Request for Proposals: South Dakota NSF EPSCoR Research Infrastructure Improvement (RII) Track-1

Synopsis

The SD EPSCoR Program invites proposals to identify the Research Infrastructure Improvement (RII) Track-1 science and engineering research focus area(s) that will be included in the state's NSF RII Track-1 proposal to be submitted in July 2023. A letter of intent is required and will be used for planning the review process and providing early feedback to the proposers. Proposals submitted in response to this call will undergo a peer-review process. Teams that submitted proposals deemed to be competitive by peer-reviewers will be invited to participate in the NSF RII Track-1 proposal preparation process and to potentially serve as Co-Principal Investigator and senior personnel on the NSF RII Track-1 proposal. The process for preparation of the NSF RII Track-1 proposal will include (i) development and submission of a Track-1 planning grant proposal to NSF by South Dakota EPSCoR, South Dakota Board of Regents based on the selected participants focus (August 2022), and (ii) development and submission of an NSF RII Track-1 proposal that integrates research, education and workforce development goals (July 2023).

Letter of Intent Deadline: March 11, 2022, 5:00 PM (proposer's local time)

Proposal Deadline: June 10, 2022, 5:00 PM (proposer's local time).

Contact:

Mel Ustad, Director, SD EPSCoR Program, 4801 N. Career Ave, Suite 103, Sioux Falls, SD 57107; 605-274-9535 (EPSCoR office) 605-670-1678 (cell), Mel.Ustad@sdbor.edu.

EPSCoR Mission and Goals

The mission of EPSCoR is to assist the National Science Foundation in its statutory function "to strengthen research and education in science and engineering discovery throughout the United States and to avoid undue concentration of such research and education." EPSCoR goals are to:

- Catalyze the development of research capabilities and the creation of new knowledge that expands jurisdictions' contributions to scientific discovery, innovation, learning, and knowledge-based prosperity;
- Establish sustainable Science, Technology, Engineering, and Mathematics (STEM) education, training, and professional development pathways that advance jurisdiction-identified research areas and workforce development;

- Broaden direct participation of diverse individuals, institutions, and organizations in the jurisdictions' science and engineering research and education initiatives;
- Effect sustainable engagement of project participants and partners, the jurisdiction, the national research community, and the general public through data-sharing, communication, outreach, and dissemination; and
- Impact research, education, and economic development beyond the project at academic, government, and private sector levels.

The National Science Foundation supports this mission through Research Infrastructure Improvement (RII) Track-1 awards that are anticipated to be 5-year awards of $20 million with a 20% ($4 million) match requirement. South Dakota intends to submit a planning grant proposal in August 2022 and a new NSF EPSCoR RII Track-1 proposal in July 2023 with a tentative start date of July-Oct 2024.

South Dakota's science and technology plan, South Dakota Science and Innovation Strategy, will guide the Track-1 proposal selection and development. The plan focuses on the importance of digital data. The strategy acknowledges the critical role data will plan in the future. Today and to a greater extent in the future digital data will play a critical role in research and effective utilization of digital data will be critical to the operation of businesses, governmental entities and other organizations. Effective management, protection, analysis and use of that data is critical in all the target industry sectors, governmental entities, other organizations and by individual citizens of South Dakota.

2030 Roadmap Goals

1. Continue to make strategic investments in Governor's Research Centers, EPSCoR Track-1 projects and other programs to build multidisciplinary research capacity to compete for external funding and partner with target industry collaborators to implement innovations to grow South Dakota's economy and improve quality of life**.** Invest in target research areas aligned with target industry sectors and leveraging unique research facilities.

    - Target industry sectors
        - Value Added Agriculture and Agribusiness (Bioeconomy)
        - Energy and Environment
        - Human Health and Nutrition
        - Information Technology
        - Materials and Advanced Manufacturing

2. Strengthen the South Dakota's ability to develop and implement effective data management and utilization capabilities.
3. Increase the diversity, inclusion, and equity of South Dakota STEM workforce.
4. Cultivate a workforce pipeline by promoting STEM careers in the South Dakota K-12 education.
5. Support South Dakota's entrepreneurial ecosystem.
6. Expand access to early stage and growth stage financing and management experience
7. Develop an environment that facilitates effective technology transfer and research collaborations with industry partners and start-up companies.

