**ENGINEERING RESEARCH CENTERS**

**Partnerships with Industry and Academe**

**for**

**Next-Generation Advances in Knowledge, Technology, and Education**

***Program Announcement***

**Division of Engineering Education and Centers**

**Directorate for Engineering**

**National Science Foundation**

**Notice of Intent: September 15, 1998**

**Pre-Proposal Deadline: November 5, 1998**

**Full-Scale Proposal Deadline: June 3, 1999**

**Site Visits: - October through November 1999**

**Awards: April 2000**

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**Engineering Research Centers Program Announcement and Guidelines for Submission of Pre-Proposals**

The Division of Engineering Education and Centers in the Directorate for Engineering is accepting pre-proposals from academic institutions to establish six Engineering Research Centers (ERC) in FY 2000.

**THE ERC CONCEPT**

 Engineering Research Centers provide an integrated environment for academe and industry to focus on next-generation advances in complex engineered systems[[1]](#footnote-1) important for the Nation’s future. Activity within ERCs lies at the interface between the discovery-driven culture of science and the innovation-driven culture of engineering, creating a synergy between science, engineering, and industrial practice. ERCs provide the intellectual foundation for industry to collaborate with faculty and students on resolving generic, long-range challenges producing the knowledge base for steady advances in technology and their speedy transition to the marketplace. These centers form long-term, trusted partnerships between academe and industry and develop a culture where graduate and undergraduate students work in cross-disciplinary teams, in close collaboration with their industrial partners. ERCs integrate engineering education and research and expose students to industrial views in order to build competence in engineering practice and to produce engineering graduates with the depth and breadth of education needed for leadership throughout their careers. Thus, ERC graduates enjoy the capacity to contribute to the Nation’s global future through a rich spectrum of career paths at the cutting edge of technical progress and innovation. The interface between research and education in an ERC is seamless at both the undergraduate and graduate levels, producing curriculum innovations derived from the systems focus of the ERC’s strategic goals.

 In its first decade of operation, the ERC Program has validated the Foundation’s strategic interests in the integration of research and education, trusted partnerships with industry, the development of shared infrastructure, and enablement of the capacity of science and engineering graduates to contribute to the Nation. The Program has been a model for the development of centers programs in the U.S. and around the world. Together, NSF and industry have developed a partnership with a shared vision for long-term engineering research and education. This partnership has produced a new generation of graduates who have proven to be more effective in industry, as well as numerous innovative, next-generation engineered systems technologies, productive engineering processes, and other innovative products and services. [[2]](#footnote-2) Thus ERCs contribute to industry’s ability over the long run to compete in global markets.

**KEY FEATURES OF AN ERC**

An ERC has the following defining characteristics or key features:

* A guiding, **strategic vision** to produce advances in **a complex, next-generation engineered system** and a corresponding new generation of engineers needed to strengthen the competitive position of industry and the Nation in a global economy;
* A dynamic, evolutionary **strategic research plan** to focus and integrate the ERC to achieve its vision;
* A cross-disciplinary **research program**, promoting synthesis of engineering, science and other disciplines, spanning the continuum from discovery to proof-of-concept in testbeds, involving undergraduate and graduate students in research teams[[3]](#footnote-3);
* An active, long-term **partnership with industry[[4]](#footnote-4)** and practitioners in planning, research and education to achieve a more effective flow of knowledge into innovation;
* An **education program** for students at all levels, enabling an integrative, systems-oriented intellectual environment and curriculum innovations;
* **Leadership** to guide and develop the ERC and a **cohesive team** effort, integrating engineering and scientific backgrounds with industrial views, that is also **diverse** in gender, race, and ethnicity;
* A program of **outreach** and **connectivity** to other institutions to enhance the research and educational capacity of the ERC and broaden the impact of the ERC culture in academe and society;
* **Supporting infrastructure** ofmanagement systems;space to integrate the ERC, experimental and enabling equipment and facilities; and **university commitment** to facilitate, reward, and sustain the ERC culture; and
* Funds and in-kind support from academe, industry and other sources to **substantially leverage** NSF’s support.

