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National Science Foundation (NSF)

# Gen-4 Engineering Research Centers (ERC)

## Solicitation Overview

The goal of the ERC program has traditionally been to integrate engineering research and education with technological innovation to transform and improve national prosperity, health, and security. Building upon this tradition, NSF is interested in supporting ERCs to develop and advance engineered systems, which if successful, will have a high Societal Impact.

ERCs create inclusive cultures not only to integrate scientific discovery with technological innovation through convergent engineered systems research and education, but also to benefit from the full participation of people traditionally underrepresented in engineering, stimulating creativity and fresh perspectives. ERCs build partnerships with industry, practitioners, and other key stakeholders to strengthen the innovative capacity of the United States in a global context. In addition to building capacity for research, innovation, and a diverse workforce, ERCs are expected to produce significant outcomes within the 10-year timeframe of NSF support and beyond.

ERCs should realize a vision of advancing an engineered system driven by clearly articulated societal impact and should have strong synergies or value-added rationale that justifies a center or institute-like approach. As part of creating sustainable positive impacts on society and communities, ERCs should focus on positive outcomes that can be seen within engineering communities and build and empower human resource capacity for their targeted engineering challenges. Beyond this, ERCs should contribute to the scientific enterprise by advancing research, science, engineering fundamentals, and research communities. This should be demonstrated with benchmarks against the state-of-the-art. ERCs should build knowledge, prepare students and researchers that respect and flourish in an environment with diverse perspectives, impact how engineering research is conducted and provide value for society.

## Award Information

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| **Solicitation issued** | Mar. 6, 2020 |
| **Deadlines** | *LOI:* Sept. 2, 2020<br>*Pre-proposal:* Oct. 2, 2020<br>*Full Proposal:* May 7, 2021<br>*Projected Start Date*: Sept. 1 2022. |
| **Eligibility** | Only U.S. universities that grant engineering degrees at the undergraduate, masters, and doctoral engineering level may submit proposals as the lead university. |
| **Award info. & Duration** | The maximum allowable budget per year ranges between $2.6M - $6M. The total maximum budget for the project is $50.6M assuming a positive performance review during the fourth year. The total performance period is up to 10 years, but can be 5 years depending on the renewal review.<br><br>NSF intends to make up to 5 awards. |
| **Link** | Full Solicitation |

