
– <https://www.grantforward.com/index> 



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# FEDERAL AGENCIES' OWN SPONSORED RESEARCH PORTAL

- National Science Foundation (NSF)
  - <http://www.nsf.gov/funding/>



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MISSOURI  
S&T 24

# FEDERAL AGENCIES' OWN SPONSORED RESEARCH PORTAL

- U.S. Department of Transportation (DOT)
  - <https://www.transportation.gov/grants>



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MISSOURI  
S&T 25



# DOT → FAST Act

- <http://www.fhwa.dot.gov/fastact/>

FAST Act Home	Funding
Milestones	FAST Act Highway Authorizations
Summary	
Funding	• PDF - estfy20162010auth.pdf, 15 KB • Excel - estfy20162010auth.xlsx, 27 KB
Fact Sheets	
Legislation	Estimated Highway Apportionments under the FAST Act
Presentations	• PDF - estfy20162020apports.pdf, 148 KB • Excel - estfy20162020apports.xlsx, 81 KB
Guidance & Regulations	



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## FEDERAL AGENCIES' OWN SPONSORED RESEARCH PORTAL

- NASA Research Opportunities
  - <http://www.nasa.gov/about/research/index.html>

Research Opportunities

NASA offices and field centers offer a wide variety of opportunities for researchers to join the NASA team. Whether supporting graduate students and funding science investigations for missions to other planets, NASA encourages all interested researchers to take advantage of these opportunities.

Find out more

Researchers can also submit unsolicited proposals.

Find out more



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# FEDERAL AGENCIES' OWN SPONSORED RESEARCH PORTAL

- NIST Funding Opportunities

- <https://www2.nist.gov/about-nist/work-nist/funding-opportunities>



The screenshot shows the NIST website's 'OFFICE OF THE DIRECTOR' page. On the left is a navigation menu with 'Leadership', 'Committees and Boards', 'Speeches', and 'NIST Organizational Chart'. The main content area is titled 'NIST Program Information' and includes a 'Current Funding Opportunities' section. This section contains a table with columns for 'Announcement of Federal Funding Opportunity (FFO) Title', 'Description', 'Deadline', and 'URL'. One entry is visible: 'Embedding MEP in NNMI Institutes' with a deadline of '06/17/2016' and a URL starting with 'http://www.grants.gov/web/opportunity.html?oppid=263'. A 'Scroll' button is on the right side of the table.



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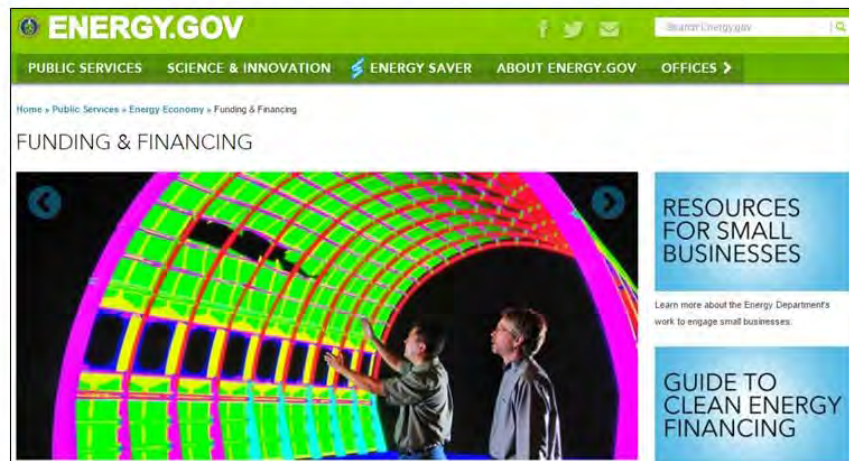


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# FEDERAL AGENCIES' OWN SPONSORED RESEARCH PORTAL

- Department Of Energy (DOE)

- <http://energy.gov/public-services/funding-financing>



The screenshot shows the Energy.gov website's 'FUNDING & FINANCING' page. The header includes 'ENERGY.GOV' and navigation links for 'PUBLIC SERVICES', 'SCIENCE & INNOVATION', 'ENERGY SAVER', 'ABOUT ENERGY.GOV', and 'OFFICES'. The main content area features a large image of two people interacting with a colorful, grid-like structure. To the right of the image are two blue boxes: 'RESOURCES FOR SMALL BUSINESSES' and 'GUIDE TO CLEAN ENERGY FINANCING'. Below the first box is a small text block: 'Learn more about the Energy Department's work to engage small businesses.'



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# DOE → FUNDING AT ENERGY

- ARPA-E Funding Opportunities

- <https://arpa-e-foa.energy.gov/>

FOA Number	FOA Title	Announcement Type	HSI Deadline	EP Deadline	FA Deadline
EE-FOA-2019-00008	INNOVATIVE DEVELOPMENT OF ENERGY STORAGE TECHNOLOGIES	Funding Opportunity Announcement (FOA)		9/30/2019 09:00 PM ET	TBD
EE-FOA-2019-00009	INNOVATIVE DEVELOPMENT OF ENERGY STORAGE TECHNOLOGIES	Funding Opportunity Announcement (FOA)		9/30/2019 09:00 PM ET	TBD
EE-FOA-2019-00010	INTEGRATION AND IMPLEMENTATION OF HYDROGEN TECHNOLOGIES	Funding Opportunity Announcement (FOA)		9/30/2019 09:00 PM ET	12/1/2019 09:00 PM ET
EE-FOA-2019-00011	RENEWABLE ENERGY TO FUEL TRANSPORTATION OF HEAVY-DUTY LOADS	Funding Opportunity Announcement (FOA)		9/1/2019 09:00 PM ET	TBD
EE-FOA-2019-00012	RENEWABLE ENERGY TO FUEL TRANSPORTATION OF HEAVY-DUTY LOADS	Funding Opportunity Announcement (FOA)		9/1/2019 09:00 PM ET	TBD
EE-FOA-2019-00013	RENEWABLE ENERGY TECHNOLOGIES CONNECTED AND AUTONOMOUS ENERGY SYSTEMS	Funding Opportunity Announcement (FOA)		9/24/2019 09:00 PM ET	TBD
EE-FOA-2019-00014	RENEWABLE ENERGY STORAGE TECHNOLOGIES TO ENHANCE TRANSPORTATION EFFICIENCY	Funding Opportunity Announcement (FOA)		9/1/2019 09:00 PM ET	TBD
EE-FOA-2019-00015	INTEGRATION AND IMPLEMENTATION OF HYDROGEN TECHNOLOGIES	Funding Opportunity Announcement (FOA)		9/30/2019 09:00 PM ET	TBD
EE-2019-00016	Announcement of 7 awards for the first year of an energy research opportunity	Training Further List			
EE-2019-00017	Announcement of 7 awards for the first year of an energy research opportunity	Training Further List			
EE-2019-00018	Announcement of 7 awards for the first year of an energy research opportunity	Training Further List			



# DOE → FUNDING AT ENERGY

- EERE Funding Opportunity Exchange

- <https://eere-exchange.energy.gov/>

FOA Number	FOA Title	Announcement Type	Program	LSI Deadline	EP Deadline	FA Deadline
EE-FOA-2017-00010	Buildings Technology Office (LIFE) Grant Review FY17-2018	Let-Gal (LC)	Buildings	2/16/2018 09:00 PM ET		5/7/2018 09:00 PM ET
EE-FOA-2018-00005	EERE Commercialization	Request for Information (RFI)	Strategic Programs			TBD
EE-FOA-2018-00006	EE - Net Benefits and Costs of Distributed Solar Storage and Dispatchable Low-Cost Generation	Request for Information (RFI)	Solar			TBD
EE-FOA-2018-00007	EE - Smart Grids and Energy Storage Technologies: Needs Analysis for Establishment of a Research Center	Request for Information (RFI)	Advanced Manufacturing (Including)			TBD
EE-FOA-2018-00008	TRANSFORMATIVE ENERGY	Other	Solar			TBD
EE-FOA-2018-00009	EE - Research and Development Needs and Technical Barriers to Fuel Cells	Request for Information (RFI)	Hydrogen and Fuel Cells			TBD



# DOE → FUNDING AT ENERGY

- **SUNSHOT Initiative**

- <http://energy.gov/eere/sunshot/sunshot-initiative>



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# FOUNDATION CENTER → FDO



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# FOUNDATION CENTER → RFP



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## RFPs

*Philanthropy News Digest publishes RFPs and notices of awards as a free service for grant-making organizations and nonprofits. To have your RFP considered for publication, please email [pndrfp@foundationcenter.org](mailto:pndrfp@foundationcenter.org) with a Word document, text-only file, or link to a Web site explaining the program scope, grantee qualifications, application instructions, and deadlines. We require notice of funding opportunities five weeks in advance of their deadlines.*

**New RFPs**

**ARTS / CULTURE**

**RISD Museum Accepting Applications for Artist Fellowship**  
POSTED: JUNE 20, 2016  
 DEADLINE: AUGUST 15, 2016

Two artists will receive stipends of \$10,000 each, professional development support, and the opportunity to work closely with the museum's collections and staff...

**Shubert Foundation Accepting Applications for Performing Arts Grants**  
POSTED: JUNE 18, 2016  
 VARIOUS

The foundation awards unrestricted to grants professional resident theater and dance companies, arts-related organizations that help support the development of theater and dance, and graduate drama departments at private universities...