**LONG-TERM SELF-SUFFICIENCY OF ERCs**

 NSF expects ERCs to become self-sustaining and to maintain the ERC culture beyond the end of their term of NSF support. By that time, they will have developed an effective and productive collaboration with industrial and other stakeholders who are deriving a range of benefits from these partnerships. They should be prepared to continue that productive relationship with university, industrial, and other support when NSF funding ceases.

**VALUE ADDED OF NEW ERC OVER PRIOR ERC OR OTHER TYPE OF CENTER**

 Former ERCs, as well as ongoing ERCs at the end of their term of NSF support, and other centers are eligible to submit proposals to establish new ERCs. Proposals with teams derived from these types of centers will be subjected to the same review process, under the same review criteria, as are teams who have no prior center-level experience. Thus, there is neither a negative or a positive bias toward such teams in the proposal review and award decision processes. However, it is imperative that they demonstrate a substantial value added over their prior work to justify an NSF investment.

**DEVELOPMENT OF AN ERC PRE-PROPOSAL**

**The Vision, Rationale, and Supporting Infrastructure**

 A prospective ERC team begins by developing a vision for a next-generation engineered system and corresponding educational innovations that will yield an exciting and compelling ERC in which to invest public and private sector funds. The vision should be at the engineered systems level, rich with barriers to be overcome and full of opportunities for advances in knowledge and technology. It should represent quantum change beyond current thinking and practice. Industrial personnel and other practitioners, as appropriate, should be involved in the efforts to contribute to the generation of the vision, scope, and strategy of an ERC. For an ERC with a vision that impacts the infrastructure systems underlying an effective economy, e.g., transportation systems, pollution abatement and control systems, building systems, financial network and communications/information transfer systems, the vision should represent means to make a quantum improvement in the performance of existing and new systems through engineering and scientific research. The vision of such an ERC should be broad enough in scope to encompass public policy, where applicable. It is anticipated that the partners for such an ERC would be from industry and also from public agencies. In addition, NSF has no preferences regarding the technological focus of an ERC, however, if there is an ongoing ERC in the topic area, the team should be sure their efforts will complement the efforts of that ERC.

 Having defined its vision, the ERC team should carry out an analysis of the current state-of-the-art in research and education, including documentation of the contributions made in the field by the prospective ERC’s faculty and others around the world. The team should determine the key intellectual challenges which pose barriers to advances in knowledge, technology[[5]](#footnote-5), and education that must be addressed to fulfill the vision. The vision will become more focused through this analysis.

 The rationale for the strategic research plan for the ERC should be derived from this analysis. The strategic plan is used to organize and integrate the centers research to achieve its deliverables and vision. As a part of the development of the ERC’s pre-proposal, the team should develop a visualization of the plan. From the chart, the reader should be able to understand how the engineer-systems goal of the ERC drives the fundamental and enabling technology research to achieve the ERC’s deliverables. There is a sample chart in the Research Management chapter of “ERC Best Practices Manual”, referenced below, that can serve as a beginning point for this analysis. The ERC program is open to many different types of approaches to visually representing this strategic plan. The scope of the ERC should include research that spans the continuum from discovery through to proof-of-concept in testbeds to achieve preliminary “realization” of technological advances at the ERC, increase their relevance to industry and speed their use.

 In education, the scope includes changes in the culture of engineering education and research to provide a team-based, interdisciplinary arena for research in partnership with industry. It also includes the development, testing, implementation, and dissemination of curricular advances emanating from the ERC’s research. The prospective ERC team should understand that NSF expects the ERC to assume a National leadership position in research and education in its field. To add a new dimension the scope of an engineering education, an ERC may also add a focus on design/build or product development experiences for students and other innovations.

