Mid-Scale Research Infrastructure – 2

Friday, 14-Apr-2023
and Monday, 17-Apr-2023
3:00 pm – 4:00 pm Eastern

Agenda

- Overview of NSF Mid-scale RI Program
- Mid-scale RI-2 Solicitation NSF 23-570
- Q & A

For improved audio: USA/Canada dial Toll-free 1-833-568-8864
4/14: Meeting ID: 160 055 3165 Meeting passcode: 041129
4/17: Meeting ID: 160 533 6673 Meeting passcode: 677693

Please submit questions via the Q&A module of Zoom

These slides and a video of this webcast will be available at
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505550

Mid-scale RI-2 Points of Contact

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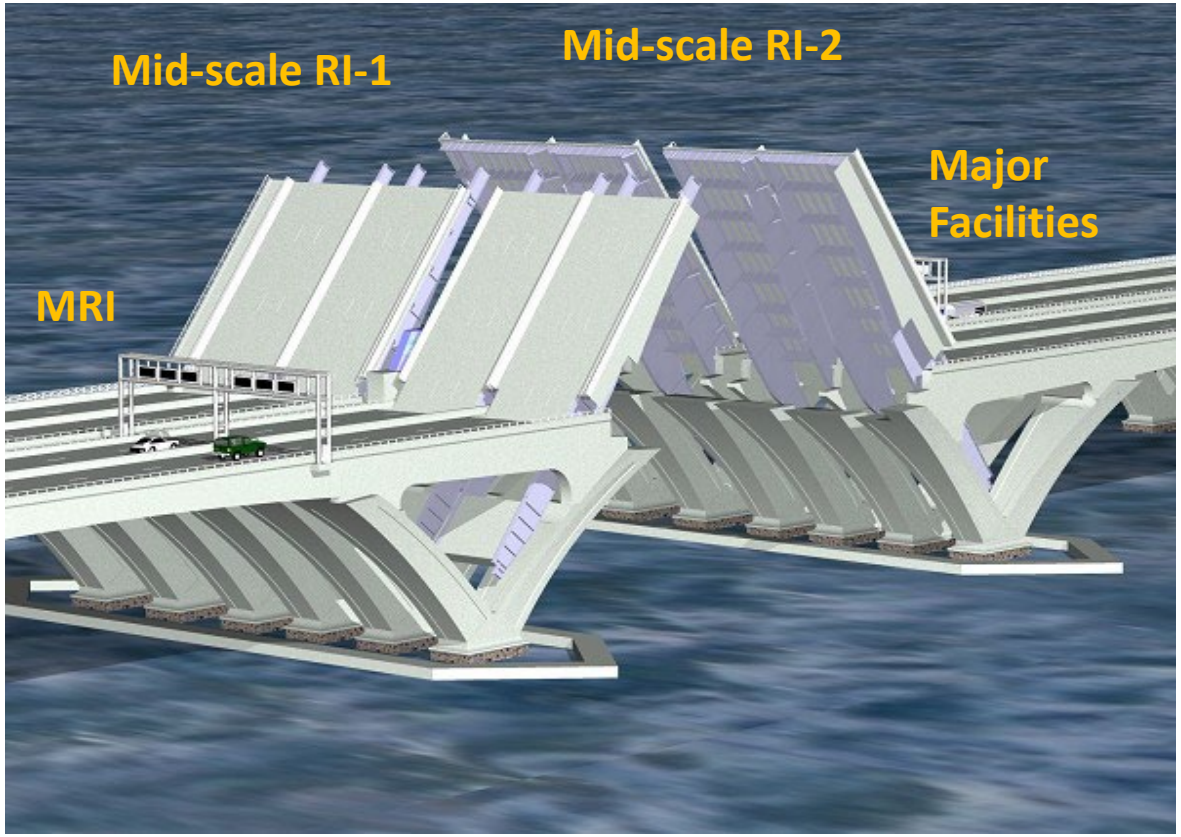
Mid-scale Research Infrastructure (Mid-scale RI)



- Major Research Instrumentation (MRI) program: $100K < instrumentation < $4M
- Major Facilities ≥ $100M
- NSF recognized that a gap between these programs results in missed opportunities that may leave essential science undone.
- NSF created a new agile process to support mid-scale experimental capabilities, in two tracks for implementation*:
  - **Mid-scale RI-1:** $4 M ≤ proposals < $20 M
  - **Mid-scale RI-2:** $20 M ≤ proposals < $100 M

**Mid-scale RI-1 also supports design projects*

Mid-scale RI

- **Mid-scale RI-1 supports:**
  - Implementation projects: any combination of equipment, instrumentation, cyberinfrastructure, broadly used large-scale data sets, and the commissioning and/or personnel needed to successfully complete the project.
  - Design projects: design activities intended to lead to eventual implementation of a Mid-scale RI class project.
  - NSF 22-637, https://www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=505602&ods_key=nsf22637.