**CHILDREN / YOUTH**

**ORIX Foundation Launches New Community Improvement Grant Program**

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**SEARCH RFPs**

Subject

Keyword

**UPCOMING DEADLINES**

**Dammann Fund Accepting Applications From Mental Health, Teen Pregnancy Organizations**  
HEALTH  
 Deadline: June 30, 2016

**Children's Leukemia Research Association Seeks Applications for Research Projects**  
MEDICAL RESEARCH  
 Deadline: June 30, 2016

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## OTHER POSSIBLE SEARCH ENGINES

- **SPIN: Sponsored Programs Information Network**

**SPIN** World's Largest Database of Sponsored Funding Opportunities

– <https://spin.infoedglobal.com/Authorize/Login>

- **Pivot**



– <http://pivot.cos.com/home/index>

- **Research Professional**

**\*Research Professional**

– <http://info.researchprofessional.com/>

- **Google**



– Topic + grant or funding (e.g. renewable energy grant)

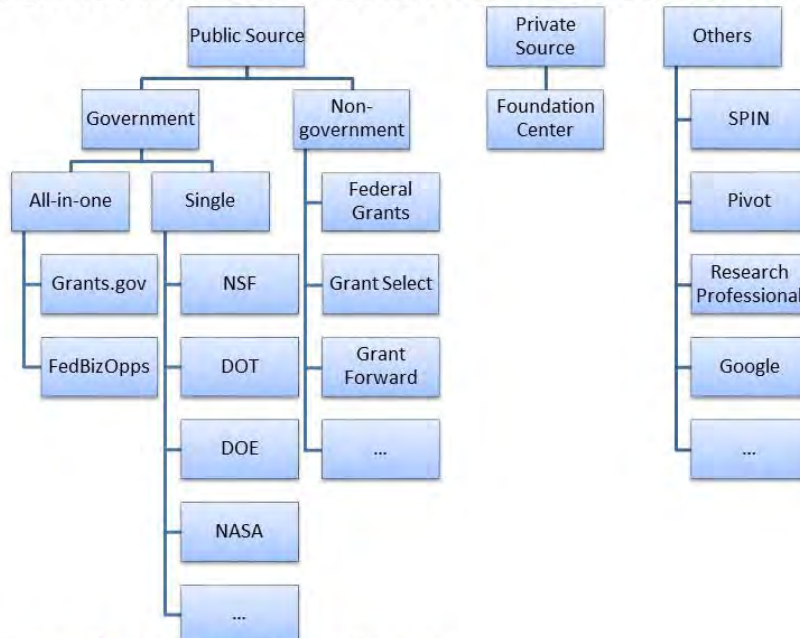


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## SUMMARY ON FUNDING INFORMATION



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# SUMMARY ON FUNDING INFORMATION

- Second hands-on exercise



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## SPECIFIC RFP OPPORTUNITIES

- FAST Act

3	DOT/Federal Transit Administration	FTA-2016-003-TPM	Low or No Emission Program	03/29/16 05/13/16	<a href="https://www.federalregister.gov/articles/2016/03/29/2016-07027/fy16-competitive-funding-opportunity-grants-for-buses-and-bus-facilities-and-low-or-no-emission">https://www.federalregister.gov/articles/2016/03/29/2016-07027/fy16-competitive-funding-opportunity-grants-for-buses-and-bus-facilities-and-low-or-no-emission</a>	Energy on the Right of Way - related to FAST Act
14	DOT	NSFHP-16-FASTLANE16	FastLane Grants	03/15/16 04/14/16	<a href="https://www.transportation.gov/FASTLANEgrants">https://www.transportation.gov/FASTLANEgrants</a>	Smart Highways - Related to FAST Act
15	DOT/Federal Highway Administration	DTFH6116RA00012	Advanced Transportation and Congestion Management Technologies Deployment Initiative	03/22/16 06/03/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppld=282433">http://www.grants.gov/web/grants/view-opportunity.html?oppld=282433</a>	Smart Highways - Related to FAST Act
27	DOT/Federal Highway Administration	DTFH6116RA00013	Surface Transportation System Funding Alternatives	04/04/16 05/20/16	<a href="http://www.grants.gov/web/grants/view-opportunity.html?oppld=282434">http://www.grants.gov/web/grants/view-opportunity.html?oppld=282434</a>	27



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# SPECIFIC RFP OPPORTUNITIES

- SunShot

	DOE/ 5 Golden Field Office	Solar Energy Evolution and Diffusion Studies II - State Energy Strategies (SEEDSII- SES)	02/05/ 2016	CP 3/8/ 2016	<a href="https://eere-exchange.energy.gov/">https://eere- exchange.energy.gov/</a>	Energy on the Right of Way - Solar/Related to SunShot
	DOE/ 7 Golden Field Office	ENabling Extreme Real-time Grid Integration of Solar Energy (ENERGISE)	05/02/ 2016	6/17/ 2016	<a href="https://eere-exchange.energy.gov/#Foald736ccdfb-d65d-49bb-9156-8ce9788802a7">https://eere- exchange.energy.gov/#Fo ald736ccdfb-d65d-49bb- 9156-8ce9788802a7</a>	Energy on the Right of Way - Solar/Related to SunShot



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Thank you!

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## Appendix C - PPT of Second Workshop at MoDOT

# Proposal Preparation

– Case Study with USDOT Opportunity

Presented by  
Genda Chen\*, Susanna Long, and Tiantian Li  
Missouri University of Science and Technology  
\* Email: [gchen@mst.edu](mailto:gchen@mst.edu)

MoDOT Research Proposal Writing Workshop  
July 22, 2016

# Smart Rocks and Wireless Communication Systems for Real-Time Monitoring and Mitigation of Bridge Scour

Research Proposal Team:  
Genda Chen\*, David Pommerenke, Rosa Y. Zheng, and David Hoffman

\* Principal Investigator  
Professor of Civil Engineering  
Department of Civil, Architectural, and Environmental Engineering  
Missouri University of Science and Technology  
Associate Director of Mid-America Transportation Center

## Outline of This Presentation

- The Proposed Technology
- Research Tasks and Work Plan
- Project Budget and Timeline
- Concluding Remarks

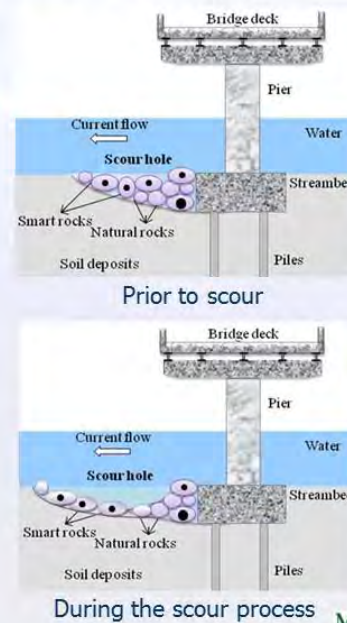


No. 3



# The Proposed Technology

- The proposed technology involves passive and/or active sensors (e.g. roll and tilt) embedded in rocks or reinforced concrete blocks and magneto-inductive or acoustic communications for a real-time engineering evaluation and prediction of bridge scour on a GIS platform.
- Together with natural rocks, smart rocks are not only distributed around a bridge foundation for scour mitigation but also represent the process of bridge scour as they are washed away.



No. 4



## Research Tasks and Work Plan

- Task 1: Real-Time Scour Monitoring with Passive Smart Rocks
  - 1.1 Optimal passive smart rocks
    - Smart rocks – passive sensors (e.g. magnets) embedded in rocks that can be directly read from a magnetometer above water
  - 1.2 Interference compensation and rock localization
    - Interference from surrounding metals
    - Localization of rocks in group (maybe individually)



No. 5



# Research Tasks and Work Plan

- Subtask 1.1: Optimal Passive Smart Rocks
  - Feasibility study
    - Strength of induced field distortion =  $\sim 1$  pT per 1kg metal at 30 m away (for reference)
    - Increase by permanent magnet = 10~100 times
    - Increase by hollow object = 2~3 times for a given weight
    - Increase by long object = 2 times
    - Preliminary tests in an open field on campus



No. 6



# Research Tasks and Work Plan

- Subtask 1.1: Optimal Passive Smart Rocks
  - Feasibility study
    - Strength of field disturbance as a magnetometer G858 moved from Point A to B (7.6 m apart) and then returned to Point A while a 1.5-cm long #8 steel reinforcing bar was fixed at one point each test

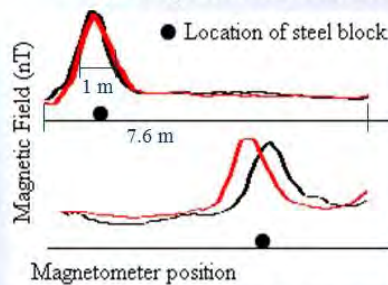


Fig. 2 Position Response Function

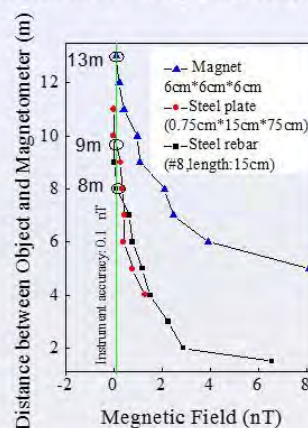


Fig. 3 Strength-Distance Curve



No. 7



# Research Tasks and Work Plan

- Subtask 1.1: Optimal Passive Smart Rocks
  - Research opportunity
    - Optimize the size, shape, and type of objects or magnets embedded in smart rocks and experimentally validate smart rocks for maximum measurement distance



Fig. 4 Design of Steel Dodecahedron

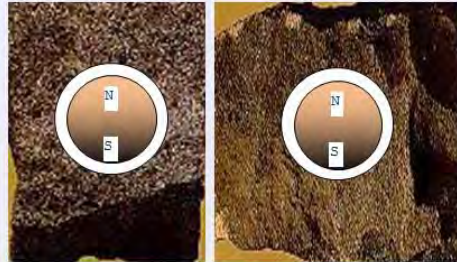


Fig. 5 Vertically Aligned Magnets in Passive Rocks (epoxy cured within 30 minutes of installation)



No. 8



# Research Tasks and Work Plan

- Subtask 1.2: Interference Compensation and Rock Localization
  - Interference and compensation
    - Unknown metal parts in river. Their effect can be discriminated by either tracking the movement of metal parts as they pass by a bridge or understanding the characteristic difference between the unknown metals and the designed magnets/objects in rocks.
    - Steel rebar in bridge piers. Their effect can be removed by subtracting the reading at the beginning of a flood event from any measurements since bridges are basically rigid and fixed except for negligible elastic deformation.
    - Slow change of the Earth's magnetic field, if any, during a flood event can be compensated by periodically taking several measurements of a reference metal object, e.g., rebar in a bridge abutment.