Eligibility Information:

Proposals must represent a collaborative effort among the South Dakota Regental institutions that offer doctoral degrees in science and/or engineering, other public, tribal or private institutions in South Dakota. Collaborations involving the private sector, national laboratories or investigators from outside South

Dakota are strongly encouraged. No funds may be requested for participants from outside South Dakota as a part of an RII proposal.

PI Eligibility Limit:

An investigator may participate in only one proposal as a project director. An investigator may participate in more than one proposal as a senior investigator/co-PI.

Proposal Preparation and Submission Instructions:

A. Proposal Preparation Instructions

- Please see the full text of this solicitation for instructions on preparing the proposal.

B. Anticipated Timeline

- Request for Proposals Released
  - February 10, 2022
- Letter of Intent Due
  - March 11, 2022
- Proposals Due
  - June 10, 2022
- REACH Committee Selection
  - July 2022
- NSF Planning Grant Proposal Submission
  - August 2022
- NSF Full Track-1 Proposal Submission
  - July 2023

C. Proposal Review Information

- Merit Review Criteria:
  - Synergy with South Dakota Science and Innovation Plan
  - Proposed research is "truly" novel (NSF Big ideas and priorities https://www.nsf.gov/news/special_reports/big_ideas/nsf2026.jsp)
  - Proposed interdisciplinary research is transformative (NSF Big ideas and priorities)
  - Multidisciplinary research team includes participants from all SD PhD granting institutions
  - Proposed data management and utilization engages users.
  - Enhancement of South Dakota research infrastructure and competitiveness.
  - Potential for sustainability and economic impact beyond the project period

- An external review of proposals will be conducted using *ad hoc* reviewers and a peer review panel.
- Additional merit review considerations apply. Please see the full text of this request for further information.

I. INTRODUCTION

EPSCoR is based on the premise that universities and their faculty and students in science, technology, engineering and mathematics (STEM) fields are valuable resources that can have positive influence on a state's development in the twenty- first century in much the same way that agricultural, industrial and natural resources did during the twentieth century.

EPSCoR's goal, therefore, is to identify, develop, and fully utilize a state's academic science and technology resources in a way that will support a more productive and fulfilling way of life for its

citizens. To achieve this end, NSF cooperates with state leaders in government, higher education, and business to support productive long-term partnerships in support of common goals. These partnerships are designed to stimulate local action that will result in lasting improvements to the state's STEM research and educational infrastructure and increased national R&D competitiveness.

EPSCoR increases the R&D competitiveness of an eligible state through the development and use of STEM resources residing in its research, educational, and industrial institutions. While EPSCoR focuses primarily on those universities granting the state's Ph.D. degrees in STEM disciplines, effective partnerships between those universities and other institutions across the state are encouraged (e.g., predominantly undergraduate universities and colleges, community colleges, and local school districts). There is widespread agreement that our Nation's continued leadership in science, technology, engineering and mathematics (STEM) and the corresponding economic prosperity that it creates requires that all its educational and private sector resources be fully employed. Therefore, to ensure full participation of all our universities and colleges in our nation's economic and scientific future, opportunities for research experiences that prepare citizens for STEM careers is essential. This is especially true in institutions that have a special role in serving groups underrepresented in STEM careers (e.g., Primarily Undergraduate Institutions, community colleges and Tribal Colleges).

Through EPSCoR funding it is expected that sustainable STEM infrastructure improvements at the state and institutional levels will be achieved that can demonstrate a significant increase in EPSCoR participants to compete for mainstream federal and private sector R&D support.