- **Mid-scale RI-2 supports:**
  - Implementation projects only.
  - NSF 23-570, https://www.nsf.gov/publications/pub_summ.jsp?WT.z_pims_id=505550&ods_key=nsf23570.

Mid-scale RI-2 solicitation

- **NSF 23-570 solicits proposals for the 3rd Mid-scale RI-2 competition:**

Letter of Intent *(Required)*	*May 15, 2023*
Preliminary Proposal *(Required)*	*June 20, 2023*
Full Proposal *(By Invitation Only)*	*December 18, 2023*

NSF definition of Mid-scale Research Infrastructure-2 in the solicitation

"Mid-scale RI-2 projects may include any combination of equipment, instrumentation, cyberinfrastructure, broadly used large-scale data sets, and the commissioning and/or personnel needed to successfully complete the project. *Mid-scale RI-2 projects should fill a research community-defined scientific need, or address an identified national research priority, that enables current and next-generation U.S. researchers and a diverse STEM workforce to remain competitive in a global research environment.* Mid-scale RI-2 projects will directly enable advances in any of the research domains supported by NSF, including STEM education research, and translational research. Projects may also include upgrades to existing research infrastructure. The total cost for Mid-scale RI-2 projects ranges from $20 million to below the threshold for a Major Facility Project, currently $100 million."

Mid-scale RI-2 (NSF 23-570)

Implementation Projects, e.g., acquisition, assembly, construction and commissioning:

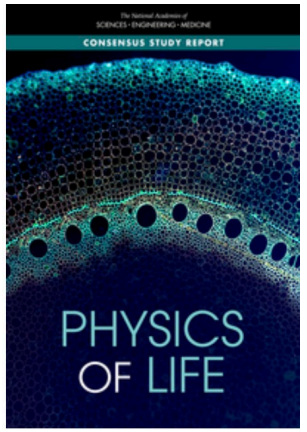
- High state of project and technical readiness for implementation
  - Those that have already matured through previous developmental investments
  - Mid-scale RI-2 does not support pre-implementation (design or development) activities
- Enable advances in any research domain supported by NSF, including STEM education research, and translational research.
- May also include upgrades to existing research infrastructure.

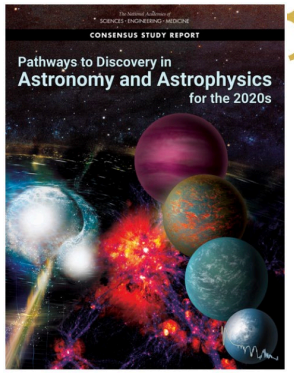
- ***$20 million ≦ Total Project Cost to NSF < $100 million***

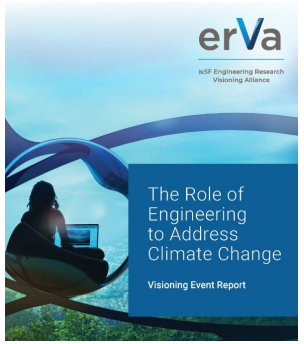
Mid-scale RI-2 (NSF 23-570)

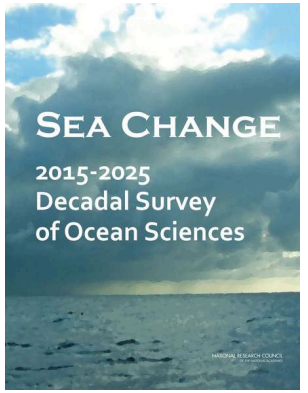
Mid-scale RI-2 projects should:

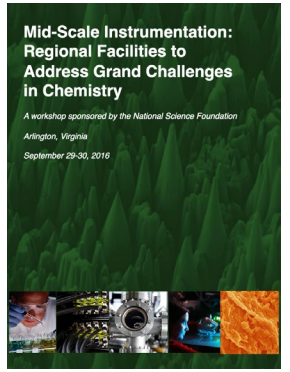
- Emphasize strong scientific merit;
- *Fill a research community-defined scientific need or address an identified national research priority;*
- Enable U.S. researchers and a diverse STEM workforce to remain competitive in a global research environment;
- Train students *in the design and implementation of mid-scale research infrastructure* and involve a diverse workforce in mid-scale facility development and/or associated data management.