 An ERC may also plan for connectivity with other institutions and partners to expand the impact of the ERC culture in research and human resource development or facilitate transfer of knowledge and technology to impact its local economy. To achieve this it may choose to expand the scope of its plans to include new approaches to preparing the technical workforce for the future, it may explore means to bring the excitement and challenge of engineering careers to K-12 students, it may develop partnerships with institutions with diverse student bodies to increase the diversity of the future engineering workforce, it may develop partnerships with state governments to increase the impact of the ERC on the development of its state’s economy, it may develop partnerships with small businesses for the further exploration and development of new technologies, and it may explore partnerships with institutions outside the U.S. to enhance the research and education programs of the ERC, etc. An ERC is not expected to address all these types of connectivity initiatives, but should plan to develop a few during the course of its 10-year span.

 The team should carry out an analysis of the infrastructure needed to support the ERC to fulfill its vision and goals. This analysis should include a study of the needed mix of disciplines and fields of expertise and an expansion of the team as needed, as well an analysis of the extant and needed space and experimental and enabling equipment. This analysis should also include a determination of the relevant industries/practitioners needed as partners in the ERC in order for it to achieve its vision.

 The team should be mindful that NSF will look for a major value added over the prior work of the team and the work of others in the field. Thus, ERC funding through this announcement will not be used to replace funding by NSF or other agencies to fulfill the past goals of an ERC or another type of center, of a group, or of separate individuals. ERC funds will not support a collection of unrelated, independent projects.

 In preparation of the proposal, the prospective ERC team might consult the ERC Home Page, http://www.eng.nsf.gov/eec/erc.htm, for information about ongoing ERCs and access to their WWW home pages. Proposers may also consult the “ERC Best Practices Manual,” at http://www.erc-assoc.org. This is a document developed by members of the ongoing and self-sufficient ERCs to share insights and guidance about how to fulfill the challenges of an ERC, not an NSF publication.

**WHO MAY SUBMIT**

U.S. academic institutions with undergraduate and graduate engineering programs, granting the Ph.D. degree in engineering**,** may submit proposals as the lead institution of an ERC. The Center Director, the NSF Principal Investigator, must be a faculty member from the lead university. More than one proposal may be submitted by a university, and a university may be the lead institution on more than one ERC proposal, as long as there is no significant overlap in the faculty and students involved. Universities that are core partners in an ongoing or proposed ERC may submit as a lead institution or core partner in another ERC.

**INSTITUTIONAL CONFIGURATION OF AN ERC**

 The core team may be drawn from a **single university**, if the needed critical mass to achieve the goals of the ERC is available in sufficient strength and breadth in the faculty of that institution. If not, the ERC may be configured with **one lead university and a few (one to three more) other long-term core partner universities.** NSF expects the lead and partner universities will function as an integrated whole, with shared research and education goals, shared curricula, and a shared program of industrial collaboration.

 If the ERC is configured with a lead university and a few long-term core partner universities, the lead university accepts the overall management and financial responsibility for the Center. The lead university receives the funds from NSF and other sources and disperses them, at a minimal overhead charge[[6]](#footnote-6), to the other partners based on their role in the strategic plan and their performance. In addition, the ERC may involve federal laboratories as partners but NSF funds may not support their staff.

Whether a proposed ERC is comprised of one university or a lead university and core partner universities, the ERC is expected to add a limited number of individual faculty from other academic institutions as **outreach partners**. The purpose of this outreach is to network the ERC with other faculty to enhance the capacity of the ERC to fulfill its research, education, and connectivity goals and share the ERC culture with others. At this stage, NSF expect the specific identification of a limited number of outreach partners for year one only. Plans for types of later outreach and connectivity should be included but specific partners need not be identified.

**LEADERSHIP AND MANAGEMENT OF AN ERC**

 The Director of an ERC is the leader of a complex enterprise, developing and leading a team of faculty, staff, students and industrial partners to fulfill a shared vision. It is expected that the Director will form a leadership team comprised of a faculty Associate Director(s) and leaders of research and education teams who will share these responsibilities. To be effective ERCs also require an Administrative Director who is responsible for the day-to-day administration and financial management of the center and an Industrial Liaison Coordinator to facilitate industrial membership and collaboration. In addition to the faculty member who leads curriculum development efforts, depending on the scope of educational outreach proposed, there may be a staff member devoted to these outreach efforts.

