



Engineering Research Centers

Gen-4 ERC: **Convergent Research and Innovation through Inclusive Partnerships and Workforce Development**

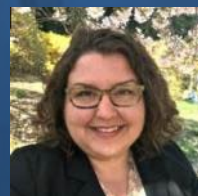
NSF 24-576

Summer 2024 Webinar

Live events with the NSF ERC Team!



Sandra Cruz-Pol



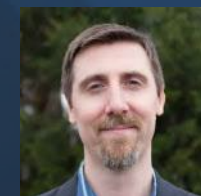
Dana Denick



Randy Duran



Nadia El-Masry



Paul Torrens



Lan Wang

Webinar Outline



- Gen-4 ERC solicitation goals
- ERC program model
- ERC strategic approaches
- Changes for Gen-4 solicitation
- Gen-4 24-576 ERC solicitation review
- Submitting questions



24-576 Gen-4 ERC Solicitation Goals

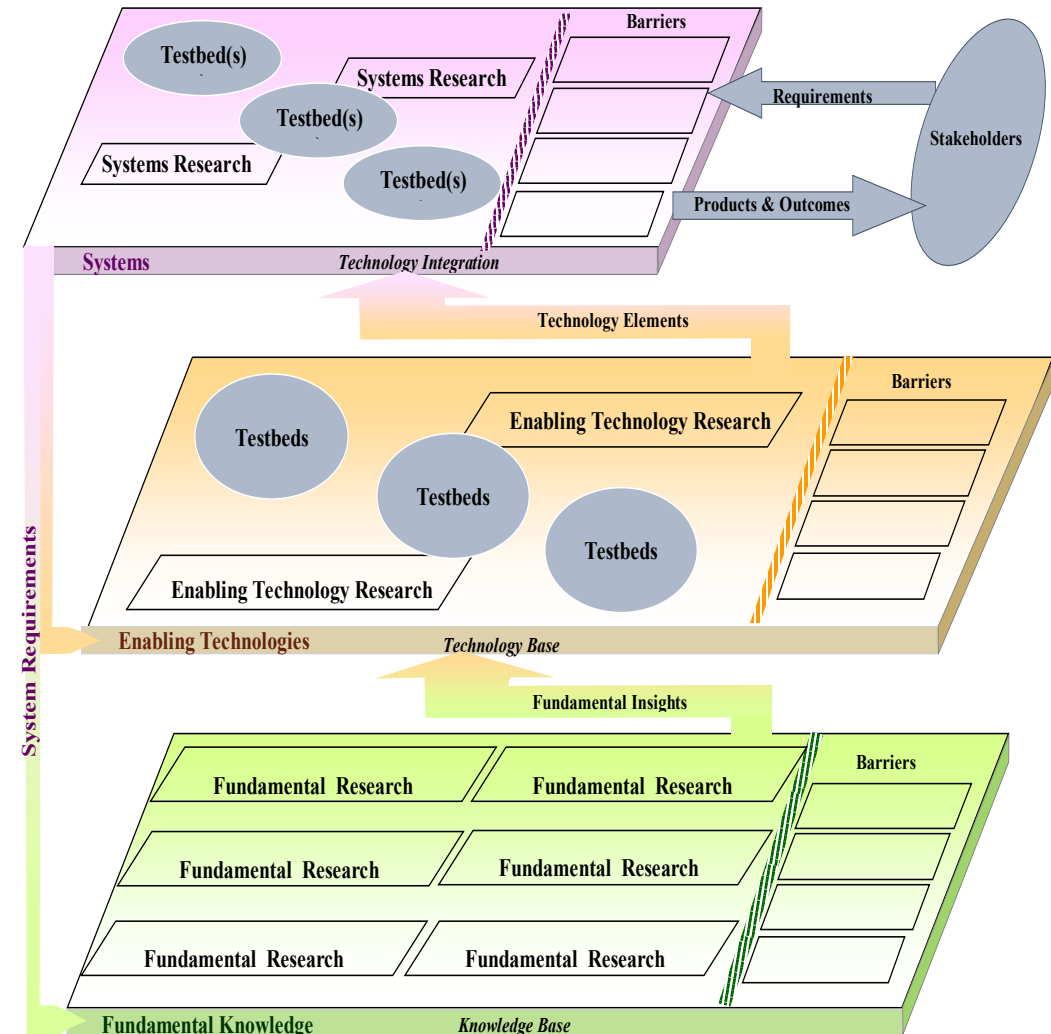
ERC solicitation was informed by a study from *NASEM*.