Mid-scale RI-2 will not support:

- Pre-implementation research and development and other community or technical preparatory activities;
- Science or engineering research (except for validation of operational capability);
- Post-implementation research, operations, and maintenance;
- Education and outreach activities other than student training in the implementation of state-of-the-art research infrastructure;
- Projects for which the amount requested from NSF is outside the limits of this solicitation;
- General-purpose buildings, support systems and equipment that are not directly required for the implementation and eventual operation of the proposed infrastructure and/or that support multi-purpose usage in addition to research, e.g., classroom, offices, or general office space;

Mid-scale RI-2 will not support (continued):

- Infrastructure that is primarily at the regional, campus or local scale;
- Multiple pieces of infrastructure/instrumentation that are grouped together, either within a single campus or for a collection of consortium or campus labs, to meet the minimum Total Project Cost [TPC] but would not be widely recognized as a single, well-integrated entity that addresses documented national research priorities;
- Other organized activities, such as research centers, that are not consistent with the definition of NSF mid-scale research infrastructure provided in this solicitation.
- Continuation or renewal of project funded by the Mid-scale RI-2 program.

Project Execution Plan (PEP)

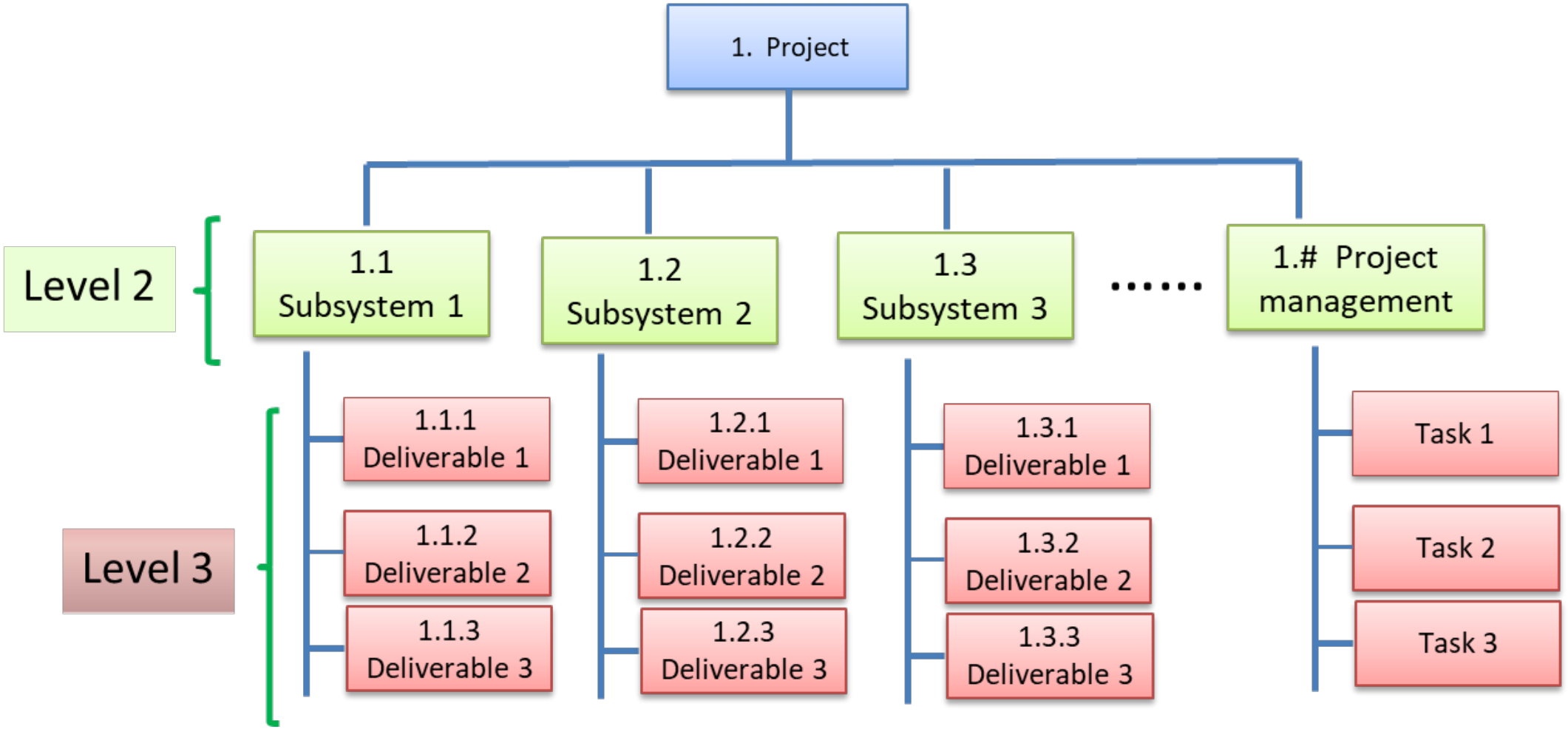
- Preliminary Proposal: A project Work Breakdown Structure (WBS) to level three and a brief description of the project management plan.
- Full Proposal: Mid-scale projects should be executed using well-established project management methodology. The specific project management approach used should be scaled to the needs of the project. The PEP should demonstrate the readiness of the project to be executed when an award is made and will be accordingly assessed during merit review.
- Solicitation provides a list of minimum required components of the PEP.
  - These are a subset of those required for NSF Major Facilities. See the NSF Research Infrastructure Guide (RIG, NSF 21-107), specifically Section 5 of the RIG, for definitions, https://www.nsf.gov/pubs/2021/nsf21107/nsf21107.pdf.
  - NSF provides a suggested PEP template for Mid-scale RI projects which describes the minimum required PEP components. See:

