



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Report on the
**DOE Accelerator Stewardship
FY 2015
Funding Opportunity Announcement**

Office of High Energy Physics
Office of Science
U. S. Department of Energy

Eric R. Colby

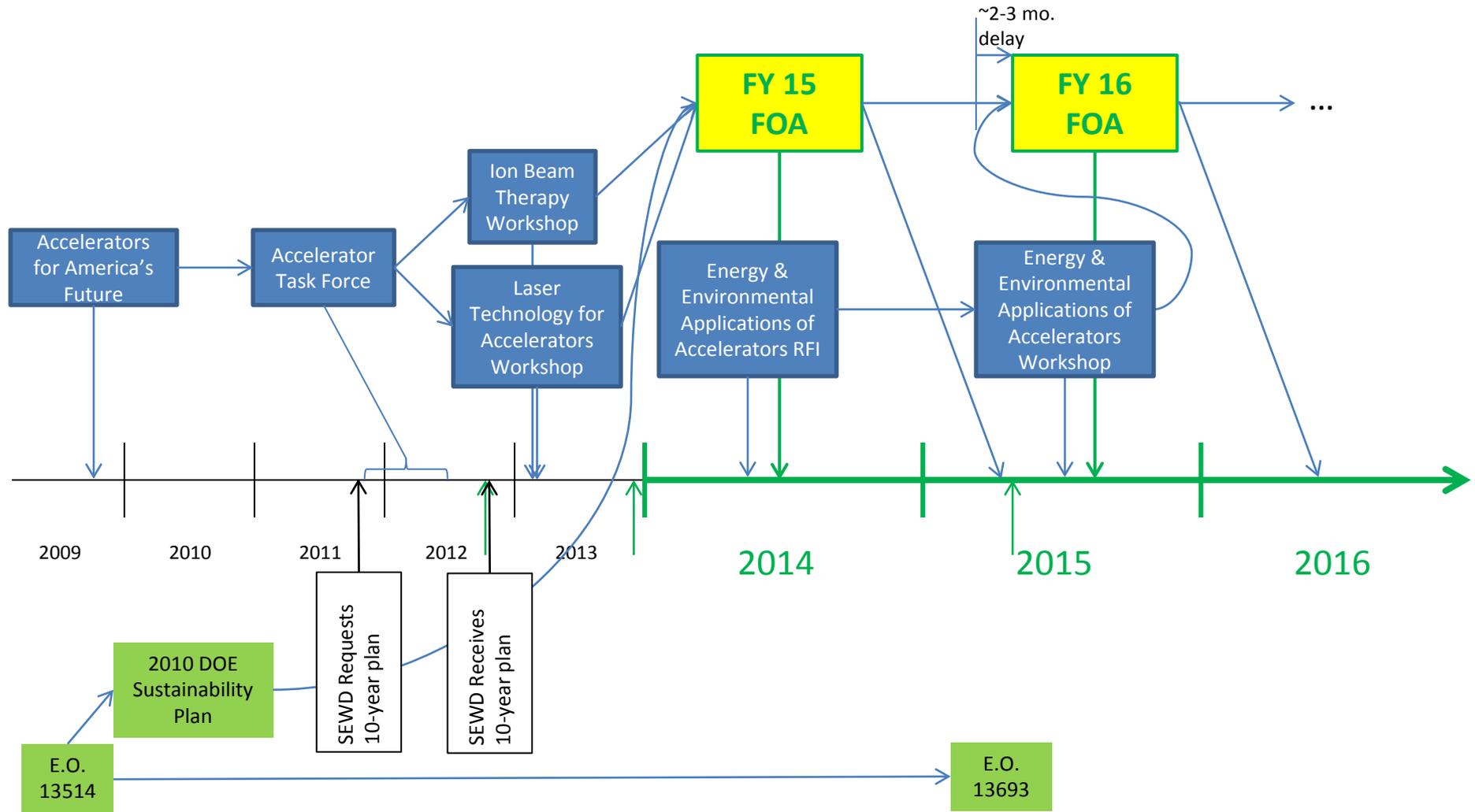
Report given to HEPAP
April 6, 2015

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The FY 2015 FOA in Context

- FY 2014, (PBR: \$10M, Appr: \$10M), Accelerator Stewardship's initial year:
 - HEP GARD grants picked (with BES, NP) to be the initial Stewardship cohort
 - BNL-ATF named as a dedicated Accelerator Stewardship test facility
 - BNL-ATF Stage 1 upgrade was approved and funding began
- FY 2015, (PBR: \$19.2 M, Appr: \$10M)
 - Prior grant obligations
 - **Awards fund under first Accelerator Stewardship FOA**
 - BNL-ATF operated as a dedicated SC User Facility under Stewardship
 - BNL-ATF Stage 1 upgrade funding continues
 - Accelerator Stewardship Test Facility Pilot Program launches
- FY 2016, (PBR: \$14M)
 - Prior grant obligations
 - **Awards under FY 16 Stewardship FOA**
 - BNL-ATF operated as a dedicated SC User Facility under Stewardship
 - BNL-ATF Stage 1 upgrade funding continues
 - Accelerator Stewardship Test Facility Program continues

Accelerator Stewardship Funding Opportunity Announcement Formulation



FY 2015 FOA Topics

- **Track 1: Applied R&D**

- **Particle Therapy Beam Delivery Improvements**

- Less massive and more compact beam delivery systems capable of delivering ion beams