 The Center Director is the NSF Principal Investigator (PI) and has primary responsibility for administering the award in accordance with NSF’s Grants General Conditions (GC-1) and the special terms of the Cooperative Agreement to be issued by the NSF in the event of an award. Copies of GC-1 are available on the NSF Home Page at: http://www.nsf.gov/home/grants3.htm#policies. Since one of the primary objectives of an ERC is to impact engineering education, the Center Director should be affiliated with an Engineering Department but need not hold an engineering degree.

**AWARDS, AWARD INSTRUMENT, DURATION AND SIZE, OVERSIGHT, RENEWAL AND SELF-SUFFICIENCY, AND REPORTING REQUIREMENTS**

**Number of Awards:** NSF expects to make awards to initiate six new ERCs as an outcome of this competition, pending availability of funds and the quality of the proposals.

**Award Instrument:** Awards will be administered under a Cooperative Agreement in accordance with the NSF Grant General Conditions (GC-1) and Cooperative Agreement General Conditions (CA-1), copies of which are available on the NSF Home Page at: http://www.nsf.gov/home/grants3.htm#policies. More comprehensive information is contained in the NSF Grant Policy Manual (NSF 95-26), available on the NSF Home Page at the address above.

**Award Duration, Size, and Long-Term Self-Sufficiency**: An ERC begins operation under a cooperative agreement that has a potential duration of ten years. The initial award under that agreement has a potential duration of five years, renewable in years three and six. ERC’s are expected to be self-sufficient from ERC Program support after year 10. The level of support provided by NSF will be commensurate with the funding needed to build and sustain the ERC. First-year level of NSF support may be between $1.5 million and $2.5 million, depending on the scope of the ERC. In subsequent years, NSF’s support may grow to between $2.5 to $4 million by year six. After year six, NSF support will decline to shift the balance of support to industry and other sources to prepare the ERC to be self-sufficient at the end of 10 years.

**NSF Performance Reviews:** ERCs undergo annual reviews of performance and plans to strengthen the Center and renewal reviews to determine whether or not NSF’s support should continue. ERCs that fail to achieve renewal will receive a brief period of phase-down support.

**Reporting Requirements:** Operating centers are required to submit annual reports on progress and plans as well as summative reports on progress and plans for renewal. These are used as a basis for assessing performance, levels of continued funding, and renewal. These reviews are carried out by reviewers external to NSF through a site visit, and determination of the level of continued annual funding. In addition, ERCs are required to develop a set of management and performance indicators for submission annually to NSF. These indicators are both quantitative and descriptive and include, for example, the number and characteristics of center personnel; sources of financial and in-kind support; expenditures; characteristics of industrial participation; research activities; technology transfer activities; patents, licenses, and publication activity; degrees granted to students involved in center activities; and descriptions of significant advances and other outcomes of the ERC’s effort.

 Upon completion of the term of their cooperative agreements, ERCs are expected to submit a Final Project Report under standard NSF requirements. Applicants should review the sample form in the NSF Grant Proposal Guide (GPG), NSF 98-2, prior to proposal submission so that appropriate tracking mechanisms are included in the proposal plan to ensure that complete information will be available at the conclusion of the center’s life under ERC Program support. Single copies of NSF 98-2 are available at no cost from the NSF Clearinghouse, PO Box 218, Jessup, MD 20794-0218 or telephone your request to 301-947-2722. This brochure is also available via electronic mail: pubs@nsf.gov or it is available on the NSF Home Page at: http://www.nsf.gov/home/grants3.htm#policies

 The ERC also will be expected to submit a more comprehensive summative final report to the ERC Program, summarizing its major achievements and accomplishments in all dimensions. Formats for this report are sent to the ERC during its last year. Data from the ERC data base of indicators of performance contribute to the preparation of this report.