No. 9



# Research Tasks and Work Plan

- Subtask 1.2: Interference Compensation and Rock Localization
  - Research opportunity – repeatable measurements from a known location over time
    - GPS installation on a magnetometer (<0.1 m accuracy)
    - A modular, portable platform with guided rails (1 cm accuracy, e.g. 5m×5m wood floor) can facilitate the tracking of a “measurement” route. More importantly, it can provide an outrigger platform for a magnetometer to stay outside the bridge deck for minimum interference from steel reinforcement in bridge structures.



No. 10

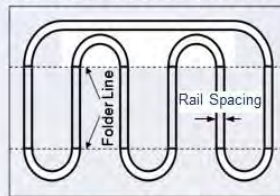
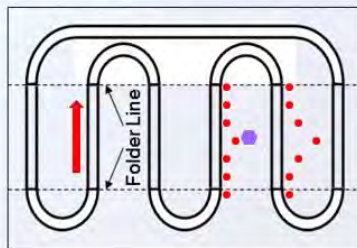


Fig. 6 Wood Guided Rails

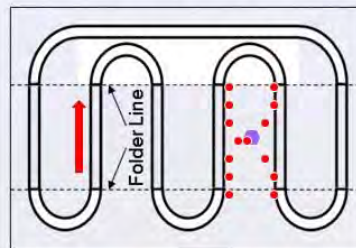


# Research Tasks and Work Plan

- Subtask 1.2: Interference Compensation and Rock Localization
  - Research opportunity – rock group localization
    - Each run of a magnetometer gives a magnetic field strength and a transverse change rate of strength.
    - Measurements from two locations can potentially give the location of a rock or a rock group with a significantly larger magnet.



Magnetic Field Strength (magnitude only)



Transverse Change Rate of Strength (sign difference)



No. 11



# Research Tasks and Work Plan

- Task 2: Real-Time Scour Monitoring with Active Smart Rocks
  - 2.1 Active smart rocks
    - Controllable permanent magnet
    - Equipped with active sensors such as timers, 3-axis accelerometers and mini 3-axis magnetometers
  - 2.2 Magneto-inductive and acoustic comm.
    - a. Magneto-inductive communications
    - b. Acoustic communications
    - c. Comparison and integration of two communications
  - 2.3 Localization of active smart rocks
    - a. Magneto-inductive transmission
    - b. Acoustic transmission



No. 12



# Research Tasks and Work Plan

- Task 2.1: Active Smart Rocks
  - Design Option #1: Controllable Permanent Magnet
    - A battery-powered, controllable permanent magnet contains a receiver, a battery pack, a strong permanent magnet, and an inductive, remotely-controlled mechanism to change the polarity of the magnet by rotating it inside the rock. The magnet enables differential magneto-static measurements.



No. 13



# Research Tasks and Work Plan

- Task 2.1: Active Smart Rocks
  - Design Option #1: Research Opportunities
    - Mechanism to invert the polarity of a magnet:



- The inside solid sphere is made of a plastic ball with a tight-fit long permanent magnet placed inside the ball
- The gap between the two spheres is filled with oil to minimize the friction between them
- The outside sphere is wrapped with several turns of coils that, once powered, induce a magnetic force to rotate the permanent magnet inside the ball in parallel or anti-parallel with the coil axis.
- In combination with the strength-distance relations from multiple magnetometer readings, both the position and rotation of the rock may be determined.

# Research Tasks and Work Plan

- Task 2.1: Active Smart Rocks
  - Design Option #1: Research Opportunities
    - Designed, simulated, optimized, and tested for their performance. Design parameters include the magnet size and dipole moment.



# Research Tasks and Work Plan

- Task 2.1: Active Smart Rocks
  - Design Option #2: 3-axis Acce./Magnetometer
    - It contains a transmitter, a battery pack, a 3-axis accelerometer, and a mini 3-axis magnetometer.
    - A prototype of 3-axis accelerometers/magnetometers can measure the roll and tilt angles of a smart rock w.r.t. the Earth's gravity and magnetic field, respectively.



Three Components of the Gravitational Acceleration



No. 16

More details on cost, battery, and prototyping are available upon request.



# Research Tasks and Work Plan

- Task 2.2: Magneto-Inductive and Acoustic Communications
  - Both communications will be investigated
  - Both use similar hardware and frequency/modulation
  - Magneto-inductive: near-field magnetic coupling that may be affected by induced currents in steel reinforcement in bridge structures
  - Acoustic: wave propagation with multiple paths in various soil deposits



No. 17



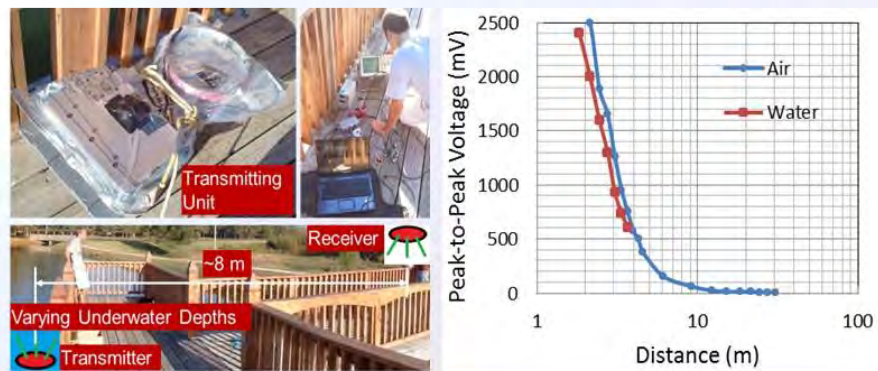
# Research Tasks and Work Plan

- Task 2.2(a): Magneto-Inductive Communication
  - Normal RF fields suffer very strong attenuation in water
  - Magneto-inductive communication, often called radio-frequency (RF) communication, represents the near-field electromagnetic field coupling between transmitting and receiving antennas that penetrates well through both air and water over 50 m distance.
  - Magneto-inductive communication has been used in mining, sea water and fresh water communication.



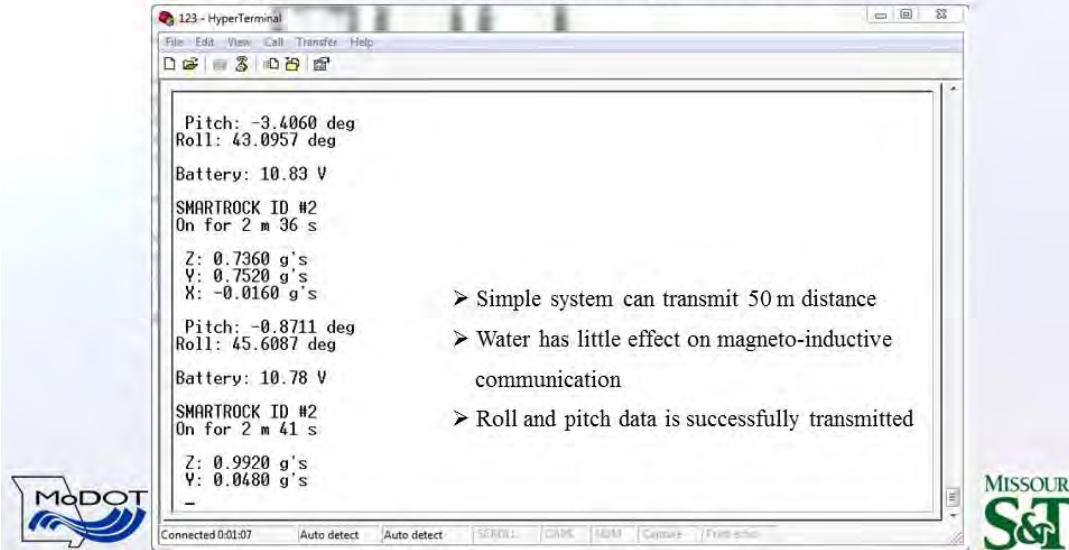
# Research Tasks and Work Plan

- Task 2.2(a): Magneto-Inductive Communication
  - Prototype built and tested in nearby lakes



# Research Tasks and Work Plan

- Task 2.2(a): Magneto-Inductive Communication
  - Screen snapshot from prototype tests



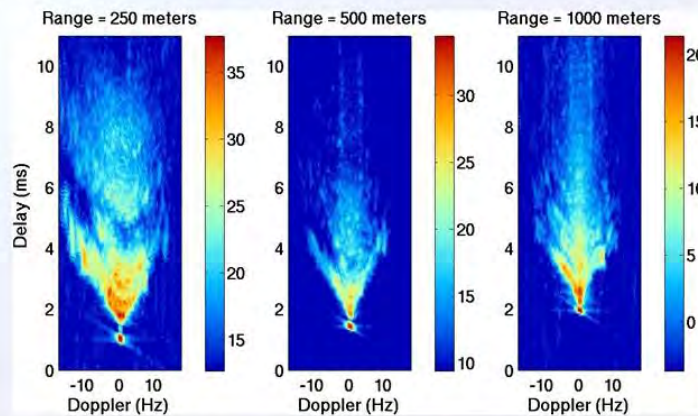
# Research Tasks and Work Plan

- Task 2.2(b): Acoustic Communication
  - Acoustic communication
    - A wireless acoustic communication network consists of underwater acoustic communication between smart rocks and gateway nodes installed on river banks, air Wi-Fi communication between the gateway nodes and a mobile vehicle, and air cellular communication between the gateway nodes and the office of engineer-in-charge.
    - Utilizing the ultrasonic wave propagation in water, mud, and soil, the acoustic system provides robust communication over 100 m range among smart rocks and between smart rocks and gateway nodes.