- Technology that can provide for rapid (seconds) scanning of the beam over a tumor
- Beam diagnostic technologies for ion beam therapy

- **Ultrafast Laser Technology Program**

- Ultrafast gain materials capable of very high average power,
- Increased robustness and reduction in size of optical components,
- Innovations in laser architectures
- Wavelength extension further into the infrared
- Improvements in laser quality

- **Energy Efficiency Improvements Compatible with SC Accelerators**

- Reduce accelerator power consumption through innovations in power conversion technology

- **Track 2: Basic R&D**

- **Significant increases in accelerator performance** (flux, brightness, polarization, coherence, stability, reliability, flexibility) and **decreases in cost** (construction cost, operating cost, physical size, complexity) are sought.

FY15 Call brought a very strong response from a diverse community

- **98 Letters of Intent (LOIs) received, totaling \$138M !**

- **By Call (LAB and FOA)**

- 26 responded to LAB call
 - 19 from SC labs (all except Ames, PNNL)
 - 7 from NNSA labs (LANL, LLNL)
 - 72 responded to FOA call

- **By Track and Topic**

- Track 1 / Applied R&D
 - Ion Beam Therapy: 12
 - U/F Laser R&D: 24
 - Energy efficiency: 18
 - Track 2 / Basic R&D: 41 (!)
 - No track (sent “FYI”): 3

- **LOI Responses**

- Encouraged: 57 (\$85M)
 - Discouraged: 41 (\$53M)
 - 10 were referred to the HEP CR FOA