- Emphasis
 - **high-risk/high-payoff** engineered systems, rigorous engineering research
 - inclusive **cross-disciplinary** and **cross-sector** partnerships
 - **High societal impact**
 - **Convergent** approaches
 - **Stakeholder** engagement
 - **Team science** efficiencies
- ERCs should have strong synergies or value-added rationale that justifies a Center or institute-like approach.



Strategic Planning

- Describe the vision of the engineered system
- Define the engineered system, and identify barriers preventing realization of the system
- 3-Plane Strategic Planning Chart
 - System level with stakeholder input
 - Enabling level
 - Fundamental level



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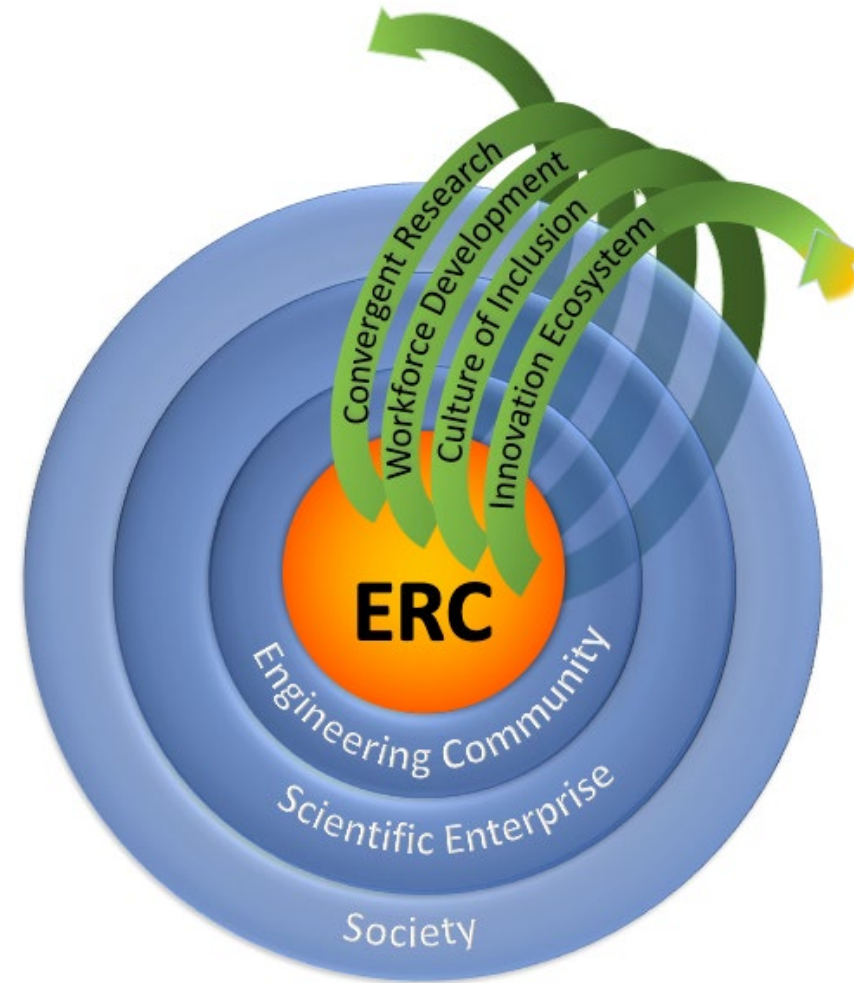


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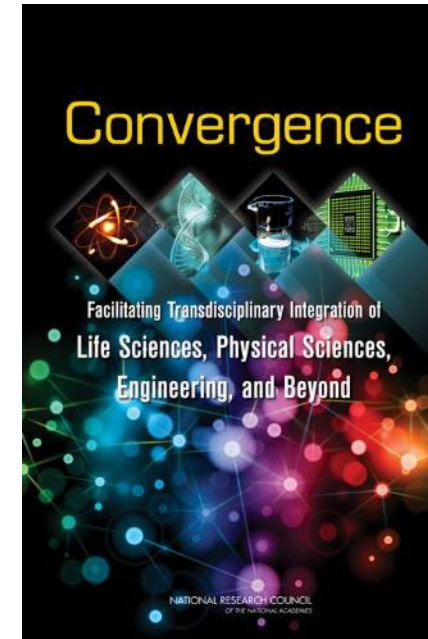
The ERC Model