https://www.nsf.gov/bfa/lfo/mid-scale_guidance.jsp

Important project management factors to consider

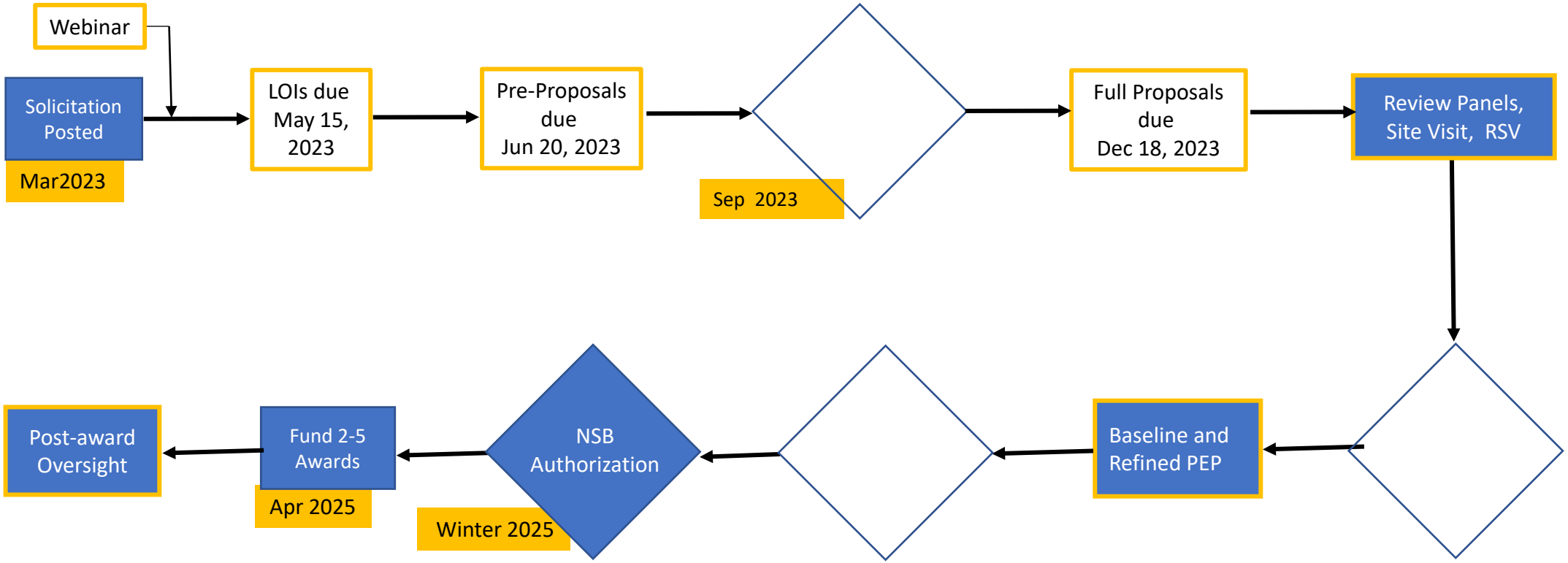
- Mid-scale RI-2 awards will be funded through the MREFC budget line and will require authorization from the National Science Board.
- Awards will be made using Cooperative Agreements. NSF post-award oversight and project reporting is more intensive than for research grants.
- Projects are expected (via the PEP) to
  - Lay out a Work Breakdown Structure (WBS) to define project scope.
  - Use the WBS to organize the project, i.e. respective costs, schedules, milestones, risks, contingency, and to assign roles and responsibilities of each member on the Project Management Team.
  - Define the Performance Measurement Baseline (PMB) comprising the proposed scope, budget, and schedule.
  - Propose Total Project Cost (TPC) comprising baseline budget plus budget contingency (if proposed).
  - Adopt a credible quantitative method of measuring and managing actual performance against the PMB.