- **50 Full Proposals Submitted by the deadline**

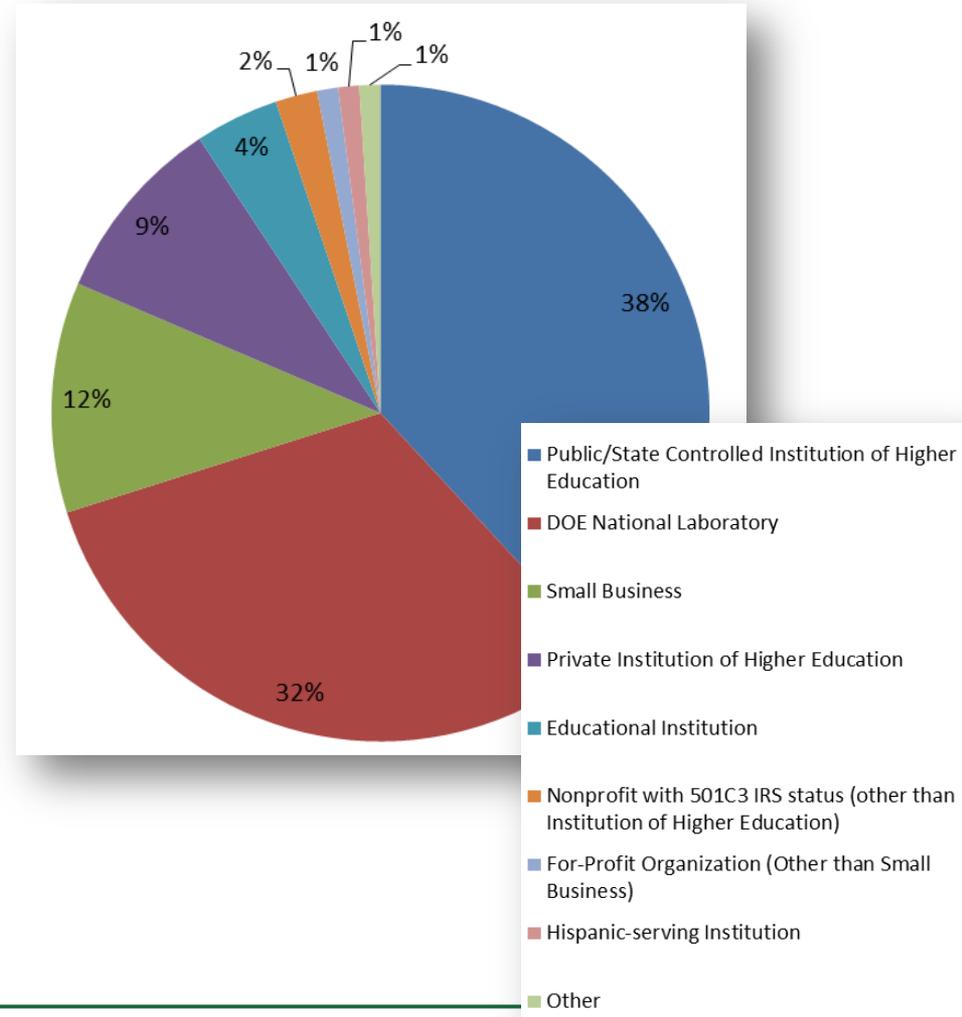
- **Track 1**

- Ion Beam Therapy: 6
 - U/F Laser R&D: 16