- Foundational Components:
 1. Convergent Research (CR)
 2. Engineering Workforce Development (EWD)
 3. Diversity and Culture of Inclusion (DCI)
 4. Innovation Ecosystem (IE)
- Areas of Impact:
 1. Engineering Community
 2. Scientific Enterprise
 3. Society



Foundational Components: Convergent Research (CR)

...“deeply integrates knowledge, tools, and ways of thinking from life/health sciences, physical, mathematical, and computational sciences, engineering disciplines, and beyond to form a comprehensive synthetic framework for tackling scientific and societal challenges that exist at the interfaces of multiple fields”



NAE study on Convergence
<https://www.nae.edu/113283.aspx>

- CR is the “first gate” of any ERC effort
- No foundational component of an ERC can be weak



Foundational Components: Engineering Workforce Development (EWD)

- **Human resource development** aligned with the targeted engineered system.
- **Workforce Development** at all levels of the Center



Foundational Components: Diversity and Culture of Inclusion (DCI)

- The culture of the ERC creates an environment in which **all members** feel valued, contribute, and mutually benefit.
- **Diversity** in terms of **scientific fields, traditionally underrepresented groups and other perspectives** is required.

Diversity is being invited to the Party. Inclusion is being asked to dance - Vernā Myers

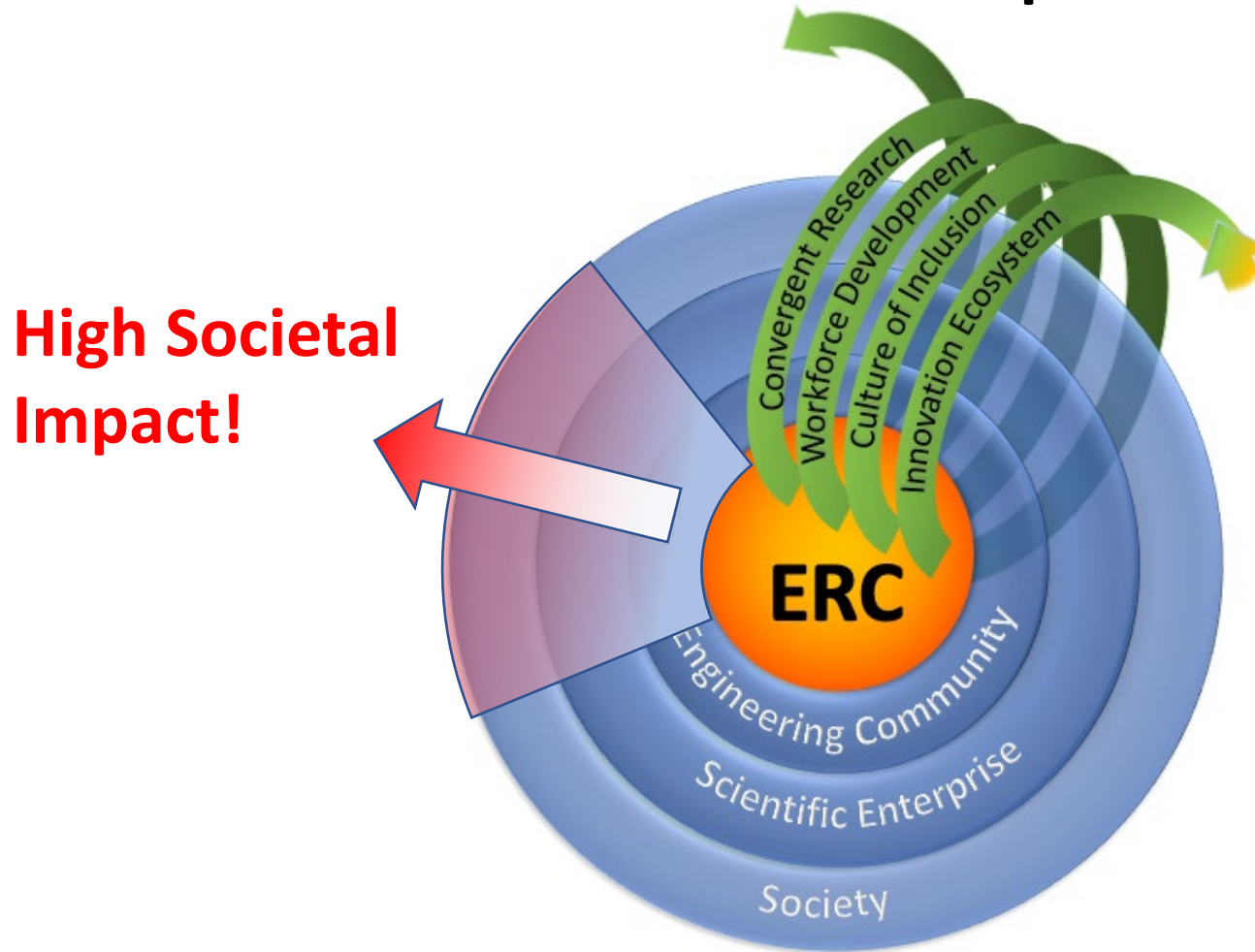


Foundational Components: Innovation Ecosystem (IE)

- **Trusted** partners that work together to create and enhance the **capacity for innovation**.
- **Effective translational efforts**.
- **Articulate plans** for strategic engagement of the broader stakeholder communities at the heart of a GEN-4 ERC.



The ERC Model: Societal Impact



Areas of Impact:

Engineering Community

Preparing students and researchers by impacting

- New areas of engineering, or new disciplines
- Best practices for workforce development,
- Innovations in diversity and inclusion
- Excellent academic-industrial partnerships



Areas of Impact:

Scientific Enterprise

- Create major impact that informs the engineering community, scientific community and beyond.



Areas of Impact:

Impact on Society

- Represents opportunities and challenges addressed through advances in engineering research and innovation for the benefit of society at large.
 - Potential **societal impact** should be relevant, responsible, and complex, and not limited to any specific schema of grand challenges



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ERC Strategic Approach: **Convergence**

- deeply collaborative, team-based approach for solving most complex societal problems
- blends scientific disciplines in a coordinated, reciprocal way
- strong potential to lead to transformative solutions and new fields of study



ERC Strategic Approach: Stakeholder Engagement

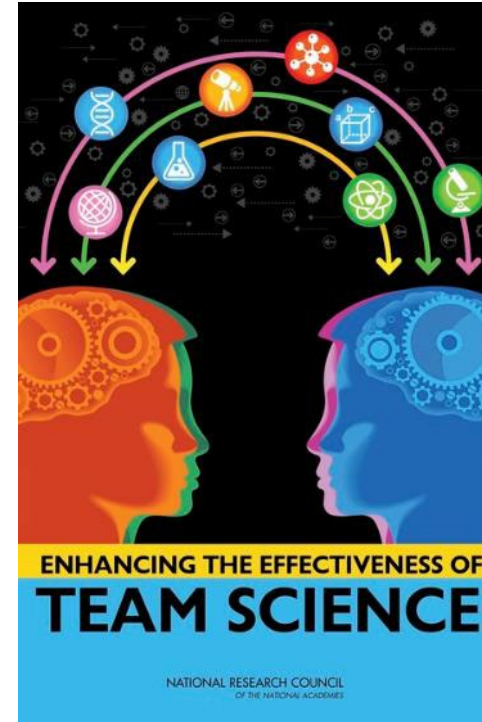
- intentional and early-stage engagement of all parties who may contribute to the ERC or may be impacted by the ERC
- examples: relevant researchers, industry leaders, partners, regulatory agencies, national labs, government agencies, and beneficiaries



ERC Strategic Approach: Team Formation

process to bring all necessary disciplines, skills, perspectives, and capabilities together

evidence-based strategies and team science training to overcome barriers to effective, collaborative teaming



Best practices:

<https://www.nap.edu/catalog/19007/enhancing-the-effectiveness-of-team-science>

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Changes in Gen-4 ERC Solicitation:

Required MSI core partner

- The lead or at least one of the core partner universities must be a STEM-MSI university which is defined by the Department of Education as institutions of higher education enrolling populations with significant percentages of undergraduate minority students, or that serve certain populations of minority students under various programs created by Congress.
- Eligibility may be defined by reference to the [Integrated Postsecondary Education Data System \(IPEDS\)](#) of the US Department of Education.



Flexibility in Eligibility

- Limit on number of letters of Intent and preliminary proposals:
 - Per Institution: None
 - Per PI or Co-PI: None
- The lead institution must have an Engineering Department/School, offering these degrees: BS, MS, PhD.