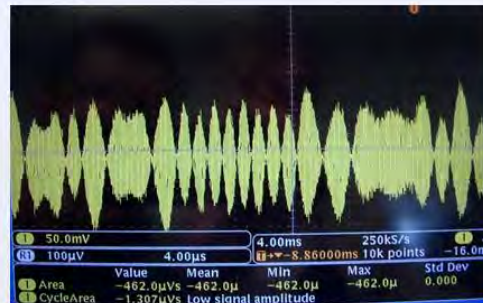
# Research Tasks and Work Plan

- Task 2.2(b): Acoustic Communication (Cont'd)
  - Very long multipath: (ms over 100 m)
  - Very high Doppler shift: (20 Hz for 100 kHz carrier)



# Research Tasks and Work Plan

- Task 2.2(b): Acoustic Communication (Cont'd)
  - Research Opportunity
    - A system fitting the riverbed constraints will be developed using the Ettus Universal Software Radio Peripheral (USRP)



# Research Tasks and Work Plan

- Task 2.2(c): Comparison and Integration of Two Communications
  - Evaluated with laboratory and field tests of their initial prototypes
  - Compared for their transmission distance, spatial resolution, measurement accuracy, and hardware cost
  - New prototypes with individual or integrated communications designed, built, and validated with field tests
  - Research will show their advantages, disadvantages, and complementary features

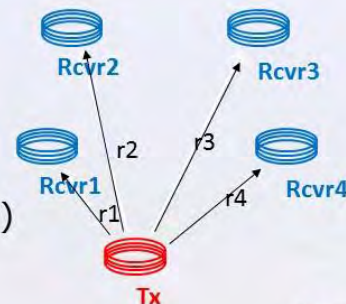


# Research Tasks and Work Plan

- Task 2.3(a): Electro-Inductive Transmission
  - Triangulation used with the following Strategies



- Signal strength versus distance
  - $1/r^6$  attenuation with distance
  - Dependence on coil orientation



- Phase of arrival (PoA)
  - Phase delay with distance (small)
- Referencing to a known rock
  - Error correction



# Research Tasks and Work Plan

- Task 2.3: Localization of Active Smart Rocks
  - Acoustic Transmission
    - A commercial modems known as the WFS RAM-300 pictured below will be used to profile the characteristics of acoustic riverbed channels.



# Research Tasks and Work Plan

- Task 2.3: Localization of Active Smart Rocks
  - Acoustic Transmission (Cont'd)
    - Multilateration may be used to determine the location of the smart rocks by measuring the time difference of arrival (TDoA) between acoustic signals.
      - $\Delta T = r/c$
    - Since the power of an acoustic signal is inversely proportional to distance squared, a received acoustic signal strength indicator (ASSI) may also be used to accurately measure distance once there is enough data collected about the profile of the channel.
      - $P \propto 1/r^2$

# Research Tasks and Work Plan

- Task 3: Scour Evaluation and Validation
  - 3.1 Smart rock movement evaluation
    - A rock positioning system with spatially-distributed smart rocks can request, receive, process, and transmit mission-critical data to the office of engineer-in-charge.
    - The multi-sensor data sets (e.g., tilts and centroid positions of smart rocks both individually and in group) and engineering and environmental information at a bridge site can be fused together to reconstruct the motion of smart rocks, improving the accuracy, reliability and completeness of real-time scour evaluation and prediction.
  - 3.2 Field validation
    - The proposed technology will be validated at three bridges



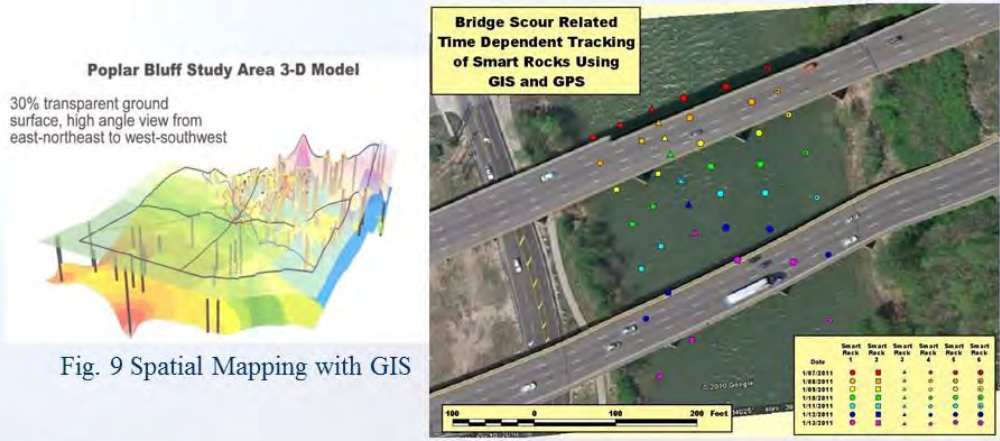
# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Multi-sensor data fusion for accuracy, reliability, and completeness of the collected scour depth and area
    - The robust centroid and size information of a rock group by passive sensors can be used to verify and improve the accuracy by active sensors.
    - The detailed information about individual rocks by active sensors can give insight on the interpretation of passive rock movements
    - The scour depth and size of individual active rocks taken with one communication are more accurate than the other communication when they correspond to the smaller root-mean-square error of the centroid coordinates and the group sizes between the prediction from active smart rocks and the direct measurement by passive smart rocks.



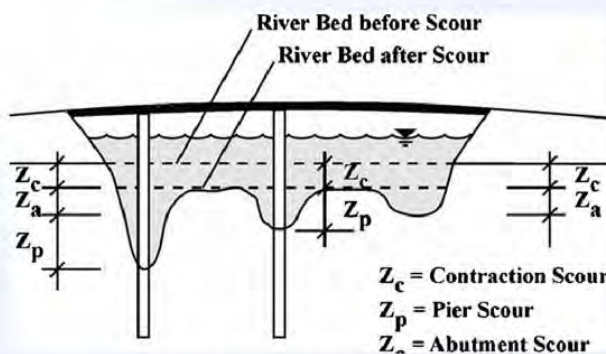
# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Example mapping and smart rock positioning



# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Scour Prediction with the Observation Method



After Briaud et al. (2005, 2009)

$$Z_{fut} = Z_{mo} \times f(V_{fut}/V_{mo})$$

$Z_{mo}$  = maximum observed scour depth

$V_{mo}$  = maximum flow velocity experienced by a bridge since its completion

$Z_{fut}$  = scour depth during a scenario future flood

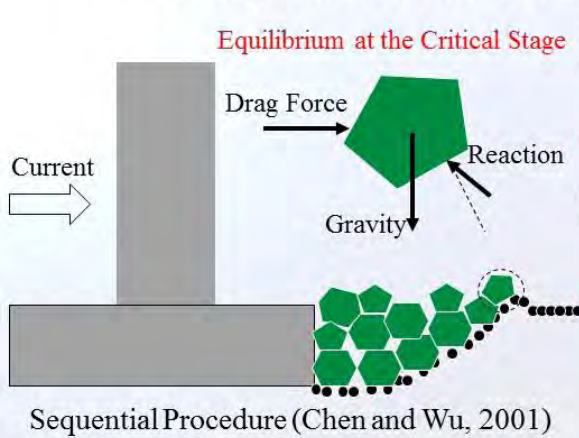
$V_{fut}$  = flow velocity of a future flood





# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Scour prediction with a mechanical model: concept



**Assumptions:**

- (1) Only the top layer of rocks moves at any time
- (2) The top rock in contact with soil deposits moves after the soil resistance is reduced to a critical value as a result of increased water flow velocity
- (3) No more than two rocks will experience significant movement simultaneously.

**Procedure:**

- (1) With the measured water flow velocity and soil density, the end rock on soil is evaluated for its potential movement (onset and magnitude).
- (2) If yes, the possibility of having the end rock and another rock on the top layer move together is evaluated. The other rock moves when it results in a minimum error of the center location and size prediction of smart rocks against the measured data in real time.
- (3) If no, which rock on the top layer moves first will be determined by evaluating the RMS prediction error for any single rock to move.
- (4) Repeat the previous step.

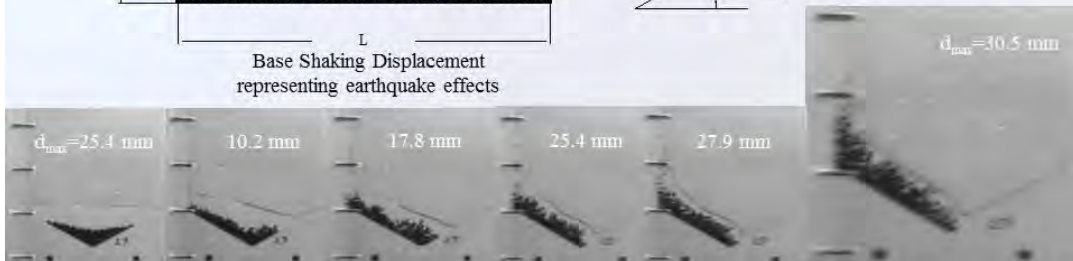
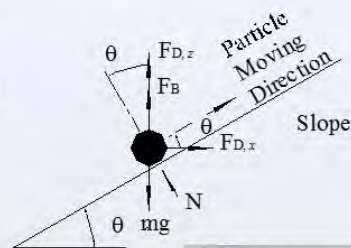
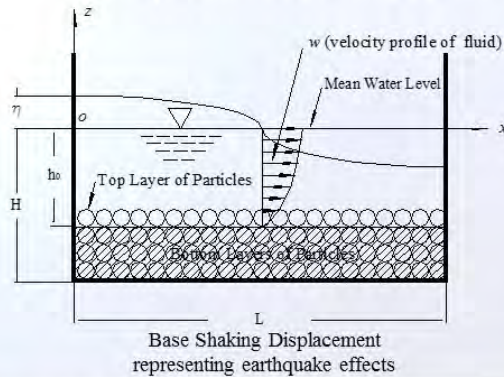


No. 32



# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Scour prediction with a mechanical model: experience



# Research Tasks and Work Plan

- Task 3.1: Rock movement evaluation with GIS
  - Scour prediction opportunities
    - Visualization of three-dimensional, spatial information on smart rock movement using GIS
    - Development of the mechanics-based model
    - Small-scale open channel tests in the Hydraulic Laboratory at Missouri S&T for the validation of the mechanical model
    - Exploration of a payload study on bridge scour tests with the Federal Highway Administration (FHWA) Hydraulics Research Laboratory that allows a further validation of the the proposed procedure within the duration of the proposed study.



No. 34



# Research Tasks and Work Plan

- Task 4: Report and Travel Requirements
  - Progress and final reports
    - Quarterly and final reports will be prepared.
  - Travel requirements
    - Travel to bridge test sites and RITA is considered.