 - Energy Efficiency: 8

- **Track 2**

- Basic R&D: 20

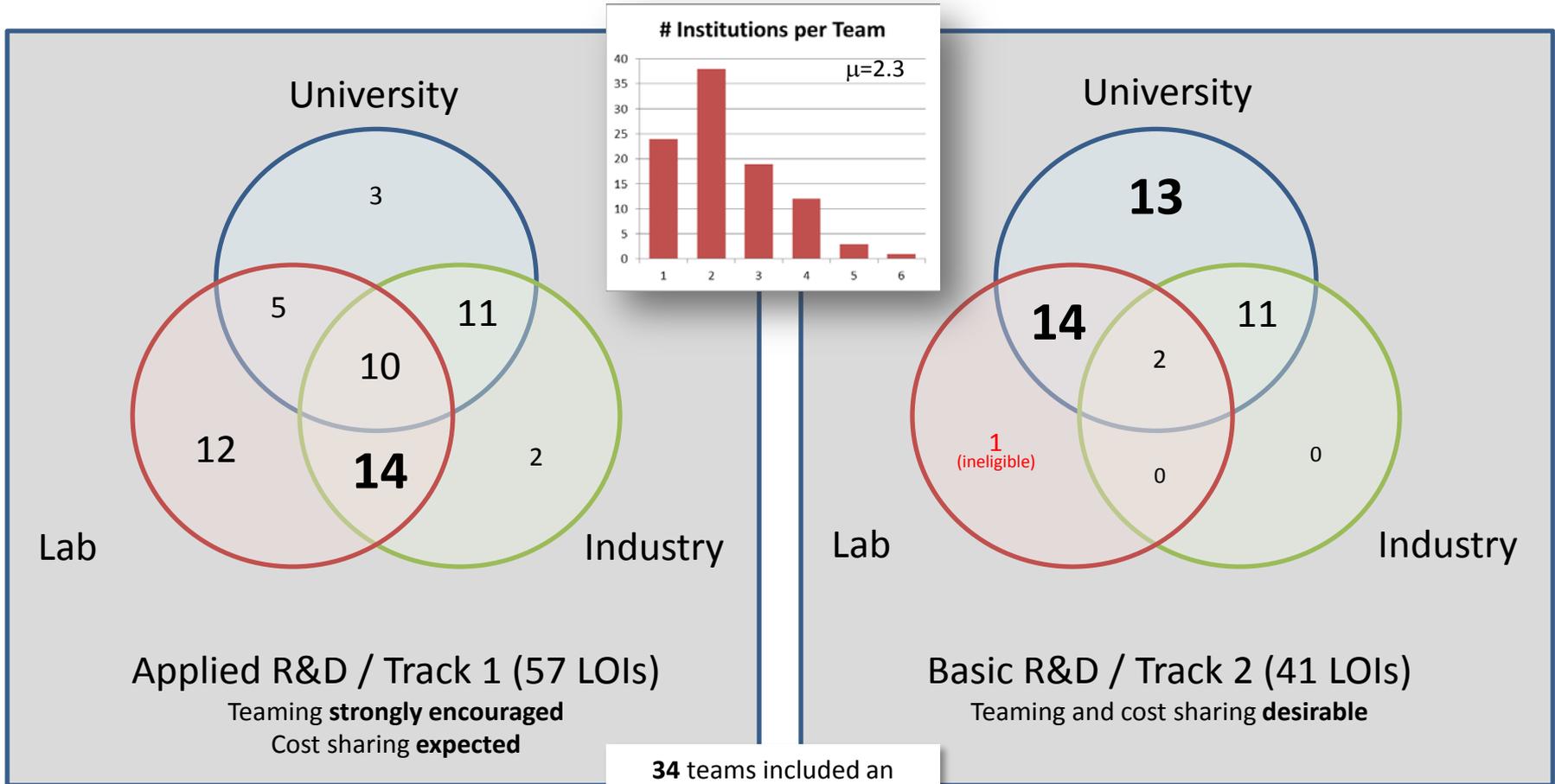
Eligibility: “All domestic organizations”