WBS Example:*



*This is one typical example among many approaches. The nature of the project can determine the WBS approach.

Mid-Scale RI-2 pre-award process

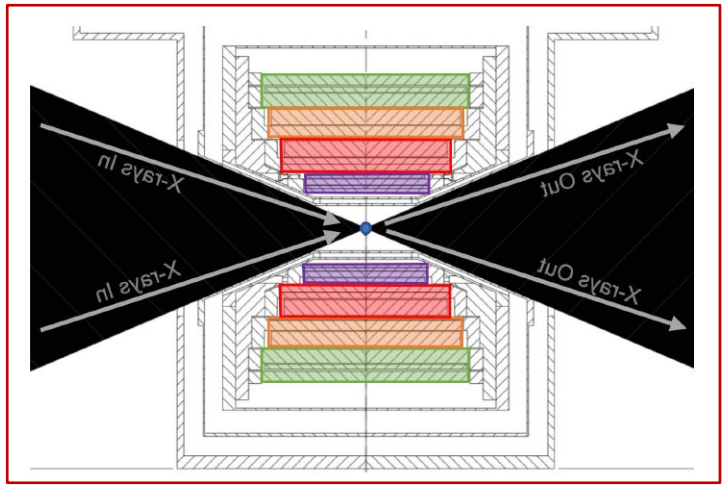


Mid-scale RI-2 Awards

NSF Award Search: Program Element = 109Y

Award # 1946998

High Magnetic Field Beamline



To build a dedicated High Magnetic Field (HMF) X-ray Beamline at the Cornell High Energy Synchrotron Source (CHESS): The world's highest magnetic field (20 tesla) at a synchrotron facility will enable new science in broad in materials, chemistry, engineering and biology.

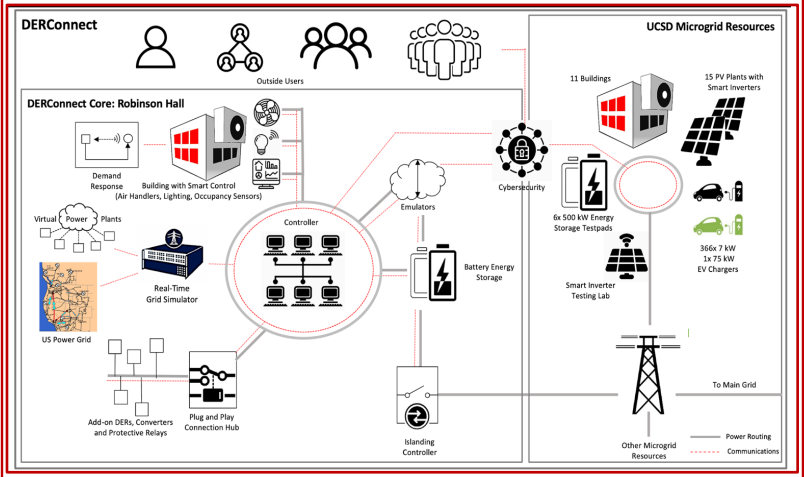
Award # 1946578

Global Ocean Biogeochemistry Array

This project will release a network of 500 robotic floats into the Global ocean to collect chemistry and biology data from the surface down to a depth of 2000m.

Award # 1947050

Grid-Connected Testing Infrastructure for Networked Control of Distributed Energy Resources



This project will provide unique, open-access assets with the potential to advance the integration of renewables and distributed energy resources into the power grids of the future.