Flexibility in Personnel

- **Principal Investigators (PI):**

- Lead PI must be a faculty at the lead university.
- Lead PI does not have to be from Engineering. Need letter of support from PI's Dean of Engineering.
- Non-Lead PIs are listed on the Cover Sheet after the Lead PI and may be from institutions other than the lead university.
- The Lead PI and the ERC Director are not required to be the same person, but both must be from the Lead Institution.

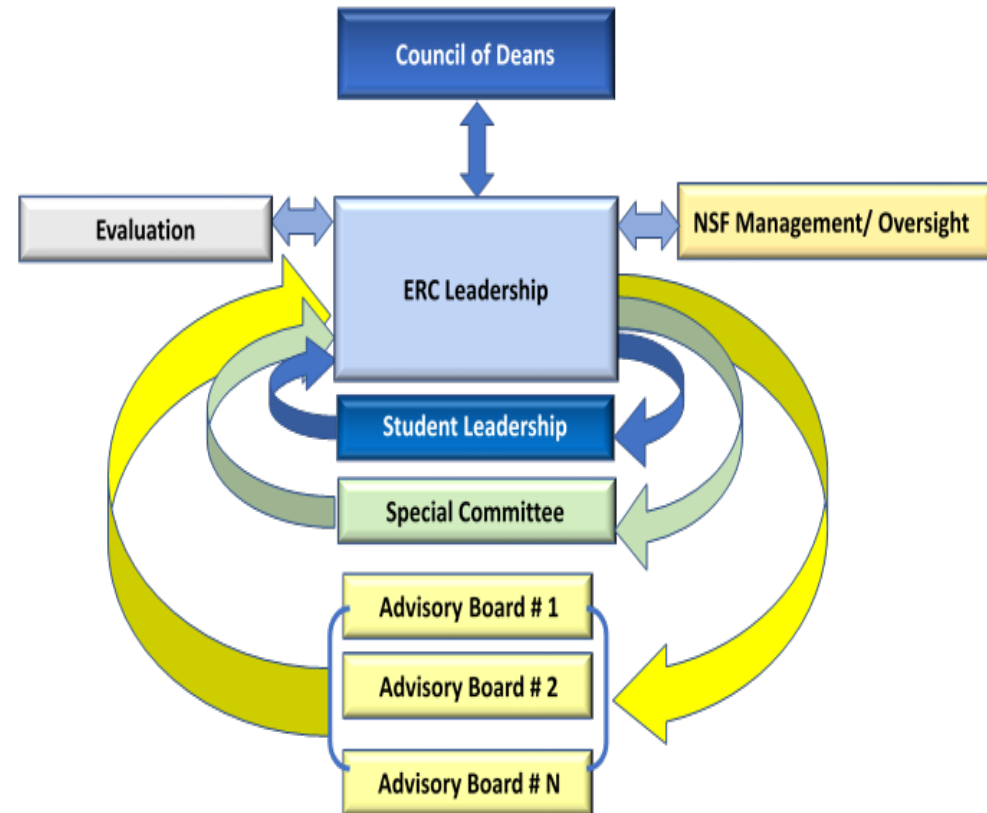
- **Leadership Roles:**

- Opportunity for different models of leadership
- Exception: ERC Administrative Director role is required.



Flexibility in Management

- **Management Structure:**
 - More freedom and creativity
 - Define the roles of various advisory boards/entities



Award Information

Year	Allowable Max Budget	Year	Allowable Max Budget
1	\$3,500,000	6	\$6,000,000
2	\$4,500,000	7	\$6,000,000
3	\$6,000,000	8	\$6,000,000
4	\$6,000,000	9	\$4,000,000
5	\$6,000,000	10	\$2,600,000

- The initial ERC award would be for 5 years.
- Cost Share is required **for all 10 years** of an ERC.



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ERC Proposal: Merit Review Criteria

Proposals are evaluated via the 2 National Science Board approved merit review criteria:

- **Intellectual Merit (IM)**
- **Broader Impacts (BI)**

Using both criteria above, these 5 elements will be considered in the review :

1. What is the potential for the proposed activity to
 - a) Advance engineering knowledge and understanding within its own field or across different fields (IM);
 - b) and Benefit society or advance desired societal outcomes (BI)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does it show engineering rigor? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?