II. PROGRAM DESCRIPTION

An NSF EPSCoR RII Track-1 award allows South Dakota to make strategic investments in building nationally competitive programs in specific areas of science and engineering that are consistent with state goals and focus on NSF priorities. Strategic investments generally take several forms including:

- start-up costs for hiring new faculty in targeted areas;
- equipping and staffing core research facilities;
- postdoctoral, graduate, and undergraduate research student support;
- creating new graduate programs and/or strengthening existing graduate programs;
- funds for developing technology-transfer capacity or university-industry partnerships such as entrepreneurship programs, internships or cooperative industry/university research infrastructure;
- increasing research access to state-of-the-art information technology;
- visiting-scientist programs;
- workshops and training courses;
- investments in mentoring programs for junior faculty;
- building a "bridge' to connect basic STEM research and education programs to the applied R&D and workforce development activities aligned with state science and technology plan;
- or any other strategy to enable South Dakota to dramatically increase its research competitiveness for nationally competitive research funding, particularly for NSF research funding, in a novel focused research area.

An NSF EPSCoR RII Track-1 award does not provide research project support in the traditional sense.
The purpose of an EPSCoR RII grant is to provide support for lasting improvements in a state's academic research infrastructure that are consistent with the state's strategic STEM goals and NSF priorities. EPSCoR support is intended to add specific value to the state's academic infrastructure not generally available through other funding sources. A RII Project enables the development of infrastructure needed to secure competitive research funding, not provide research funding.

An EPSCoR RII Track-1 proposal must describe the strategy and implementation mechanisms to develop and use the science and technology resources that currently comprise the state's research

enterprise. In preparation for submitting a proposal, the EPSCoR governing committee within each state is expected to have undertaken a comprehensive analysis of the strengths, barriers, and opportunities for development of its institutions in support of overall state objectives. Successful infrastructure improvement plans are likely to be those that represent the opportunities for enhanced academic R&D competitiveness among a state's universities, including plans for generation of sustained non-EPSCoR support. Most importantly, the state's infrastructure improvement strategy must identify implementation mechanisms that have a high probability of realizing stated goals and objectives. In all instances, specification of performance milestones and a timetable for achieving such milestones is a requirement for EPSCoR support. With EPSCoR support, it is expected that the improvement strategies will enable targeted research areas to become nationally competitive and sustained by non-EPSCoR support after the award period.

A key premise behind the initiatives undertaken with an RII award is that the outcomes must result in progress that will be sustainable beyond the life of the award. A specific goal is to demonstrate that the state is more competitive for extramural research funding, especially NSF research funding, in the chosen area at the end of an award than it was at its beginning.

It is important to note that an RII award is **NOT** the appropriate mechanism to provide support for individual faculty research projects. Requests for support of such projects should be directed to NSF's regular research and educational grant programs and a proposal must demonstrate how it will achieve this goal. In addition, because EPSCoR investments are important to enhancing a state's competitiveness, it is expected that equipment purchased with EPSCoR funds will remain in the state and will not be transferred should an investigator transfer to another state.

It is anticipated that a new RII Track-1 award will provide $24M over a five-year period ($20M NSF, $4M anticipated state cost-share). This amount will be used to fund the research infrastructure improvement components, and the education, outreach, human resource development and administrative components of the project. In the past, NSF has required a significant “jurisdictional and institutional commitment” in support of an RII proposal. NSF’s formal announcement of the FY24 RII competition in the spring of 2023 will have the final say on this issue.

III. ELIGIBILITY INFORMATION

The research lead is limited to South Dakota Regental institution faculty that offer doctoral degrees in one or more STEM disciplines. Proposals must represent a multidisciplinary collaborative effort among the South Dakota Regental institutions, tribal colleges and other South Dakota research organizations. No funds may be requested for participants from outside South Dakota as part of an NSF EPSCoR RII Track-1 proposal.

The research infrastructure development focus area must have national and statewide impact and be directly aligned with NSF Big Ideas and South Dakota’s State Science & Innovation Plan.