Teaming and Cost Sharing were Strong

- **Teaming plans as written in the LOI Responses**

- Numbers indicate how many LOIs involved which types of participants



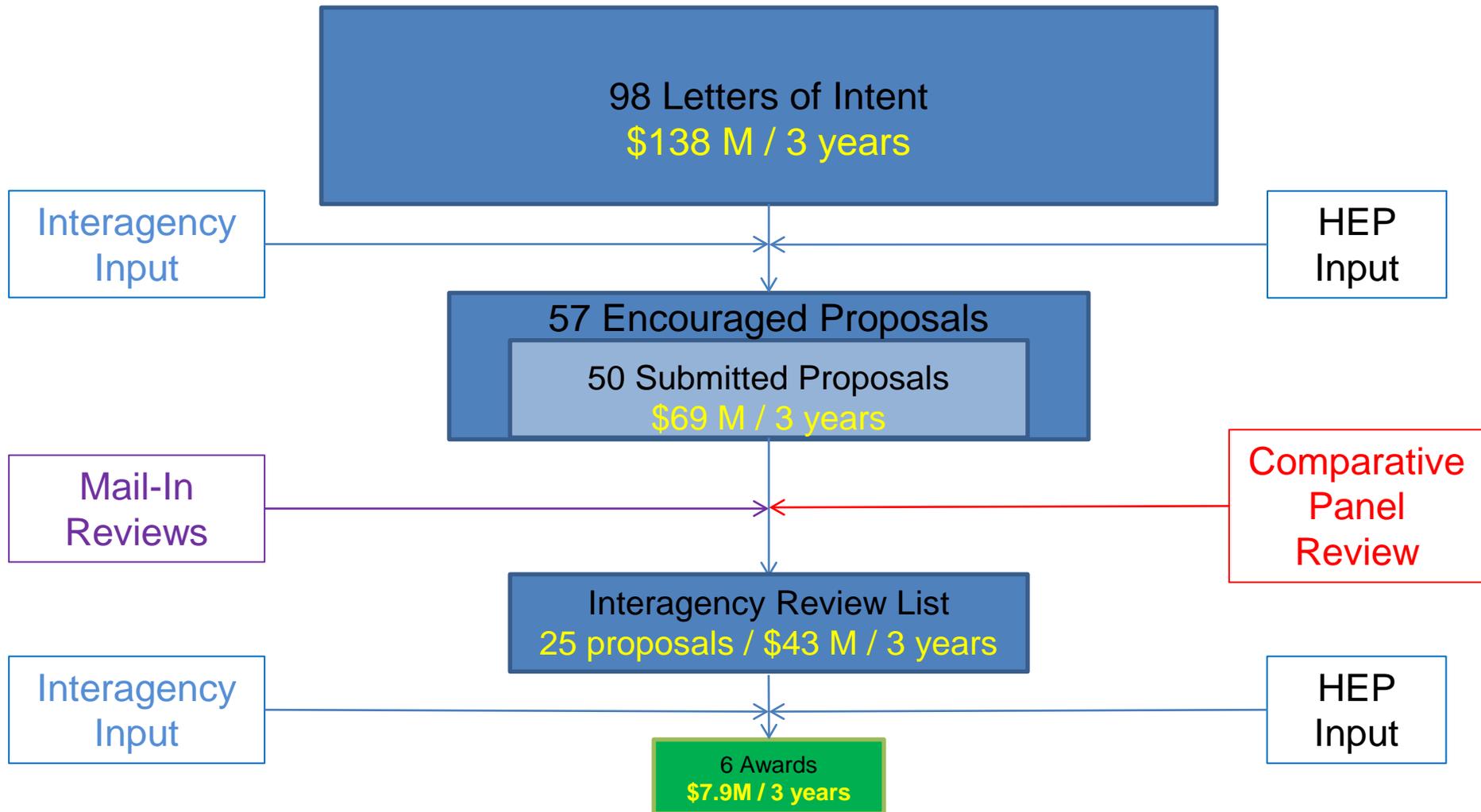
Institutional Participation by Type and Role

(based on submitted LOIs)

Institution	Lead / Prime	Partner / Subaward	Total
CSU	9	4	13
SLAC	6	7	13
FNAL	2	10	12
UMD	6	3	9
LLNL	2	6	8
STANFORD	5	2	7
RADIABEAM	2	5	7
LBNL	6	0	6
UCLA	3	2	5
BNL	2	3	5
LANL	4	0	4
CORNELL	3	1	4
U CO	2	2	4
CPI	1	3	4
Jlab	1	3	4
CWM	3	0	3
NIU	3	0	3
ANL	2	1	3
TAMU	2	1	3
ORNL	1	2	3



FY 2015 Stewardship Selection Process



Boundary Conditions: What is Stewardship and what is **GARD**?

- DOE-HEP has a separately funded, separately managed program in accelerator R&D specifically aimed at supporting its mission called “**GARD**” = **General Accelerator Research & Development**.
- Accelerator R&D often has broad impacts beyond the program that funded the work. Differentiating what is HEP-mission and what is Stewardship is important.
- The difference, stated simply, is:

GARD	predominantly impacts the HEP R&D mission
Accelerator Stewardship	predominantly impacts non-HEP applications

- The stewardship proposal must clearly state the goals and impacts of the proposed work.