No. 35



# Research Tasks and Work Plan

- Summary of All Tasks

Task	Description
<b>1 Real-Time Scour Monitoring with Passive Smart Rocks</b>	
1.1	Optimal passive smart rock
1.2	Interference compensation and rock localization
<b>2 Real-Time Scour Monitoring with Active Smart Rocks</b>	
2.1	Active smart rocks
2.2	Magneto-inductive and acoustic communications
(a)	Magneto-inductive communications
(b)	Acoustic communications
(c)	Comparison and integration of two wireless communications
2.3	Localization of active smart rocks
(a)	Magneto-inductive transmission
(b)	Acoustic transmission
<b>3 Scour Evaluation and Technology Validation</b>	
3.1	Smart Rock Movement Evaluation with Multi-Sensor Fused Data
3.2	Scour Evaluation and Validation of the Proposed Technologies
<b>4 Report and Travel Requirements</b>	



# Research Tasks and Work Plan

- Effort Distribution by Tasks

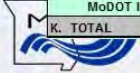
Task	Chen	Pommerenke	Zheng	Hoffman	All
1.1	0.67	0.33			1.00
1.2	0.67	0.33			1.00
2.1	0.67	0.33			1.00
2.2(a)	0.33	0.67			1.00
2.2(b)		0.33	0.67		1.00
2.2(c)		0.33	0.67		1.00
2.3(a)		0.67	0.33		1.00
2.3(b)		0.33	0.67		1.00
3.1	0.67		0.33		1.00
3.2	0.40	0.20	0.20	0.20	1.00
4.0	0.40	0.30	0.30		1.00



# Project Budget and Timeline

- Budget Summary by Tasks

Expense Category		1.1	1.2	2.1	2.2 (a)	2.2 (b)	2.2 (c)	2.3 (a)	2.3 (b)	3.1	3.2	4	Total
<b>A. Personnel</b>													
RITA		\$ 39,749	\$ 60,179	\$ 40,027	\$ 27,623	\$ 24,702	\$ 13,861	\$ 14,462	\$ 13,861	\$ 39,721	\$ 50,507	\$ 63,677	\$ 388,368
MS&T		\$ 5,632	\$ 8,478	\$ 5,647	\$ 5,393	\$ 7,382	\$ 4,232	\$ 4,582	\$ 4,232	\$ 5,322	\$ 4,623	\$ 11,491	\$ 67,012
<b>B. Fringe Benefits</b>													
RITA		\$ 7,207	\$ 10,958	\$ 7,281	\$ 4,185	\$ 1,790	\$ 1,026	\$ 1,111	\$ 1,026	\$ 7,273	\$ 10,065	\$ 9,845	\$ 61,768
MS&T		\$ 1,366	\$ 2,056	\$ 1,369	\$ 1,308	\$ 1,790	\$ 1,026	\$ 1,111	\$ 1,026	\$ 1,291	\$ 1,121	\$ 2,787	\$ 16,251
<b>C. Travel</b>													
RITA		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 44,727	\$ 44,727
<b>D. Equipment</b>													
MS&T		\$ 53,106	\$ -	\$ -	\$ 22,656	\$ 15,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 90,762
<b>E. Supplies</b>													
RITA		\$ 9,986	\$ 18,704	\$ 11,849	\$ 4,918	\$ -	\$ -	\$ -	\$ -	\$ 13,711	\$ 7,074	\$ 14,148	\$ 80,390
<b>F. Contractual</b>													
<b>G. Construction</b>													
<b>H. Other</b>													
Tuition	RITA	\$ 6,170	\$ 9,602	\$ 6,343	\$ 3,039	\$ -	\$ -	\$ -	\$ -	\$ 6,517	\$ 3,787	\$ 7,574	\$ 43,032
Rental	RITA	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2,900	\$ -	\$ 2,900
<b>I. Total Direct Cost</b>													
		\$ 63,112	\$ 99,443	\$ 65,500	\$ 39,765	\$ 26,492	\$ 14,887	\$ 15,573	\$ 14,887	\$ 67,222	\$ 74,333	\$ 139,971	\$ 621,185
		\$ 60,104	\$ 10,534	\$ 7,016	\$ 29,357	\$ 24,172	\$ 5,258	\$ 5,693	\$ 5,258	\$ 6,613	\$ 5,744	\$ 14,278	\$ 174,025
<b>Modified Total Direct</b>													
RITA		\$ 56,942	\$ 89,842	\$ 59,156	\$ 36,726	\$ 26,492	\$ 14,887	\$ 15,573	\$ 14,887	\$ 60,705	\$ 67,646	\$ 132,397	\$ 575,253
MS&T		\$ 6,996	\$ 10,534	\$ 7,016	\$ 6,701	\$ 9,172	\$ 5,258	\$ 5,693	\$ 5,258	\$ 6,613	\$ 5,744	\$ 14,278	\$ 83,263
<b>J. Indirect Charges</b>													
RITA	51.5%	\$ 29,325	\$ 46,268	\$ 30,465	\$ 18,914	\$ 13,643	\$ 7,667	\$ 8,020	\$ 7,667	\$ 34,263	\$ 34,838	\$ 68,184	\$ 296,255
MS&T	51.5%	\$ 3,604	\$ 5,425	\$ 3,613	\$ 3,451	\$ 4,723	\$ 2,708	\$ 2,932	\$ 2,708	\$ 3,406	\$ 2,958	\$ 7,353	\$ 42,890
<b>MoDOT In-Kind</b>													
		\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 700,536	\$ -	\$ 700,536
<b>K. TOTAL</b>													
		\$ 156,144	\$ 181,670	\$ 106,595	\$ 91,486	\$ 69,031	\$ 30,520	\$ 32,218	\$ 30,520	\$ 108,503	\$ 818,409	\$ 229,786	\$ 1,834,881



No. 38



# Project Budget and Timeline

- Timeline by Quarters

Task	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1.1	✓	✓	✓	✓				
1.2			✓	✓	✓	✓	✓	✓
2.1			✓	✓	✓	✓		
2.2(a)	✓	✓	✓	✓				
2.2(b)	✓	✓	✓	✓				
2.2(c)					✓	✓	✓	✓
2.3(a)					✓	✓	✓	✓
2.3(b)					✓	✓	✓	✓
3.1					✓	✓	✓	✓
3.2			✓	✓			✓	✓
4	✓	✓	✓	✓	✓	✓	✓	✓



No. 39



# Concluding Remarks

- The Proposed Monitoring Technology
  - Can address the No. 1 cause of bridge collapses in the U.S. over the past 40 years.
  - Will be readily implementable, cost effective, and highly innovative.
  - Is integrated with a current mitigation strategy with rocks that are already in applications.
  - Can advance the state of art/practice of structural health monitoring for bridge scour (both hardware and software).
  - Can tailor commercial remote sensing technologies in new applications for scour monitoring.



## Proposal Review Process

– Case Study with USDOT Opportunity

Presented by  
Genda Chen\*, Susanna Long, and Tiantian Li  
Missouri University of Science and Technology

\* Email: [gchen@mst.edu](mailto:gchen@mst.edu)

MoDOT Research Proposal Writing Workshop  
July 22, 2016

# Smart Rocks and Wireless Communication Systems for Real-Time Monitoring and Mitigation of Bridge Scour

Research Proposal Team:  
Genda Chen\*, David Pommerenke, Rosa Y. Zheng, and David Hoffman

\* Principal Investigator  
Professor of Civil Engineering  
Department of Civil, Architectural, and Environmental Engineering  
Missouri University of Science and Technology  
Associate Director of Mid-America Transportation Center

## Outline of This Presentation

- Introduction to the Team
- Objectives and RITA Goal
- Technical Concept and Viability
- Technical Approach and Program
- Technical Resources
- Consortia Partnerships
- RITA Budget and Cost Sharing
- Concluding Remarks



No. 3



# Introduction to the Team

- Genda Chen, Ph.D., P.E., F. ASCE
  - Ph.D. received from SUNY at Buffalo in 1992
  - Bridge Engineer with Steinman Consulting Engineers in 1993 – 1996
  - Assistant, Associate, and Full Professors since 1996 at Missouri S&T (formerly University of Missouri-Rolla)
  - Specialties in structural health monitoring, smart structure, and multi-hazards assessment and mitigation
  - 2 patents plus 1 patent in pending, NSF CAREER Award
  - Technical Director of FHWA/MoDOT sponsored, two-year earthquake hazard mitigation program in 2002 (~\$1M)
  - PI/Technical Coordinator of MoDOT/NUTC sponsored structures research program in 2008 (~\$1.9M)



No. 4



# Introduction to the Team

- David Pommerenke, Prof. of Electrical Engineering
  - Ph.D. degree/Diploma received from Technical University Berlin, Germany in 1995/1989
  - Research Scientist at Hewlett Packard in 1996 - 2001
  - Associate and Full Professors since 2004 at Missouri S&T
  - Specialties in measurement and instrumentation, electronics, electromagnetic compatibility, and sensors
  - Deputy Director of Electromagnetic Compatibility Laboratory, a consortium of over 20 industrial partners including Apples, Sony, etc.
  - Inventor of 9 patents



No. 5



# Introduction to the Team

- Rosa Y. Zheng, Assistant Prof. of Electrical Engineering
  - Ph.D. degree received from Carleton University, Ottawa, Canada in 2002
  - System Engineer with SAGEM Australasia Ltd., Sydney, Australia in 1994 – 1996
  - Quality Control Manager, Polytronics Engineer Ltd., Markham, Ontario, Canada in 1996 - 1997
  - Assistant Professor since 2005 at Missouri S&T
  - Specialties in wireless communication, underwater acoustic communication, and acoustic signal processing
  - Recipient of NSF CAREER award in networked underwater acoustic transmission



No. 6



# Introduction to the Team

- David Hoffman, P.E., R.G.
  - M.S. degree received from Missouri S&T in 1967
  - Geologist with Missouri Department of Natural Resources (MoDNR) Geological Survey and Resource Assessment Division in 1976 - 1980
  - Chief Engineer with MoDNR Dam and Reservoir Safety Program in 1980 - 1982
  - Geologist with MoDNR Division of Geology and Land Survey in 1985 – 2004
  - Research Associate Engineer since 2004 for natural hazards assessment and engineering mitigation research in civil engineering at Missouri S&T
  - Mapping and GIS work for over 40 years



No. 7





# Introduction to the Team

- Research Assistant Professor, Ph.D.
  - Ph.D. in Hydraulic Engineering/Geotechnical Engineering
  - Preferable Experience with Bridge Scour Study
  - To Be Recruited from Candidates such as
    - Dr. Anand V. Govindasamy, Geocomp Corporation, was a former Ph.D. student with Professor Jean-Louis Briaud at Texas A&M University, significantly contributing to the scour assessment project with Texas Department of Transportation.
    - Dr. Dongkyun Kim was a former Ph.D. student with Professor Francisco Olivera at Texas A&M University, significantly contributing the scour assessment project with Texas Department of Transportation.
    - Others who have been working in the Hydraulic Research Laboratory at the Turner-Fairbank Highway Research Center.