A single investigator must be designated as the research project lead. An investigator may participate in only one proposal in this role. An investigator may participate in more than one proposal as a senior investigator.

To be considered in this competition, a research infrastructure development focus area must be in an NSF-fundable area, address at least one of the NSF Big Ideas and involve truly novel research. Proposals outside the NSF criteria are inappropriate and will be returned without consideration.

IV. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS

A. Proposal Preparation Instructions

Proposals submitted in response to this request should be prepared in accordance with the general guidelines contained in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) with some deviations mentioned below. The complete text of the PAPPG is available electronically on the NSF Website at: https://www.nsf.gov/pubs/policydocs/pappg22_1/index.jsp

The research leadership should consist of a small group of the senior investigators that includes the research focus area leader for each area and represent each collaborating institution. The research lead should be a senior faculty member with demonstrated organizational, managerial, and leadership ability who is willing and able to devote the considerable time needed to build and manage a substantial research organization. The remainder of the leadership team must include senior investigators (co-PIs) at the project's collaborating research institutions.

1. Letter of Intent

A Letter of Intent is a required prerequisite to submitting a proposal in response to this solicitation. The Letter of Intent should be prepared as a single-spaced document and written for a layperson. The REACH Committee will review the Letters of Intent and provide feedback to proposers. The Letter of Intent must be submitted by the lead institution's Sponsored Program Office. The Letter of Intent may be up to two-pages and must include:

Project Title

Research Team
Leadership team must include representation from all South Dakota research institutions. Research team's qualifications to successfully develop and execute the proposed work; Who are the leaders and how balanced is the team across SD institutions of higher education? What are the team's strengths and how the proposed project will leverage existing infrastructure and talent?

Project Summary
The project summary should include the following components.

Intellectual Merit and Broader Impacts:
What is the broader research question to be addressed and is it relevant to State priorities and NSF big ideas? How does the research push the knowledge frontier and help South Dakota?

Research Infrastructure:
Key research infrastructure gaps (physical, cyber and human capital) to be addressed and relevance to the research question and state workforce development priorities; Why addressing this infrastructure gap is critical to the research question and how does it help South Dakota become competitive in obtaining research funding, generating innovations and building a workforce for the future?

Sustainability:
How will the research infrastructure form the foundation for externally funded research during and following the five-year project period?

2. Full proposal

Full proposals not preceded by a Letter of Intent will be returned without review. The proposal should include the following components.

A. Cover Page (1 page)

- Project Title
- Project Lead name, contact information, and institutional affiliation

- Collaborating campus, participants name, contact information and institutional affiliation
- Signature from Authorized Official of the Lead institution (Typically this is the Vice President of Research).

B. Project Summary (1 page)

- The project summary should a project overview, intellectual merit and broader impacts.

C. <u>Project Description (13 pages)</u>

The Project Description should clearly define the goals of the infrastructure development to be accomplished during the project, describe how the desired goals will be achieved and how the success of the activities will be evaluated.

<u>Project Description.</u> The Project Description in the full proposal should be prepared using the following page-limit guidelines for each section described below (13 pages total). Proposals should use the Times New Roman 11-point font and have 1-inch margins. Proposals not adhering to the page limit will be returned without review.

1. **The current status of the jurisdiction's academic R&D enterprise relevant to the proposed project area must be described (2 pages).** How the research is truly novel and aligned with NSF's strategic research investment priorities (i.e., How are the proposed activities aligned with NSF's "Big Ideas"?). The proposal narrative should provide convincing background and rationale for the project's scientific vision and how it is novel and South Dakota is uniquely capable to do the research. <u>It should show how the overall strategy and accompanying implementation mechanisms, if augmented with the requested infrastructure support, will improve the jurisdiction's competitiveness for federal, jurisdictional, and private sector R&D funding.</u> This narrative must describe how the activities will add significantly and measurably to research capability in S&T areas of high institutional and jurisdictional priority (i.e., How are the proposed activities aligned with and support the SD State Science and Innovation Plan?).