Mid-scale RI-2 Awards

NSF Award Search: Program Element = 109Y

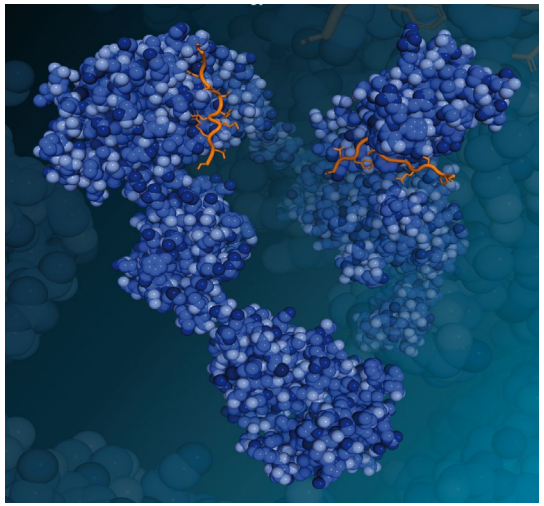
Award # 1946932

Research Data Ecosystem (RDE)

A comprehensive data infrastructure for the entire research lifecycle, RDE supports the discovery, preservation, analysis, re-use, and interoperability of data in the social, behavioral, and economic sciences.

Award # 1946970

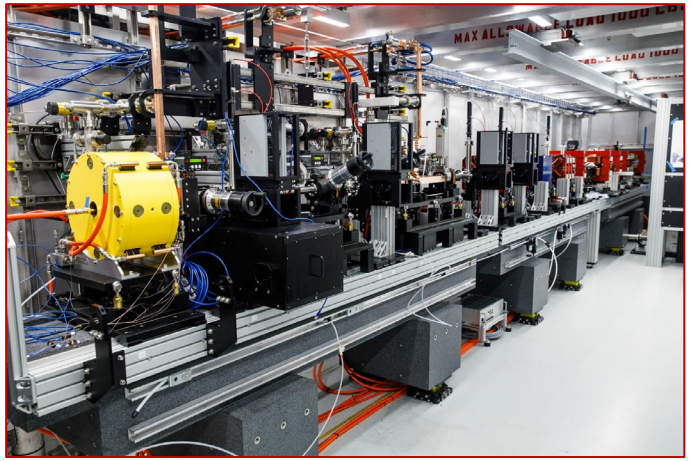
Network For Advanced NMR (NAN)



An integrated network of more than 20 NMR instruments, including two 1.1GHz systems and a shared cyberinfrastructure to support data analysis, preservation and dissemination will enable the broader research community and democratize access to high-field NMR systems.

Award # 2153503

Compact X-Ray Free Electron Laser (CXFEL)



A novel system to generate ultrafast pulses of hard x-rays and coherent soft-x-rays from a compact accelerator design for use in research across biology, physics, materials science, chemistry and other disciplines.

Project Management Resources

- 2023 NSF Research Infrastructure (RI) 3-part Webinar Series on Mid-Scale RI Project Management.
  - More info and registration: https://researchinfrastructureoutreach.com/2023-webinar-series/
  - Part I and II recorded sessions: https://researchinfrastructureoutreach.com/knowledge-gateway/

Part I: Mid-scale Project Planning & Management	Part II: Mid-scale Project Development, Definition and Risk	Part III: Mid-scale Project Performance Management
• **February 28, 2023** • Overview and key concepts of a PEP. • Basic Project Management concepts for RI projects. • Initial steps to develop a PEP for Mid-scale projects per NSF's RIG. • Review the first two PEP components: Introduction and Organization.	• **March 28, 2023** • Key Design/Development and Project Definition elements of PEP. • Project Definition (Baseline) • Scope and WBS • Quality Management • Schedule and Milestones • Budget and Basis of Estimate (BoE) • Risk and Contingency Management.	• **April 25, 2023, 12p - 1:30p EST** • Cover remaining PEP components. • Performance management techniques that are efficient, scalable, tailorable, and satisfy NSF's statutory obligations for managing and oversight.

- 2023 RI Workshop, June 27-30, 2023, info and registration: https://researchinfrastructureoutreach.com/2023-research-infrastructure-workshop/

Resource Infrastructure Guide (RIG) Key Sections

- Section 1.4 – Applicable Legislation and NSF Policy.
- Section 5 – Guidance for Mid-Scale Research Infrastructure Projects. This section refers to other RIG sections, such as:
  - Section 2.3.3.2 – Final Design Review
  - Section 3.4.1 – Components of a Project Execution Plan
  - Section 4.2 – Cost Estimating and Analysis
  - Section 4.2.5.7 – Contingency Use and NSF Oversight during Construction
  - Section 4.3 – Schedule Development, Estimating, and Analysis
  - Section 6.5 – Environmental Considerations
  - Section 6.8.4 – NSF Scaled EVMS
  - Section 6.8.5 – Practice Guide to Establish Scaled EVMS

Thank You!