No. 8



# Objectives and RITA Goal

- Objectives of This Study
  - Integrate commercial measurement and communication technologies into a rock positioning system with spatially-distributed smart rocks
  - Evaluate the technologies and improve their performance for bridge applications at reduced costs
  - Collect mission-critical data and develop a mechanics-based model for the reconstruction of a scour process
- Meeting the Goal of the RITA Program
  - New applications of commercial measurement and wireless communication technologies in bridge scour monitoring
  - Introduction of a rock positioning system with spatially distributed rocks and visualization of scour process on a GIS platform



No. 9



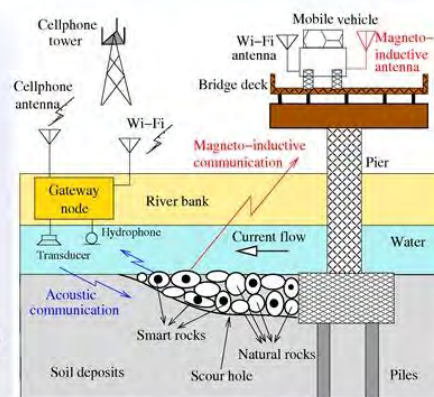
## Evaluation Criteria

### 1. Technical Concept and Viability



## Technical Concept and Viability

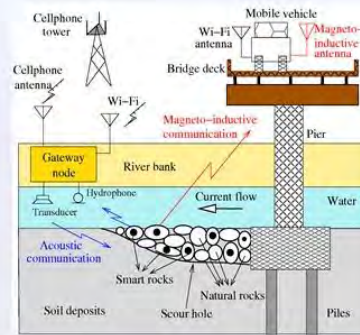
- The Proposed Concept
  - Smart rocks - sensors packaged in rocks for survivability and integration with scour mitigation
  - Passive sensors/rocks directly read by instrument above water
  - Active sensors/rocks connected to a mobile vehicle with wireless communication systems (acoustic or magneto-inductive)
  - Data/information sent to engineers' office via cellphone as needed
  - Localization of smart rocks for scour information mapping on a GIS platform



# Technical Concept and Viability

- Potential Products and Results

- Prototype sensors (passive and active)
- Prototype communication systems (acoustic and/or magneto-inductive)
- Performance of commercial instrument and communication systems
- Performance charts with laboratory development for new applications
- Performance validation and documentation with field studies
- Cost reduction documentation from commercial to application-specific devices
- Localization algorithms for scour depth and area estimations



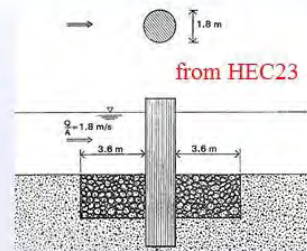
No. 12



# Technical Concept and Viability

- Innovative Solution and Unique System

- Integrate scour monitoring into a riprap scour mitigation strategy with rocks so that a cost-effective, practical solution can be derived.
- Package rocks as rugged sensors so that they can survive the harsh condition during a flood event, enabling real-time scour monitoring in long term.
- Develop a localization algorithm for scour area and depth with spatially distributed smart rocks.
- Reconstruct the process of scour with a real-time rock positioning system on a GIS platform.



No. 13



# Technical Concept and Viability

- Technical Challenges and Merits
  - Localization of spatially distributed smart rocks from a 5m~30m distance requires the use of sensors with high sensitivity and spatial resolution and noise reduction processing.
  - The proposed rock positioning system requires the development of a robust algorithm that is well validated and documented in laboratory and field conditions.
  - The multi-phase, multi-layer media with potential unknown objects in between (e.g. air/water/mud/deposit, metals carried at riverbed with water current) requires the detection of the most plausible underwater propagation path of acoustic signals.
  - Reconstructing a scour process requires a sophisticated soil-structure-water interaction analysis at bridge foundations based on the data collected from spatially distributed smart rocks.



# Technical Concept and Viability

- Overcoming Strategies
  - Passive Smart Rocks
    - Maximizing the magnetic field strength of rocks
    - Improving the measurement sensitivity of instrument
    - Compensating unchanged effects with background knowledge at deployment sites
  - Active Smart Rocks
    - Reducing transmission power while maintaining robust communication
    - Selecting quality batteries to target 20 years of operation life span
    - Possibly utilizing both magneto-inductive and acoustic wave propagation means to mitigate the localization ambiguity
    - Combining information from low-cost passive smart rocks and background site knowledge
    - Designing and integrating low cost transceivers and network protocols



# Technical Concept and Viability

- Potential Impact to Practice
  - Versus the current commercial technologies
    - Extending their application into bridge engineering
    - Providing vendors with field-validated performances
  - Versus the state-of-the-art scour monitoring

Table 2 Comparison of Existing Monitoring Technologies with the Proposed Technology

Method	Cost (*\$1,000)	Accuracy	Durability	Ease in installation	Applicability		
					Current	Debris/ice	Mitigation
Diver	0.5-1	Poor	NA	Good	NA	NA	NA
Probing rods	2	Fair	Poor	Fair	NA	NA	NA
GPR	3-10	Good	Fair	Poor	NA	NA	NA
Boats	0.5-1	Fair	NA	Poor	NA	NA	NA
Sonar	5-15	Good	Fair	Good	Good	NA	NA
Float-out	3	Fair	Poor	Fair	Poor	NA	NA
Magnetic collars	5-10	Good	Good	Good	Good	NA	NA
Optical sensors	5-10	Good	Fair	Fair	Good	NA	NA
Global positioning	5-20	Good	NA	Good	Good	Good	NA
<b>Smart rocks</b>	<b>0.5-5</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>

Notes: GPR=Ground Penetration Radar; NA=Not Applicable



No. 16



# Technical Concept and Viability

- Closure on Proposal Evaluation Criterion #1
  - Technology assessment criteria (to be confirmed with Missouri DOT and FHWA)
    - Rock position within 0.5 m (sensor's sensitivity)
    - Rock spacing within 1.0 m (sensor's spatial resolution)
    - Measurement distance within 5m ~ 30m
    - Signal transmission frequency below 100 kHz (>50 m)
  - Significant advances over the commercial technologies in new applications of bridges
    - Rugged sensors to survive the harsh environment
    - Reliable measurements in the more noisy environment
    - Low costs for new bridge applications



No. 17



# Evaluation Criteria

## 2. Technical Approach and Program Planning for Validation



# Technical Approach and Program

- The Society Need Addressed



Fig. 10 Scour-Induced Bridge Damage and Statistics

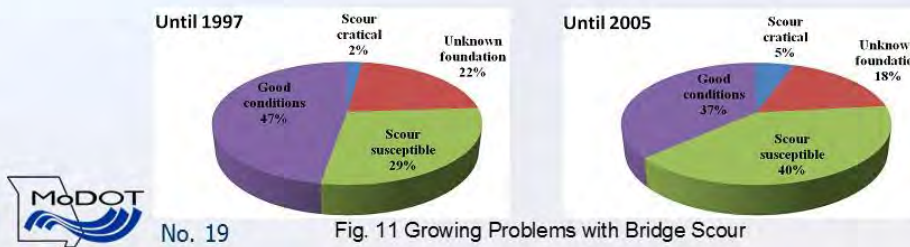


Fig. 11 Growing Problems with Bridge Scour



# Technical Approach and Program

- Current Status of the Technology
  - Radio/Acoustic Modems applied to military applications for water/ground/air operations
    - The main concern for transportation applications is cost (\$1k~\$20k for each transducer)
  - Static Field Magnetometers applied to detect pipelines at seabed
    - Main challenges for transportation applications:
      - Interference from the steel reinforcement in bridges or unknown subjects in the riverbed
      - Survivability for underwater monitoring
      - Relatively long distance for above water monitoring



# Technical Approach and Program

- Potential Benefits and Quantifiable Metrics
  - Save lives by enabling a real time monitoring of bridge scour during a flood event
  - Extend the applications of commercial technologies related to rock positioning systems and wireless communications
  - Allow the development of cost-effective mitigation strategies with the new technology
  - Measured by the number of bridges instrumented and the number of smart rocks used in each bridge application, particularly the number of instrumented bridges that are exposed to potential scour and survive from flood events



# Technical Approach and Program

- Potential for Commercialization/Transfer
  - Strong interest by transportation engineers and officials due to the fact that the new technology provides a direct and visual monitoring of a bridge scour process
  - Integration of the new technology into engineers' daily maintenance work (for rating)
  - Participation and support from Missouri DOT and leading industries throughout the project
  - Strong presence of transportation research on the campus of Missouri S&T



# Technical Approach and Program

- Closure on Proposal Evaluation Criterion #2
  - Significant validation and demonstration in an actual operating environment by the end of this project
    - Prototypes assembled mainly with commercial parts and systems will be tested on three bridges in Missouri in Year 1.
    - Prototypes with modified commercial and new parts and systems will be tested on two bridges in Missouri in Year 2.





## Evaluation Criteria

### 3. Technical Resources for Performing the Project



No. 24



## Technical Resources

- Organization and Personnel Qualifications
  - Missouri S&T has long relationship with transportation industries and federal agencies – home of a national UTC (CTIS = Center for Transportation Infrastructure and Safety) and a partner of Region VII UTC.
  - Over 25 faculty members in various disciplines are associated with the state-funded Center for Infrastructure Engineering Studies (CIES).
  - The team specialties are complimentary to each other.