**THE TWO-STAGE ERC COMPETITION**

 Proposers compete for support from the ERC program in a two-stage process. The first stage consists of a notice of intent and a pre-proposal. At the completion of the review of the pre-proposals, NSF will invite a small number of the most highly qualified proposing ERC teams to prepare a full-scale proposal. All other pre-proposals will be declined at that time. No full-scale proposals will be accepted without a pre-proposal and a subsequent invitation. All full-scale proposals, not selected for an award, will be declined after awards are made.

 A format for the pre-proposal follows. The format for the full-scale proposal will be sent to those invited to submit. The major differences between the two scales of proposals can be found in the summary of requirements table at the end of this announcement. In addition, NSF does not require financial cost-sharing by participating lead and partner universities in the pre-proposal but it will be required in the full-scale proposal. NSF also does not require commitments from industrial for financial support in the pre-proposal but these will be required in the full-scale proposal.

**REVIEW PROCESS AND CRITERIA**

 Pre-proposals and full-scale proposals will be evaluated in accordance with established NSF policies. Pre-proposals will be evaluated through a combination of individual and panel review by experts from academe, industry, and government. Full-scale proposals will be evaluated through a combination of individual, panel review, and site visits by experts from academe, industry, and government. Teams of ERCs from site-visited proposals, will make presentation to a review panel of outside experts as the final stage in the review process.

 These reviews will be carried out using merit criteria, (“What is the intellectual merit of the proposed activity? And What are the broader impact of the proposed activity?”), approved by the National Science Board on March 28, 1997 (NSB 97-72). These criteria have been integrated with the ERC key features to yield the following key decision factors which are the basis for the review process. They are used in the review in the following order of priority, with a high quality effort required for the proposed ERC to pass to the next review gate. These criteria are used in the review of both pre- and full-scale proposals unless otherwise stated.

**ERC Decision Factors**

 **Gate 1,** **Vision, Research , Leadership and Team**

* Compelling vision for a complex next-generation engineered system that will be the foundation for major innovations in industry in a global economy;
* Strategic plan that effectively organizes and integrates the research to achieve the goals of the ERC;
* Research that is high quality with sound and innovative methodologies, appropriately cross-disciplinary, spans continuum from discovery to proof-of-concept in testbeds, with significant value added over the state of the art, and challenges/barrier that are worthy of a 10-year investment by NSF and industry;
* Director who is capable of developing and leading a complex enterprise and a team that shares the vision and is high quality with appropriate expertise;
* Outreach in research that will significantly and effectively enhance the impact of the ERC and its ability to effectively fulfill its vision;

**Gate 2, Industrial Collaboration, Education, and Connectivity**

* Industrial membership that involves a broad spectrum of firms/users/practitioners, with appropriate mix of sectors in the industry, that are committed, share the vision, and will be actively involved in planning, research, and education;
* Industrial collaboration strategy that will yield effective movement of knowledge into practice;
* Education program that provides unique opportunity to integrate the ERC’s systems view into the curriculum, will build competence in engineering practice, and involve teams of undergraduates and graduates in cross-disciplinary research teams;
* Curricular innovations that will significantly improve engineering education for undergraduate and graduate students and practitioners, are worthy models for other universities, will be tested, evaluated, and shared;
* Plans for connectivity that enhance the impact of the ERC in education, human resource development, and/or technology transfer.

**Gate 3, Infrastructure**

* ERC and university(ies) that are committed to involving faculty and students who are diverse in gender, race, and ethnicity to enhance the diversity of the engineering workforce;
* Strong management systems, effective cross-institutional management and communication if a multi-university ERC, and university policies that support the ERC culture;
* Space, and experimental equipment that support the culture and research of ERC; and
* Academe, industry and others that provide financial and other support to significantly leverage NSF’s investment **(not considered at the pre-proposal stage).**

**THE PRE-PROPOSAL STAGE**

**Notice of Intent**

Teams intending to submit a pre-proposal should submit a notice of intent, not to exceed 500 words. The notice should be sent via email to: ercintent@nsf.gov. **on or before September 15, 1998**. The purpose of the notice is to enable NSF to develop a reviewer base before pre-proposals are submitted. The notice of intent is not mandatory. Proposers who do not submit this notice may submit pre-proposals.