ERC Preliminary Proposals: Additional Review Criteria

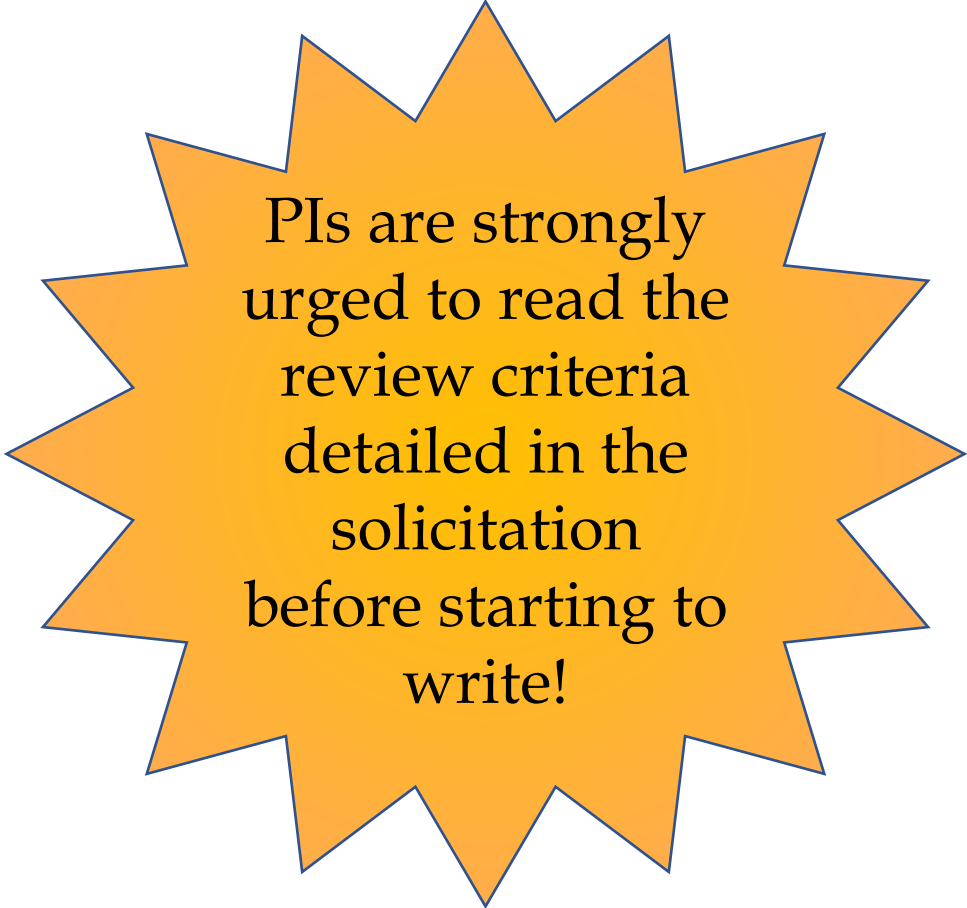
Questions to Guide the Narrative:

1. *What is the compelling new **idea** and what is the potential **high societal impact**?*
2. *What is the **engineered system**? Is it high-risk but high payoff? Is it clearly defined?*
3. *How does the proposed Center's research benchmark against the state-of-the-art?*
4. *Why is an ERC necessary to tackle the idea?*
5. *What is the proposed management structure for the ERC? How will the proposed infrastructure integrate and implement the four foundational components (CR, EWD, DCI, and IE) and foster team-formation?*
6. *What are the proposed strategies for engaging and developing the appropriate stakeholder community?*
7. *Does the proposed ERC create an inclusive environment where all the ERC participants learn to work on a team towards a common goal?*