NOVA
PBS
WGBH

Mid-scale RI-2 Q&A (page 1)

1. Q: Should we submit using Research.gov?

A: Letters of Intent and preliminary proposals must be submitted via *Research.gov; full proposals may be submitted via Research.gov or Grants.gov. Do not use FastLane.*

2. Q: The solicitation refers to "Major Multi-user Facilities" for large (≥$100 million) projects. Why are these no longer referred to as "Major Research Equipment and Facilities Construction" or "MREFC" projects?

A: *"MREFC" is a funding line in the NSF budget that is approved during the Congressional appropriations process. Mid-scale RI-2 projects in the $20 to less than $100 million range, solicitated through a separate solicitation, are funded through MREFC along with Major Facilities projects that are equal to or exceed $100 million.*

Mid-scale RI-2 Q&A (page 2)

3. Q: These are large projects so why are we limited to identify only a single PI and up to four co-PIs?

A: *The NSF Cover Sheet allows for only a single PI and up to four co-PIs with those titles. Other major participants may be designated as "Senior Personnel." For both preliminary and full proposals, Biographical Sketches are required for the PI, all co-PIs, and any additional Senior Personnel at all participating organizations. Additionally, Collaborators and other affiliations (COA) must be separately provided for each individual identified as Senior Personnel on the project as a Single Copy Document. For full proposals only, Current and Pending Support must also be provided for the PI, all co-PIs and Senior Personnel in the designated section of the proposal.*

Mid-scale RI-2 Q&A (page 3)

4. Q: We have a project that spans multiple directorates at NSF. How do we coordinate submission and especially long-term operations and maintenance (O&M) issues?

A: *NSF reserves the right to place a proposal in the proper division(s) for review and consideration of possible long-term O&M support for awarded infrastructure. As PIs, you can help by: a) following solicitation instructions including listing* on t*he first line of the Project Summary the most relevant Directorate(s) / Division(s) for review of the proposal; b) be clear in the proposal about the impacts on research areas that span multiple directorates; c) describe an operations plan that adequately addresses access to the infrastructure by all involved disciplines; and d) include as a Single Copy Document suggested reviewers and their expertise in the research areas covered by the proposal.*

Mid-scale RI-2 Q&A (page 4)

5. Q: What level of detail should be in a pre-proposal? Should it focus exclusively on the science, or should I try to address all aspects that you expect to see in a full proposal, but at a coarse-granular detail? I am afraid that I will get dinged on aspects that I have answers to but did not think was important to include in a pre-proposal.

A: *Follow solicitation guidance. There should be a strong focus on the scientific justification and research community priority. A compelling need for the infrastructure should be made clear.*

Mid-scale RI-2 Q&A (page 5)

6. Q: How detailed should the cost estimates be?

A: It is understood that cost estimates will undergo refinement (become more detailed and more accurate) as the proposed project goes through successive stages of the competition. *For pre-proposals, preliminary estimates are appropriate, but the basis for those estimates must be clear. Budget contingency, when applicable, should be included as part of the total amount of Other Direct Costs under section G.6 on the standard NSF budget form. Copies of vendor quotations should not be included in preliminary proposals.*

Mid-scale RI-2 Q&A (page 6)

7. Q: If I write a pre-proposal with a budget that is close to $100 million, and I receive a subsequent invitation for a full proposal that has a refined budget that is $100 million or higher, will it be considered for Major Facility funding with the higher budget?

A: *In either the preliminary or full proposal stage, the total project cost may come in at just below $100M, but Mid-scale RI-2 will not accept proposals with budgets of $100M or greater at any stage of the competition. If the budget for an invited full proposal is $100 million or greater, the proposal will be returned without review or declined, depending on where it is in the review process. This also applies if internal NSF review reveals that the budget as proposed is inadequate to complete the project. Proposals near the $100M limit should have robust risk analysis, supporting the proposed TPC and/or robust contingency addressing known risks. Projects outside of budgetary guidance will not be shifted among Mid-scale RI-1/2 programs or for consideration of Major Facility funding.*

Mid-scale RI-2 Q&A (page 7)

8. Q: What are the rules on collaboration letters from the industry partners, stakeholders, and other potential users of our proposed infrastructure in the full proposal round? How do this differ in the pre-proposal? Does the pre-proposal need some proof that companies or organizations are willing to support us?