Dr. Genda Chen, Professor of Civil Engineering at Missouri S&T (PI)  
Dr. David Pommerenke, Professor of Electrical Engineering at S&T (Co-PI)  
Dr. Rosa Zheng, Assistant Professor of Electrical Engineering at S&T (Co-PI)  
Mr. David Hoffman, Associate Research Engineer of Civil Engineering at S&T  
Dr. Research Assistant Professor, Hydraulics/Geotechnics Specialist (TBD)



No. 25



# Technical Resources

- Project Management Experience

- The Center for Infrastructure Engineering Studies (CIES) has been expending over \$3.5M/year since 2006.
- PI is Interim Director of the CIES (the current appointment ends in August, 2011) and has led the following major initiatives since 2002:
  - Technical Director of the 2002-2005 FHWA/MoDOT-sponsored, multi-facet Earthquake Hazard Mitigation Program (~\$1M)
  - PI of three National Science Foundation projects (2004-2011) in the area of structural health monitoring (~\$1.2M)
  - PI of the 2008-2010 MoDOT/CTIS-sponsored, Structures Research Program (~1.9M)
- PI completed a campus leadership training program.



No. 26



# Technical Resources

- Technical Experience and Capabilities in Federal Research Program

- The Team collectively received the following grants and contracts in the past ten years:
  - 12 from National Science Foundation (NSF)
  - 3 from Army Research Laboratory (ARL)
  - 2 from the Office of Naval Research (ONR)
  - 1 from the Air Force Office of Scientific Research (AFOSR)
  - More than 10 from USDOT including one from FHWA



No. 27



# Technical Resources

- Qualifications and Facilities for Remote Sensing Applications
  - GIS and GPS experiences
  - Wireless communication systems
  - Distributed sensing systems (Dr. Chen and Pommerenke jointly have a patent on coax strain and crack sensors)
  - Electromagnetic Compatibility Laboratory
  - Wireless Communication Laboratory
  - Structural Engineering/Hydraulic Laboratories



No. 28



# Technical Resources

- Closure on Proposal Evaluation Criterion #3
  - Experiences with space based technology applications
    - Distributed sensing systems – electromagnetic and optical
    - Underwater wireless communication
    - GIS and GPS applications in mapping
  - Capability with transportation applications
    - Management and research experiences with two university transportation centers at Missouri S&T
    - Research examples include
      - Engineering interpretation of real-time measured data from the Bill Emerson Cable-Stayed Bridge, sensor application for crack detection in bridge structures
      - Crack and fracture investigations of steel girders and steel struts of bridges and steel arm-to-post connections of signal support structures
      - Study on corrosion resistance and bond strength of enamel-coated steel rebar in concrete bridges



No. 29



## Evaluation Criteria

### 4. Consortia Partnerships



## Consortia Partnerships

- **Consortia Partnerships**
  - Missouri S&T (lead institute)
  - Missouri DOT
- **External Advisory Committee**
  - FHWA Hydraulics Research Laboratory (pending)
  - Missouri DOT
  - City of San Jose, Public Works Department
  - WFS Defense, Inc., Radio/Acoustic Transmissions
  - Olson Engineering, Condition Assessment
  - Geometrics (tele-participation only)
- **Participation of the Public**
  - Project website developed to facilitate research disseminations



## Evaluation Criteria

### 5. Requested DOT Budget and Cost Sharing Contributions



## RITA Budget and Cost Sharing

- Requested DOT Budget and Cost Sharing
  - DOT=\$917,440
  - Missouri DOT=\$700,536, S&T=\$216,905
  - Timeline for Commercialization

Period	Major Activities	Milestones	Resources
01/2013 to 12/2013	<b>Commercialization</b> <ul style="list-style-type: none"> <li>• Offer training classes for practitioners</li> <li>• Collect review comments from practitioners</li> <li>• Set new expectations for deployment</li> </ul>	Feedback review New expectation review and deployment strategy	FHWA CTIS Geometrics Inc. WFS Defense, Inc.
01/2013 to 12/2014	<b>Deployment</b> <ul style="list-style-type: none"> <li>• Fine tune a multi-functional system for optimal performance and cost effectiveness</li> <li>• Deploy the system on one or two bridges for demonstration of long-term monitoring</li> <li>• Develop internet-based access for real-time monitoring or frequent routine inspections</li> </ul>	Design review Installation review Durability review Data repository Review	FHWA CTIS Olson Engineering Geometrics Inc. WFS Defense, Inc.



# Concluding Remarks


- The Proposed Monitoring Technology
  - Can address the No. 1 cause of bridge collapses in the U.S. over the past 40 years.
  - Will be readily implementable and cost effective, and highly innovative (new application).
  - Is integrated with a current mitigation strategy with rocks that are already in applications.
  - Can advance the state of art/practice of structural health monitoring for bridge scour (both hardware and software).
  - Can tailor commercial remote sensing technologies in new applications for scour monitoring.



No. 34



## Appendix D - PPT of Third Workshop at MoDOT




SYSTEM AND PROCESS ASSESSMENT RESEARCH LABORATORY  
**SPAR Lab**  
Civil, Architectural and Environmental Engineering • 103/104-E Butler-Carlton Hall

# Evaluating Proposal Responsiveness-Red Team Review - Third Workshop at MoDOT

Suzanna Long\*, Genda Chen, and Tiantian Li  
Missouri University of Science and Technology  
\*Email: [longsuz@mst.edu](mailto:longsuz@mst.edu)

October 21, 2016; Jefferson City



# PROPOSAL REVIEW BASICS

- **General**
  - Completeness
  - Format Followed
  - Submittal Process Followed
- **Intellectual Merit**
  - Proposal fit with the RFP
  - Intellectually grounded in the literature?
  - Potential for transformative research
  - Qualifications of the team
  - Strengths vs. Weaknesses



SYSTEM AND PROCESS ASSESSMENT RESEARCH LABORATORY  
**SPAR Lab**



2

## BASICS CONTINUED

- **Broader Impacts**
  - Can the proposed work create systemic change?
  - How will the proposed work benefit society?
  - Will this broaden participation of any underrepresented groups in the workforce or communities?
  - How will the results of the work be disseminated?
  - Strengths vs. Weaknesses



SYSTEM AND PROCESS ASSESSMENT RESEARCH LABORATORY  
**SPAR Lab**



3



## RED TEAM ASSIGNMENT:

- Review the submitted proposal using the the proposal basics on slides 2 and 3.
- Refer to the Appendix of RFP Requirements
- Note strengths and weaknesses for both intellectual merit and broader impacts
- Rate the proposal!
  - Excellent
  - Very Good
  - Good
  - Fair
  - Poor



SYSTEM AND PROCESS ASSESSMENT RESEARCH LABORATORY  
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## RED TEAM REVIEW

- Discuss your findings with your team
- Select a scribe to make notes for your team.
- Create a summary of your collective findings
  - This may take some time if different opinions exist!
  - Decide collectively on a common rating
  - Fund or not? Why!!



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## APPENDIX-RFP REQUIREMENT

- Program Description
- Federal Award Information
- Eligibility Information
- Application and Submission Information
- Application Review Information



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## PROGRAM DESCRIPTION

- **NSFHP program**
  - Established by FAST ACT
  - Referred to as FASTLANE grants
  - Provide Federal financial assistance to freight and highway projects of national or regional significance
    - ✓ *Critical freight issues facing nation's highways and bridges*
    - ✓ *Broad, multiyear eligibilities for freight infrastructure*
  - Prioritize projects that also enhance personal mobility and accessibility
    - ✓ *Connect people to essential services such as employment centers, health care, schools and education facilities, etc.*
    - ✓ *Remove physical barriers to access*
    - ✓ *Mitigate the negative impacts of freight movement on communities*



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## FEDERAL AWARD INFORMATION

- **NSFHP program**
  - \$4.5 billion for fiscal years (FY) 2016-2020
  - \$800 million for FY 2016 to be awarded by DOT
  
- **DOT**
  - **Large projects**
    - ✓ *At least \$25 million*
    - ✓ *May not exceed 60% of future eligible project costs*
  - **Small projects**
    - ✓ *At least \$5 million*
    - ✓ *May not exceed 60% of future eligible project costs*
    - ✓ *Approximately \$76 million in FY 2016 are reserved for small projects*



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## ELIGIBILITY INFORMATION

### 1. Eligible Applicants

- 1) A State or group of States
- 2) A metropolitan planning organization that serves an urbanized area
- 3) A unit of local government or group of local governments
- 4) A political subdivision of a State or local government
- 5) A special purpose district or public authority with a transportation function, including a port authority
- 6) A Federal land management agency that applies jointly with a State or group of States
- 7) A tribal government or a consortium of tribal governments
- 8) A multi-State or multijurisdictional group of public entities



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# ELIGIBILITY INFORMATION

## 1. Eligible Applicants

- **Multiple States or jurisdictions that submit a joint application**
  - ✓ *Must identify a lead applicant as the primary point of contact*
  - ✓ *Each applicant must be an Eligible Applicant*
  
- **Joint applications**
  - ✓ *Must include a description of the roles and responsibilities of each applicant and must be signed by each applicant*



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# ELIGIBILITY INFORMATION

## 2. Cost Sharing or Matching

- **NSFHP grants** → *may be used for up to 60 percent of future eligible project costs*
- **Other Federal assistance** → *may satisfy the non-Federal share requirement for an NSFHP grant*
- **Total Federal assistance** → *may not exceed 80 percent of the future eligible project costs*
- **Local cost-share** → *may not be counted as non-Federal share for both the NSFHP and another Federal program*
- **Previously incurred costs or previously expended or encumbered funds towards the matching requirement** → *cannot consider*
- **Matching funds** → *subject to the same Federal requirements described in Section F.2 as awarded funds*



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# ELIGIBILITY INFORMATION

## 3. Other

### i. Eligible Project

- ✓ *Highway freight projects carried out on the National Highway Freight Network (23 U.S.C. 167);*
- ✓ *Highway or bridge projects carried out on the National Highway System (NHS) including projects that add capacity on the Interstate System to improve mobility or projects in a national scenic area;*
- ✓ *Railway-highway grade crossing or grade separation projects;*
- ✓ *A freight project that is 1) an intermodal or rail project, or 2) within the boundaries of a public or private freight rail, water (including ports), or intermodal facility.*



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# ELIGIBILITY INFORMATION

## 3. Other

### ii. Eligible Project Costs

- ✓ *Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work;*
- ✓ *Other preconstruction activities;*
- ✓ *Construction, reconstruction, rehabilitation, acquisition of real property, environmental mitigation, construction contingencies, acquisition of equipment, and operational improvements directly related to system performance.*



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# ELIGIBILITY INFORMATION

## 3. Other

### iii. Minimum Project Size Requirement

#### a. Large Projects

- lesser* {
- \$100 million
  - 30 percent of a State's FY 2015 Federal-aid apportionment if the project is located in one State
  - 50 percent of the larger participating State's FY 2015 apportionment for projects located in more than one State

State <sup>a</sup>	One-State Minimum (millions)	Multi- State Minimum <sup>b</sup> (millions)
Alabama	\$100	\$100
Alaska	\$100	\$100
Missouri	\$100	\$100

<sup>a</sup> For multi-State projects, the minimum project size is largest of the multi-State minimums from the participating States.