   The narrative should demonstrate how the specific S&T infrastructure improvements and activities proposed will advance the jurisdiction's future research competitiveness and develop clearly focused research areas. This description must include a comprehensive analysis of the strengths, barriers, and opportunities for development of its academic institutions in support of overall jurisdictional R&D objectives making South Dakota a research leader in this area.

2. **Description of the research program and research infrastructure development activities (8 pages).** The research program is the heart of a RII Track-1 proposal and all other project components are built around it and integrated with it. This section must propose truly novel and nationally competitive research. Thus, a clearly articulated narrative is critical for a successful proposal.

- For each research area proposed, clearly distinguish how much of the future work would be research (with the needed infrastructure in place) and how much would be research infrastructure improvement (effort toward establishing the equipment and human resources needed for research excellence in the chosen topical area). Provide a concise description of the research, intellectual focus, and describe the planned activities in sufficient detail to enable their scientific merit and broader impacts to be assessed.

  Present proposed research in each focus area in the context of other efforts in the field (with appropriate references), state the major challenges, and comment on novelty and/or originality of the proposed approach. The Research description must contain sufficient details regarding the scientific hypotheses, goals, and research and training methods (laboratory, field, theoretical, computational, or other) such that experts in the field of proposed research or closely related fields may accurately

judge the intellectual merit and broader impacts of the proposed research. All proposals must include a detailed data management plan that includes details on data acquisition (types and amounts of data), security, management, and how the data will be disseminated and utilized by all potential users.

In addition to providing clear and concise evidence for intellectual merit and broader impacts of the research and education activities, this section should:

- Identify the senior leadership representing collaborating institutions, describe their role and estimate the numbers of junior faculty, postdoctoral, graduate, and undergraduate research participants. Briefly outline the resources (available and planned) to accomplish the research goals.
- Clearly establish the means of developing a coordinated, collaborative multidisciplinary "team-science" approach involving multiple investigators and institutions to develop the full proposal. Describe interactions with other groups and organizations within the jurisdiction and at the national and international levels.
- Briefly describe the mechanisms that will be employed to catalyze research in emerging areas including anticipated funding amounts and durations for seed projects.
- Describe the roles of the participating institutions and the private sector partners in achieving the research and research infrastructure development goals.
- Provide well-documented data and other evidence, including clear references and citations to data sources, to support claims throughout the Project Research Description

3. **Plans for workforce development, including involvement of undergraduate students, graduate students, postdoctoral associates, and new faculty hires (1 page).** The scope of RII Track-1 activities must include specific STEM workforce development activities that are integrated with the research and education program and contribute to the preparation of a new cadre of competitive researchers, innovators, and educators. The narrative should indicate synergies between proposed workforce development activities and state workforce development initiatives and identified workforce needs. This should include plans for broadening participation.

4. **Description of a plan for long-term sustainability of the proposed research program that clearly presents the strategy and implementation plan (with milestones) for sustaining the impacts and achievements in the science and technology enterprise after the period of proposed NSF EPSCoR support (1 page)**. The RII Track-1 is not intended to provide a substitute for NSF individual investigator funding and it is expected that participants will be actively seeking and receiving NSF investigator research grants (and other agency funding as appropriate). This section should describe the vision and specific plans for supporting and continuing to grow the research activities beyond the duration of a RII Track-1 award. Present a detailed strategy to build ongoing research relationships and generate subsequent, sustained non-EPSCoR funding from federal, jurisdictional, and private sector sources.

5. **Identification of potential broader impacts of the project including education and outreach, diversity and economic and societal impacts (1 page)**. Broader impacts are a major NSF review criteria and initial ideas regarding broader impact should be discussed.