Boundary Conditions: “Stewardship Customer’s Needs” vs. “synergy with HEP”

- DOE-HEP funds a program with a distinct mission. As such, HEP-funded activities must be defensible within the context of the mission:
The mission of the High Energy Physics (HEP) program is to understand how our universe works at its most fundamental level.
 - Particle accelerators play a key enabling role in HEP experiments.
 - Higher energy and intensity, and lower cost are the primary R&D goals.
- **Two questions** must be answered in the affirmative for a proposal to qualify for the Stewardship program:
 1. Is there a clear non-HEP customer for the work, and does the proposed work have a potentially *strong impact* on the customer’s needs?
 2. Will conducting the activity likely result in a *positive impact* on HEP’s ability to conduct its mission?

“*strong impact*” – is defined by the Stewardship Customer.

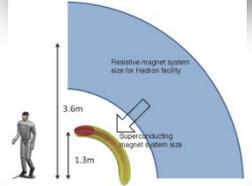
“*positive impact*” – can include: enhancing a competence, improving a facility, or developing an industry capability that one day will prove useful to the HEP mission.

FY 2015 Stewardship Awards

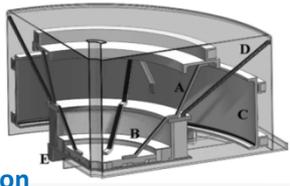


\$850k
Cost
Share

**Compact Superconducting
Combined Function Gantry
Magnets**



\$405k
Cost share **Ironless Variable Energy
Superconducting Proton Cyclotron**



Gantry Optics Design
Cost share



Office of Science and Technology Policy Blog

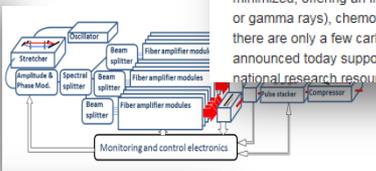
Targeting Tumors with Particle Beams

Posted by ToF Carim on February 10, 2015 at 12:15 PM EDT

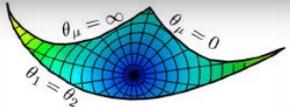
Today, the National Cancer Institute (NCI), part of the National Institutes of Health, and the Department of Energy (DOE) are each announcing the selection of several new research awards to advance particle beam therapies for the treatment of cancer. Particle beam approaches use directed protons — or heavier ions, such as carbon ions — to target and kill cancerous tissue. Because the delivered particles interact strongly with tissue at a certain distance within the body that depends on the energy of the beam, the damage to surrounding healthy tissue can be minimized, offering an important possible alternative or supplement to more conventional radiotherapy (using x-rays or gamma rays), chemotherapy, and surgery. At present, there are 14 proton therapy centers in the United States; there are only a few carbon ion therapy facilities worldwide, but none are in the United States. The NCI awards announced today support planning for the establishment of a Center for Particle Beam Radiation Therapy as a national research resource, and the DOE awards address development of improved hardware that could shrink the



**Advanced Beam Dynamics
for High Power Cyclotrons**



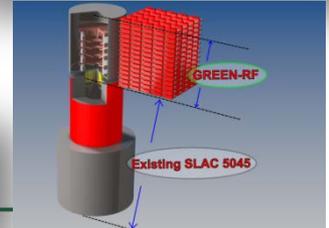
**High Peak & Average
Power Laser
Technology R&D**