#### b. Small Projects

- A small project is an eligible project that does not meet the minimum project size



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# ELIGIBILITY INFORMATION

## 3. Other

### iv. Rural/Urban Area

- ✓ *Cost share requirements and minimum grant awards are the same for projects located in rural and urban areas*

### v. Application Limit

- ✓ *The lead applicant → no more than three applications*
- ✓ *An applicant listed as a partnering agency → no limit*



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# ELIGIBILITY INFORMATION

## 3. Other

### vi. Project Components

- ✓ *A project may contain more than one component*
- ✓ *A component, instead of the larger project, may be awarded funds, meeting the following requirements:*
  - 1) independently meets minimum award amounts described in Section B and all eligibility requirements described in Section C;
  - 2) independently aligns well with the selection criteria specified in Section E;
  - 3) meets National Environmental Policy Act (NEPA) requirements with respect to independent utility.
- ✓ *All project components must demonstrate a relationship or connection between them*



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# APPLICATION AND SUBMISSION INFORMATION

## 1. Address

- Applications must be submitted through [www.Grants.gov](http://www.Grants.gov)

## 2. Content and Form of Application

- The Standard Form 424 (Application for Federal Assistance)
- Standard Form 424C (Budget Information for Construction Programs)
- Cover Page
- The Project Narrative



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## APPLICATION AND SUBMISSION INFORMATION

### 2.1 Cover Page

Project Name	
Previously Incurred Project Cost	\$
Future Eligible Project Cost	\$
Total Project Cost	\$
NSFHP Request	\$
Total Federal Funding (including NSFHP)	\$
Are matching funds restricted to a specific project component? If so, which one?	Yes/no
Is the project or a portion of the project currently located on National Highway Freight Network	Yes/no
Is the project or a portion of the project located on the National Highway System <ul style="list-style-type: none"> <li>• Does the project add capacity to the Interstate system?</li> <li>• Is the project in a national scenic area?</li> </ul>	Yes/no (for each question)
Do the project components include a railway-highway grade crossing or grade separation project?	Yes/no
Do the project components include an intermodal or freight rail project, or freight project within the boundaries of a public or private freight rail, water (including ports), or intermodal facility?	Yes/no



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## APPLICATION AND SUBMISSION INFORMATION

### 2.1 Cover Page

If answered yes to either of the two component questions above, how much of requested NSFHP funds will be spent on each of these projects components?	
State(s) in which project is located	
Small or large project	Small/Large
Also submitting an application to TIGER for this project?	Yes/no
Urbanized Area in which project is located, if applicable	
Population of Urbanized Area	
Is the project currently programmed in the: <ul style="list-style-type: none"> <li>• TIP</li> <li>• STIP</li> <li>• MPO Long Range Transportation Plan</li> <li>• State Long Range Transportation Plan</li> <li>• State Freight Plan?</li> </ul>	Yes/no (please specify in which plans the project is currently programmed)



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# APPLICATION AND SUBMISSION INFORMATION

## 2.2 Project Narrative

- **Basic outline**
  - ✓ *A detailed statement of work*
  - ✓ *A detailed project schedule*
  - ✓ *A detailed project budget*
  - ✓ *A table of contents*
  - ✓ *Maps*
  - ✓ *Graphics*
- **Standard formatting preferences**
  - ✓ *A single-spaced document, using a standard 12-point font such as Times New Roman, with 1-inch margins*
- **May not exceed 25 pages in length, excluding cover pages and table of contents**
  - ✓ *Supporting documents may exceed the 25-page limit*



# APPLICATION AND SUBMISSION INFORMATION

## 2.2 Project Narrative

- a. **Project Description**
  - ✓ *Project size including previously incurred expenses to show the project meets minimum project size requirements*
  - ✓ *What requested NSFHP and matching funds will support*
  - ✓ *How the project is nationally or regionally significant*
  - ✓ *Information on the expected users of the project*
  - ✓ *Transportation challenges the project aims to address, and how the project will address these challenges*



# APPLICATION AND SUBMISSION INFORMATION

## 2.2 Project Narrative

### b. Project Location

- ✓ *Geospatial data for the project*
- ✓ *A map of the project's location*
- ✓ *Its connections to existing transportation infrastructure*

### c. Project Parties

- ✓ *The grant recipient*
- ✓ *Other affected public and private parties*
  - Ports, terminal operators, freight railroads, shippers, carriers, freight-related associations, third-party logistics providers, and the freight industry workforce



# APPLICATION AND SUBMISSION INFORMATION

## 2.2 Project Narrative

### d. Grant Funds, Sources and Uses of Project Funds

- i. Future eligible cost, as defined in Section C.3.ii-iii*
- ii. Availability and commitment of all committed and expected funding sources and uses of all project funds for future eligible project costs*
- iii. Federal funds already provided and the size, nature, and source of the required match for those funds, as well as pending or past Federal funding requests for the project*
  - The requested NSFHP funds  $\leq$  60 percent of future eligible project costs
  - Total Federal funding  $\leq$  80 percent of future eligible project costs
  - Local share for the NSFHP grant is not counted as the matching requirement for another Federal program
- iv. A detailed project budget containing a breakdown of how the funds will be spent*
- v. Amount of requested NSFHP funds that will be spent on highway, bridge, freight intermodal or freight rail, port, grade crossing or grades separation project components*



# APPLICATION AND SUBMISSION INFORMATION

## 2.2 Project Narrative

### e. Cost-Effectiveness

- ✓ *Demonstrate the likeliness to deliver its anticipated benefits at reasonable costs*
- ✓ *A complete Benefit-Cost Analysis (BCA) is preferred*

### f. Project Readiness

- i. *Technical Feasibility*
- ii. *Project Schedule*
- iii. *Required Approvals*
- iv. *Assessment of Project Risks and Mitigation Strategies*

*A large project that is not reasonably expected to begin construction within 18 months of obligation of funds for the project → Cannot be awarded*



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# APPLICATION AND SUBMISSION INFORMATION

## 3. Unique entity identifier and System for Award Management (SAM)

- 1) Register in SAM before submitting application
- 2) Provide a valid unique entity identifier in application
- 3) Continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency

*Not comply with all applicable unique entity identifier and SAM requirements → No NSFHP grants*



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# APPLICATION AND SUBMISSION INFORMATION

## 4. Submission Dates and Timelines

### i. Deadline

- ✓ *Submit application by 8:00 p.m. EDT April 14, 2016*
- ✓ *Submit application through [Grants.gov](https://www.grants.gov)*

### ii. Consideration of Application – *Eligible applicant*

- ✓ *Comply with all submission deadlines*
- ✓ *Submit applications through [Grants.gov](https://www.grants.gov)*

### iii. Late Applications

- ✓ *Applications received after the deadline will not be considered*



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# APPLICATION REVIEW INFORMATION

## 1. Criteria

### – A small project

- ✓ *Evaluate the cost effectiveness of the proposed project*
- ✓ *The effect of the proposed project on mobility in the State and region in which the project is carried out*

### – A large project

- ✓ *generates national or regional economic, mobility, or safety benefits;*
- ✓ *is cost-effective;*
- ✓ *contributes to one or more of the goals described in 23 U.S.C 150;*
- ✓ *is based on the results of preliminary engineering;*
- ✓ *has one or more stable and dependable funding or financing sources to construct, maintain, and operate and contingency amounts to cover unanticipated cost increases;*
- ✓ *cannot be easily and efficiently completed without other Federal funding or financial assistance;*
- ✓ *is reasonably expected to begin construction no later than 18 months after the date of obligation.*



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# APPLICATION REVIEW INFORMATION

## 1. Criteria

### i. Merit Criteria (for both large and small projects)

#### a. *Economic Outcomes*

- Improving the efficiency and reliability of the surface transportation system at the regional or national level to increase the global economic competitiveness of the United States

#### b. *Mobility Outcomes*

- Improving the movement of people and goods

#### c. *Safety Outcomes*

- Achieving a significant reduction in traffic fatalities and serious injuries
- Improving interactions between roadway users
- Reducing the likelihood of derailments or high consequence events
- Improving safety in transporting certain types of commodities

#### d. *Community and Environmental Outcomes*

- How and whether the project mitigates harm to communities and the environment, extends benefits to the human and natural environment, or enhances personal mobility and accessibility



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# APPLICATION REVIEW INFORMATION

## 1. Criteria

### ii. Other Review Criteria

#### a. *Partnership and Innovation*

- Strong collaboration among a broad range of stakeholders
- Using innovative strategies to pursue primary outcomes
- Innovative and flexible designs and construction techniques or innovative technologies

#### b. *Cost Share*

- Must have one or more stable and dependable sources of funding and financing to construct, maintain, and operate the project
- Demonstrate that the project cannot be easily and efficiently completed without other Federal funding or financial assistance
- Firm commitments of cash that indicate a complete project funding package and demonstrate local support for the project are more competitive than other forms of cost sharing



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# APPLICATION REVIEW INFORMATION

## 2. Review and Selection Process

- DOT review all eligible applications
- The NSFHP process
  - ✓ *Technical Evaluation phase*
    - Whether the project satisfies statutory requirements
    - Rate how well it addresses selection criteria
  - ✓ *Senior Review*
    - Consider the applications and the technical evaluations
    - Determine which projects to advance to the Secretary for consideration
  - ✓ *The Secretary select the projects for award*

## 3. Additional Information

- Each selected applicant will be subject to a risk assessment required by 2 CFR § 200.205



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