 At the top of the notice the following information should be provided: title of the ERC, name of the lead institution and any other core partner institutions, the name of the Center Director and the name(s) of the Associate Director(s). The notice should provide a brief summary of the vision of the center, the key barriers to be addressed by the research program and expected deliverables in knowledge, enabling technology, and engineered-systems technology, its research strategy and research goals (including the names of its research clusters or thrusts), education programs goals and deliverables, and industrial/practitioner collaboration and technology transfer goals.

 In addition to the 500 word narrative, the notice of intent also should include a list giving the names of the lead university, any core partner universities, and the names of the ERC Director, Associate Director(s) and other key faculty, with their disciplines and institutional affiliations. It should also list the names of the firms or other organizations[[7]](#footnote-7) committed to be or interested in being an industrial/practitioner partner at that point in time, with the names of the individual(s) who are they key points of contact for the ERC in an individual firm.

**Preparation of the Pre-Proposal**

 Pre-proposals must be prepared according to the following format and must contain **only the materials requested by this announcement.** Copies of the required forms are contained in the NSF Grant Proposal Guide (GPG) (NSF 98-2). This announcement is available on the NSF Home Page at: http://www.nsf.gov/home/grants3.htm#policies and no printed copies are available from NSF.

**Preparation Guidance for the Pre-Proposal**

 **The narrative of the pre-proposal will be no longer than 20 pages of text, including lists, charts, figures, and tables instructed to be a part of the narrative or placed there by the proposers**. The page numbering should run from the beginning to the end of the narrative section. The other requirements are outside these page limits.

 The pre-proposal must be prepared using a **12 point font**, with single spacing. Note the font requirement is greater than that required in the GPG at the request of ERC reviewers. They should be prepared with the reviewer in mind. Spacing should be used to facilitate reading and comprehension. Illustrations of complex concepts should be used to improve communication.

 Applicants are required to **prepare and submit the cover sheet only using NSF FastLane.** This will facilitate tracking. Instructions for submitting cover sheets through NSF FastLane are available on the NSF home page at http://www.fastlane.nsf.gov or see Appendix I for basic instructions. The rest of the proposal **must not be submitted** via FastLane, as the system is not yet ready to handle the complexity of ERC proposals.

**Format for the Pre-Proposal**

**(1)** **Cover Sheet (NSF 98-2, Form 1207, page 1, all copies; pages 1 and 2, original copy only):** This form must be signed by the Principal Investigator (Center Director), the Associate Director(s) as Co-Principal Investigator(s) and an official authorized to commit the lead institution in business and government affairs. The Engineering Research Centers (ERC) Announcement Number NSF 98-?? should be designated as the Program Announcement/Solicitation Number/Closing Date in the upper-left hand corner of the form. “EEC” should be listed as the NSF Organizational Unit. Include page 2 only with the pre-proposal copy containing the original signatures**.**

**(2)** **Information about the Principal Investigator (NSF 98-2, Form 1225).** Attach one copy to the original, signed copy of the proposal. Do not attach it to any of the other copies, since this would compromise the confidentiality of the information.

 **(3)** **Lists of Academic Participants, Industrial, and Other Partners:** Provide two lists: (a) a List of Academic Participants and (b) a List of Industrial and Other Partners.

**List of Academic Participants:** Begin the list of academic participants, with the name of the institution which will lead the ERC, followed by the name(s) of any partner institution(s) which will form the institutional core for the ERC. Provide a list of the faculty who are committed to long-term involvement in the ERC, with their names, departmental, school, and institutional affiliation(s). These would be faculty from the lead university and any core-partner universities**.** Outreach faculty for **year 1 only** should be listed.