**Innovative
Accelerator Control
and Optimization**



**Energy Efficient
LCLS-I Klystron
Replacements**



FY 2015 Stewardship FOA Summary

- **FY 2015 FOA Formulated with input from 3 workshops, the Accelerator Task Force, an Executive Order, and DOE-SC Offices**
- **Reduced Funding (\$10M vs. \$19.2M) led to a much-reduced program**
 - 98 LOIs → 50 Proposals → 6 awards
 - 3 of 6 were funded at ~half of the requested amount; all were funded below request
 - Many, many outstanding proposals could not be funded
- **Please read the coming FOA carefully**
 - Topic descriptions are specific for a reason
 - **Please call and discuss if clarification is needed**
 - The benefits of the R&D should be strongly and clearly articulated and should cite documentation of the need
 - **Proposals are scored on this explicitly**
- **Expect FY 2016 FOA will be later than FY 2015 (June) by 2-3 months**
 - Will continue many of the topics from the FY 2015 FOA
 - Informed by the Workshop on Energy & Environmental Applications of Accelerators

Supplementary Materials



Applied Research (Track 1) Topics

Topic 1.1: Particle Therapy Beam Delivery Improvements

Technical Contact: Michael Zisman, (301)-903-2718, Michael.Zisman@science.doe.gov

Targeted R&D leading to one of:

- Less massive and more compact beam delivery systems capable of delivering ion beams from protons up to carbon that are suitable for patient therapy,
- Technology that can provide for rapid (seconds) scanning of the beam over a tumor volume in three dimensions, that is both transversely and longitudinally,
- Beam diagnostic technologies for ion beam therapy, with emphasis on increased readout speed and accuracy of position and dose.

Proposals to design an accelerator or accelerator complex are outside the scope of this call, and such proposals will be declined without review

Stewardship customer: NIH/NCI.

References: DOE/NIH Workshop on Ion Beam Therapy

<http://science.energy.gov/hep/research/accelerator-rd-stewardship/workshop-reports/>

Related calls: NIH PAR-13-096, PAR-13-371 (both now closed).

Applied Research (Track 1) Topics

Topic 1.2: Ultrafast Laser Technology Program

Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Targeted R&D in one or more of the following areas:

- Ultrafast gain materials capable of very high average power,
- Increased robustness and reduction in size of optical components,
- Innovations in laser architectures, cryogenics, other advanced thermal management techniques,
- Wavelength extension further into the infrared,
- Improvements in laser quality.

Proposals to develop full-scale demonstration laser systems are out of the scope of this FOA, and will be declined without review.

Stewardship customers: SC/BES, SC/NP, SC/FES, DoD, and DHS. SC/HEP also benefits.

References: Workshop on Laser Technology for Accelerators

<http://science.energy.gov/hep/research/accelerator-rd-stewardship/workshop-reports/>

Related calls: CRNBAA14-002, BAA-N00173-02, BAA-AFOSR-2014-0001, BAA-RQKM-2013-0005.

Applied Research (Track 1) Topics

Topic 1.3: Energy Efficiency Improvements Compatible with Office of Science Accelerators

Technical Contact: Eric Colby, (301)-903-5475, Eric.Colby@Science.doe.gov

R&D leading to new concepts in very high efficiency power conversion systems in two categories:

- **Plug-Compatible Concepts** -- targeted at upgrading existing power supplies, modulators and/or klystrons that are currently in service. Designs must be as close to plug-compatible as possible.
- **Revolutionary Concepts** -- Developments in this area must offer revolutionary gains in efficiency. While plug-compatibility is not required, a cost/benefit analysis must be included in the application to support the claim that the differential cost of developing, deploying, and operating the new power system components will generate a positive return on investment over a 10-year time period.

Stewardship customers: SC/BES, SC/NP, and Industry. SC/HEP also benefits.

References: E.O. 13514, and DOE's 2010 Strategic Sustainability Performance Plan

http://www.energy.gov/sites/prod/files/edg/media/DOE_Sustainability_Plan_2010.PDF

Related calls: none.

Basic Research (Track 2)

Topic 2.0: Long-Term Generic Accelerator R&D

Technical Contact: Michael Zisman, (301)-903-2718, Michael.Zisman@science.doe.gov

Basic research aimed at improving the theory, computational tools, and fundamental physical and technical understanding of accelerator science.