# Changes to the New Gen-4 ERC Solicitation

## Adapted Sections

| Section | Old Text | New Text |
|---|---|---|
| **Number of Awards** | Up to 4 | Up to 5 |
| **Eligibility Information** | The Lead PI must be a *tenured* faculty member at the lead university. | The Lead PI must be a faculty member at the lead university. |
| **Preliminary Proposal Instructions** | What is the compelling new idea and what is the potential high societal impact? | What are the compelling new ideas and the potential high societal impacts? Are they high-risk but high-payoff?<br><br>How do the proposed centers research benchmarks against the state of the art? |
| **Engineering Workforce Development** | At least 6 non-ERC students must enroll in a Research Experiences for Undergraduates (REU) program budgeted at a minimum of $42K per year from the ERC base budget. | At least 6 non-ERC students must enroll in a Research Experiences for Undergraduates (REU) program budgeted at a minimum of $50K per year from the ERC base budget, as well as at least 6 participants must be engaged in a Research Experiences for Teachers (RET) program budgeted at a minimum of $60K per year from the ERC base budget. |
| **Diversity and Culture of Inclusion** | Groups traditionally underrepresented in engineering include African Americans, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, Native Pacific Islanders, women, and persons with disabilities. | The ERC program is committed to enhancing the diversity and inclusion of all underrepresented populations in engineering, including gender identity and expression, race and ethnicity (African Americans/Blacks, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders), disability, LGBTQ+, first generation college and socio-economic status. |
| **Financial Support and Functional Allocation of Resources** | Discuss the plans for financial and in-kind support from all sources, except the cost sharing. Include plans for allocation of those resources to fulfill the goals of the ERC. Include a functional budget table, showing only the estimated proportional distribution of effort across the functions of the ERC in its first year without showing the support levels from any sources. | Discuss the plans for financial and in-kind support from all sources, except the cost sharing. Include plans for allocation of those resources to fulfill the goals of the ERC. Include a functional budget table, showing only the estimated proportional distribution of effort across the ERC in its *first 5 years* without showing the support levels from any sources. |
| **Review and Selection Process** | The anticipated review process consists of a LOI followed by a preliminary proposal. The LOI is used for planning purposes and is not reviewed. Preliminary proposals are reviewed through Ad hoc Reviews and/or Panel Reviews. Full proposals are invited after the preliminary proposals are reviewed. The full proposals are first reviewed through Ad hoc Reviews and/or Panel Reviews. The most promising full proposals will be selected for pre-award site visit review followed by a reverse site visit panel after which recommendations for awards will be made. | The solicitation has extensive additional review criteria, for both the preliminary proposals and the full proposals. These criteria are listed in the solicitation. The expectations for an ERC go beyond the general intellectual merit and broader impact requirements of the usual NSF review. Specifically, the ERC proposal must exhibit synergy or value-adding features that justify center- or institute-type support, rather than an equivalent level of support for individual or small groups of investigators. The ERC must describe a convergent approach that will allow the ERC to have a major societal impact. The ERC must demonstrate a management plan that will support these efforts, and a commitment to the four foundational components (convergent research, engineering workforce development, diversity and a culture of inclusion, and an innovation ecosystem). Review questions have been developed to help reviewers assess these requirements. The review process first breaks down to sixteen panels for the preliminary proposals, from which a subset will be invited to submit a full proposal. Three panels will be done for the full proposals, and ten anticipated site visits. |

## New Sections

| Section | New Text |
|---|---|
| **Eligibility Information** | There is no maximum number of partner institutions. |
| **Award Information** | No-cost extensions (NCEs) will not be granted. |
| **Program Description** | Beyond this, ERCs should contribute to the scientific enterprise by advancing research, science, engineering fundamentals, and research communities. This should be demonstrated with benchmarks against the state-of-the-art. ERCs |
| **ERC Infrastructure** | The Center Director should understand her/his strengths and limitations and be effective in assembling an executive leadership team that fills in the gaps of her/his limitations. The Director does not need to be a faculty member. |
| **Advisory Boards** | The Student Leadership Council and the Council of Deans are mandatory advisory groups. Other advisory boards are expected to be formed according to the needs of the ERC. |
| **Project Title** | The title should begin with “NSF Engineering Research Center for (insert the rest of the title and the Center's acronym)". The rest of the title and acronym can change from the LOI to the submitted preliminary proposal as long as it is in the same topic area. The title should reflect the system focus of the proposed ERC. |
| **Proposing Team** | The team table in the supplemental documents should include only those personnel who would receive NSF funds. This table is used to identify potential reviewer conflicts of interest. |
| **Infrastructure (Organization and Management)** | Note that there is no recommendation for how ERCs should be managed. This solicitation provides for flexibility on organization structure and management and is part of the review criteria – as such the proposal should clearly justify the proposed structure. |
| **3-Plane Strategic Planning Chart** | The chart should be at least half a page, but a full page is recommended for legibility. This section should clearly state what new knowledge is expected that would advance the state of the art in key research areas. |
| **Diversity and Culture of Inclusion** | This section should include evidence-based and intentional programming to support diversity and a culture of inclusion. |
| **Engineering Workforce Development** | Engineering workforce activities should contribute to a diverse, globally competitive, and team-oriented engineering workforce that has experience in convergent research, technology advancement, industrial practice, and innovation. Rather than a comprehensive set of training opportunities (general public, faculty, professional, vocational, graduate, undergraduate, and K-12), EWD programs should include a strategic selection of targeted activities that will enable the long-term vision of the Center. ERCs should leverage team and institutional expertise and resources to maximize impact with targeted activities. |
| **Letters of Commitment** | These letters should express commitment, but should not praise or advocate for the project, and must follow the format for letters of collaboration given in the PAPPG. |