A: *The only letters of collaboration that should be included with the* preliminary *proposals are those from international collaborators. Any involvement of industry or organization partners, stakeholders and potential collaborators in the project should be discussed in the Project Description and/or the Facilities, Equipment and Other Resources Section, or if appropriate in the Budget Justification and Supplemental Documents list of partners if funded through subawards.*

Letters of collaboration from private-sector partners or other organizations serving as partners in the implementation of the research infrastructure are allowed in full *proposals and should follow the directions in the solicitation. Per the PAPPG, letters of support are not allowed.*

Do not include a list of potential users of the proposed research infrastructure in the preliminary or full proposal.

Mid-scale RI-2 Q&A (page 8)

9. Q: When will decisions about full-proposal invitations be made?

A: *Our goal is to invite full-proposals in September. Full proposals may be submitted only if invited.*

10. Q: If I am not invited to submit a full proposal after preliminary proposal review, may I elect to submit one as an "uninvited" full proposal?

A: *No. Full proposals may be submitted only if invited. "Uninvited" full proposals will be returned without review.*

Mid-scale RI-2 Q&A (page 9)

11. Q: Our project will require ongoing Operations and Maintenance (O&M) support. How do we ensure that support is available?

A: *After Mid-scale RI-2 infrastructure is implemented, NSF has an expectation that ongoing O&M support will be available so that the infrastructure will lead to advance science and engineering research. The source of the O&M support may or may not be provided by NSF.*

Preliminary proposals *must* include an outline of operations and maintenance plans for the first five years of operation,

Full Proposals must discuss the overall plan for operating the infrastructure including at a minimum management/governance plans, strategy for access and utilization of the infrastructure by the target research communities, and planned metrics and evaluation of the success and impact of the NSF investment in this infrastructure. This section must also identify the anticipated sources of operations and maintenance funding.

As noted in the PEP Template at https://www.nsf.gov/bfa/lfo/mid-scale_guidance.jsp the PEP should have a section on Commissioning and Concept of Operations.

Mid-scale RI-2 Q&A (page 10)

12. Q: My project will be performed in a collaboration with international partners. Can they be included in the project as PIs, co-PIs, or senior personnel?

A: NSF welcomes international collaboration in all projects. Your project should clearly describe (1) true intellectual collaboration with a foreign partner and (2) benefits that are realized from the expertise, specialized skills, capabilities, phenomena, or other resources that the foreign collaborator or research environment provides. Your foreign collaborators should be listed as unfunded foreign collaborators. Biographical sketches using the NSF template must be included as supplementary documents. Typically, they can NOT serve as PIs, co-PIs or funded senior personnel on Mid-scale RI-2 proposals. Letters of collaboration from international collaborators should be included as Supplementary Documents in both the preliminary and full proposals.

Mid-scale RI-2 Q&A (page 11)

13. Q: My project proposes to make a significant contribution to an existing or developing infrastructure abroad. Can I include a subaward to a foreign institution?

A: Subawards to foreign institutions are very rare and involve specific requirements to be satisfied. Particularly, the PI must demonstrate that

- The foreign organization contributes a unique organization, facilities, geographic location and/or access to unique data resources not generally available to U.S. investigators (or which would require significant effort or time to duplicate) or other resources that are essential to the success of the proposed project; and/or
- The foreign organization to be supported offers significant science and engineering education, training or research opportunities to the U.S.

See details in the PAPPG or contact OISE for further guidance.

Earned Value Management (EVM)

- NSF suggests (does not require) that PIs consider using EVM for quantitative measurement of progress of Mid-scale RI-2 projects.
- EVM is a systematic project management method based on comparison of *worked performed* to *work planned* using basic variables and calculations.
  - **Planned value (PV):** Approved budget for work scheduled *to be completed* by a specified date;
  - **Earned value (EV):** Approved budget for work *actually completed* by that date;
  - **Actual cost (AC):** Costs *actually incurred* for the work completed by that date.
- EVM reports performance as differences ("variances") from plan, e.g.,
  - Schedule variance (SV) = (EV – PV), Cost Variance (CV) = (PV-AC), etc.
- NSF has established a "scaled EVM" approach to aid mid-scale projects.
  - See draft Scaled EVM guide: https://www.nsf.gov/bfa/lfo/mid-scale_guidance.jsp.
- There are alternatives to EVM for measuring and reporting project progress.