D. Results from Prior EPSCoR RII Track-1 Support. Inclusion of this section is required only by those proposals whose research topics have been, or currently are, a research focus of a funded NSF EPSCoR RII Track-1 project. This section must document the competitive status of the proposed research area as a result of prior/current RII Track-1 funding. This may be documented through a list of publications acknowledging the support of that award, a list of the individual or group NSF research grants (project title, PI/CoPIs, title agency, amount awarded, start date and duration) and any other similar metrics that the proposers wish to provide to demonstrate their progress towards competitive status. How additional NSF EPSCoR RII Track-1 funding will enhance its competitive status. The proposal must demonstrate the impact that additional funding would have on the state's research competitiveness in this research. This section is limited to 2 pages of narrative plus any additional lists of

metrics provided to support. This section is outside the page limit.

E. References Cited. Reference information is required. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. This section is outside the page limit.

F. Budget and Budget Justification. A high-level budget showing proposed allocation of research funds, estimated total of $14 million, by participating institution should be included using the table below. This section is outside the page limit.

Organization	Year 1 ($K)	Year 2 ($K)	Year 3 ($K)	Year 4 ($K)	Year 5 ($K)	Total (K)
Participating Institutions						
Total						$14,000

G. Biographical Sketches. A biographical sketch, limited to two pages and presented in NSF format, is required and should be included for each senior investigator. This section is outside the page limit.

H. Letters of Commitment. Letters of commitment should be included as an appendix. These are not letters of support for the project but letters that commit resources to its implementation, for example support for new tenure-track lines beyond the project period, space and maintenance plan for equipment to be acquired, the required cost-share, etc. Each participating institution should provide a separate letter on institutional letterhead and signed by an individual with the authority to make the commitment described. This section is outside the page limit.

V. ANTICIPATED DUE DATES

Proposals must be submitted electronically in PDF format, each as a single file, e-mail attachment to the SD EPSCoR program office by the date and time indicated in the formal RFP using the following e-mail address: Marcy.Olsen@sdbor.edu

- Request for Proposals Released
  - February 10, 2022
- Letter of Intent Due
  - March 11, 2022
- Proposals Due
  - June 10, 2022
- REACH Committee Selection
  - July 2022
- NSF Planning Grant Proposal Submission
  - August 2022
- NSF Full Track-1 Proposal Submission
  - July 2023

VI. WHERE TO SUBMIT

Letters of Intent and proposals should be submitted electronically as a single file in PDF format as e-mail attachments to the SD EPSCoR Office using the following e-mail address: Marcy.Olsen@sdbor.edu.

VII. PROPOSAL REVIEW INFORMATION

Letter of Intent Review. The goal is to develop the strongest Track-1 proposal for submission to NSF. To facilitate that the REACH Committee will review the Letters of Intent and provide feedback to applicants. The letters of Intent will also be available for all proposers to review and consider potential collaborations and resources they may want to include in their proposal.

Proposal Review Process. A two-phase proposal review process will be used to select the research focus area(s) for the next state submission. An external organization will be contracted to conduct a technical review of proposals. Phase I of this review will consist of an *ad hoc* technical review of the proposals received. Based on the technical reviews the research teams will be invited to present to the SD EPSCoR Advisory Committee (REACH) to select the research focus that will be included in the NSF Track-1 planning grant proposal. During the planning and proposal development process the details of the research, education, outreach and economic development activities will be developed. This will include budget details.

Proposal Review Criteria.

Proposals will be reviewed using the NSF review criteria described in the PAPPG (Intellectual Merit, Broader Impacts, etc.). Additional evaluation criteria that the reviewers will be asked to consider in their assessment of the proposals include:

- Synergy with South Dakota Science and Innovation Plan
- Proposed research is "truly" novel (NSF Big ideas and priorities https://www.nsf.gov/news/special_reports/big_ideas/nsf2026.jsp)
- Proposed interdisciplinary research is transformative (NSF Big ideas and priorities)
- Multidisciplinary research team includes participants from all SD PhD granting institutions
- Proposed data management and utilization engages users.
- Enhancement of South Dakota research infrastructure and competitiveness.
- Potential for sustainability and economic impact beyond the project period