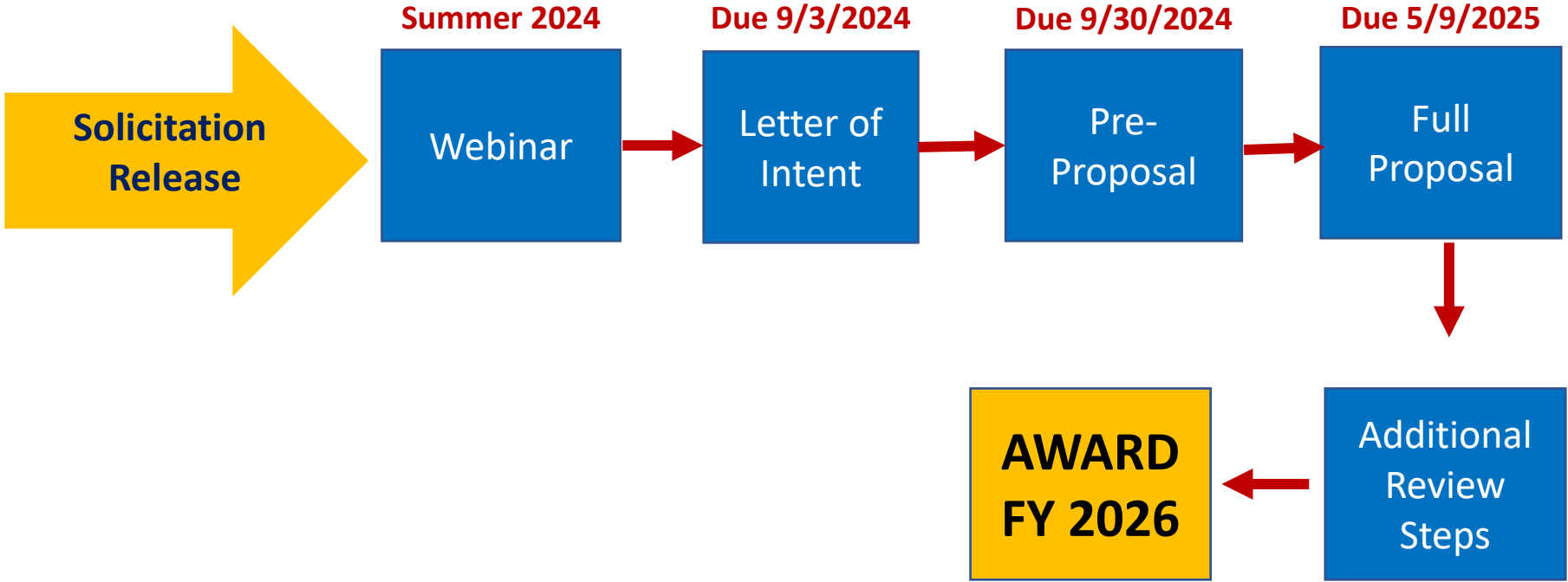
ERC Full Proposal: Additional Review Criteria in These Areas

- Vision
- Engineered system/3 plane diagram
- High Societal Impact
- High-risk/High-Payoff
- Convergence
- Stakeholder Engagement
- Team Formation
- Strategic Plan
- Infrastructure
- Research
- Engineering Workforce Development
- Diversity and Culture of Inclusion
- Innovation Ecosystem
- Evaluation Plan
- Financial Support and Resources



PIs are strongly urged to read the review criteria detailed in the solicitation before starting to write!

Key Dates in the 24-576 Competition Timeline



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Two Ways to Ask Questions

FIRST Check the FAQ <https://new.nsf.gov/funding/opportunities/gen-4-engineering-research-centers-erc>

1. Submit questions to NSFERC@nsf.gov at any time
2. Ask during Webinar & **Live Q&A events** with NSF ERC Team. **ANONYMOUSLY**



Summary

1. **Societal impact**, convergence, team formation, & stakeholder engagement.
2. Clear **engineered system**, *“The engineered system is...”* 1-2 sentences in the text
3. Integrate 4 foundational components
4. 3-plane chart using a **top-down** thought process
5. Read the Solicitation & **review criteria** carefully
6. Is there a **need for center?**
7. Look at FAQ online & use email alias nsferc@nsf.gov



The Value of an ERC

ERCs are of tremendous value to all their institution. See: <https://erc-history.erc-assoc.org/>

Additional Resources:

- **Webinar slides/recording** will be posted to the ERC Association

Website: <http://erc-assoc.org/>

- **Gen-4 ERC Program**

Website: <https://new.nsf.gov/funding/opportunities/gen-4-engineering-research-centers-erc>

NASEM Reports:

1. *A New Vision for Center-Based Engineering Research*: <https://www.nap.edu/catalog/24767>
2. *Convergence*: <https://www.nap.edu/catalog/18722>
3. *Enhancing the Effectiveness of Team Science*: <https://www.nap.edu/catalog/19007>





Questions?

nsfERC@nsf.gov



Mute



Stop Video



3

Participants



Q&A



Polling