Topic areas include: beam physics, advanced computational methods for accelerator design and analysis, beam diagnostics and feedback control, new superconducting materials, new materials and coatings for accelerator components, novel power sources for accelerators, new particle sources, novel magnet designs, novel lattice designs, and novel technologies for secondary beam production.

Significant increases in performance (flux, brightness, polarization, coherence, stability, reliability, flexibility) and **decreases in cost** (construction cost, operating cost, physical size, complexity) are sought.

Stewardship customer: varies by topic area.

References: Advisory committee reports, workshop reports, NAS reports, industry technology roadmaps, etc.

Related calls: NSF PD-13-7243.

Merit Criteria for Accelerator Stewardship Proposals

(in addition to the usual 10CFR605 criteria)

QUALITY OF THE ACCELERATOR R&D STEWARDSHIP OPPORTUNITY

In the questions that follow, the term “**Stewardship customer**” is used broadly to refer to the entity (other than HEP) whose mission or research objectives encompass the proposed work. The Stewardship customer can be another Office of Science (e.g., BES, NP, FES), another DOE program office (e.g., NNSA, EERE, ARPA-E) another federal agency (e.g., NIH, DoD), or industries that use accelerator technology.

1. Does the proposed work require significant scientific or technical **advances in accelerators or accelerator-related technology**? (Accelerator-related technology includes such things as: superconducting magnets and RF cavities, RF and magnet power systems, specialized laser systems, specialized diagnostics and controls, and so on.)
2. Will the proposed work result in substantial **impact on the Stewardship customer’s needs** and result in some **synergy with the HEP mission**? (synergies might include: developing additional expertise or facilities relevant to present or future HEP-supported work).
3. For the primary participating institution(s), is the activity reasonably **consistent with the institution’s primary mission**? (e.g., if a National Laboratory is involved, is the activity consistent with that Laboratory’s primary mission?)
4. Is the PI/collaboration arguably **the best performer/provider for the Stewardship activity**? Are other entities capable of providing a substantially similar (or superior) capability?
5. What evidence is there that the **Stewardship customer endorses the goal**? Does this proposal address issues that have been identified in writing (e.g., advisory committee reports, workshop reports, white papers, roadmaps) by the Stewardship customer? Does the Stewardship customer participate substantially and materially in this effort (e.g., by co-funding, cost-sharing, in-kind donation or equipment, donation of effort)?



FY 2015 FOA/LA Process Overview

- Program Planning
 - January 2013 – Ion Beam Therapy Workshop & Lasers Technology for Accelerators Workshop
- FOA Preparation
 - April 2014 – FOA written and circulated to SC/BES+SC/NP, NSF, NIH/NCI, DoD/ONR
 - June 13, 2014 – FOA posted
- LOI Phase
 - **July 3, 2014, 5:00pm EDT –deadline for Letters of Intent**
 - July 3-9, 2014 LOIs reviewed by SC/HEP, then SC/BES+SC/NP, NSF, NIH/NCI, DoD/ONR
 - July 10, 2014—encourage/discourage responses given
- Merit Review Phase
 - Late July—BES, NP, NSF, NCI, DOD provided reviewer selection panelist recommendations
 - August, 2014--Reviewer selection panel identifies and confirms mail-in reviewers
 - **September 4, 2014—full applications due**
 - September 4, 2014 to November 3, 2014—mail in reviews
 - 17-19 November, 2014—Comparative Panel review meeting
- Interagency Review Phase
 - December, 2014—Interagency review with SC/BES+SC/NP, NSF, NIH/NCI, and DoD/ONR
- Decision and Execution
 - January 2015—award decisions
 - February 10, 2015—awards announced
 - April 2015 – awards funded

Legend

Proposers

Mail-In Reviewers

CR Panel Reviewers

HEP

Broader SC

Broader Fed Gov't



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