**List of Industrial/User/Practitioner Partners:** On this list, provide the names, professional titles, and corporate, agency, or other affiliations of industrial, user, practitioner, and other personnel who are interested in participating in and financially supporting the Center. At this stage interest is sufficient.

**(4)** **Project Summary (NSF 98-2, Paragraph II.D.2) (one page)**

A statement of the vision, research, education, and industrial collaboration/ technology transfer components of the ERC. List the title of the ERC, the name of the Center Director, and the name of the ERC’s lead and any core partner institutions at the top, center of the page.

**(5) Table of Contents:** Organize the Table of Contents to follow the outline requested by the pre-proposal format **not** the outline specified by the official NSF Table of Contents in the NSF Grant Proposal Guide (NSF 98-2).

**(6)** **Narrative (not to exceed 20 pages)**

The narrative should be structured according to the following outline and the page count starts from here. The pages counts by section are suggestions.

* **Vision of the ERC and Rationale for the ERC**
* **Vision and Rationale for the ERC**

Provide a statement of the vision of the ERC, its systems focus and its value to industry/practitioners and the Nation in a global economy. Provide an analysis of relevant work in the field by ERC participants and others in the US and abroad. Indicate the major barriers and challenges upon which the ERC will focus its research to achieve the vision, and the major advances in fundamental knowledge and technology that the ERC expects to deliver. Justify the need or rationale for the ERC based on this analysis and its value to industry and Nation.

* **Strategic Research Plan for the ERC**

Provide the ERC’s strategic research plan to organize and integrate the ERC’s research program to address these barriers, produce the expected deliverables, and achieve the ERC’s systems-level goals. Develop a chart to succinctly portray the ERC’s strategic Plan over a ten year period.

* **Research Program**

Derived from the Strategic Plan, provide an overall description of the organization of the research program into manageable clusters or thrusts of projects designed to address common barriers and deliverables. Describe how the thrusts depend upon each other to achieve the ERC’s overall goals and deliverables. Describe the role of proof-of-concept testbeds designed to explore the ERC’s engineered systems goals.

Provide an analysis of the critical mass of faculty needed to support the ERC’s research goals, their disciplines, fields of expertise, experience. This should include faculty from the lead university and from any core partner universities. For research outreach there should be discussion of the fields needed in the first five years, but contacts should be made with a limited number of faculty to associated with the ERC in **year one only**.

For each thrust area, provide a rationale for the research and give examples of its key research barriers and deliverables. Relate the work of the thrust to the work performed by the faculty involved and others in the US and abroad, explaining how the ERC’s research will create value added. Describe exemplar research projects so the reviewers will understand how the barriers will be addressed, what novel ideas will be pursued, and what methodologies will be used.

* **Industrial/User/Practitioner Collaboration and Technology Transfer Program**

Provide information on how the industrial/user/practitioner collaboration program will be structured to achieve their involvement in strategic planning, research and education. Provide a rationale for inclusion of different sectors of the industry, e.g., manufacturers, suppliers, service providers/ practitioners, etc. Discuss how the ERC will organize industrial input. Discuss the ERC’s strategy for technology transfer. Discuss any connectivity partnerships to enhance the impact of the ERC at the local level.

In this section, provide a table listing the names of the firms interested in or committed to involvement at this stage of the ERC, grouping the firms by the sectors involved (manufacturers, suppliers, service providers, practitioners, etc.). Mark the firms according to whether they are already committed to involvement in the ERC or merely interested at this stage. Financial and/or in-kind support is not required at the pre-proposal stage.

* **Education Program**

Provide a brief description of the goals of the ERC’s core education program. Describe how the ERC proposes to develop a team-based research/educational culture that will involve undergraduates and graduates in cross-disciplinary research with an industrial perspective. Discuss goals for curriculum innovations and how they will be developed, tested, evaluated, implemented, and disseminated beyond the ERC. Discuss any other educational innovations the ERC will undertake.

If the ERC is a multi-university ERC, with a lead university one or more long-term core partner universities, discuss how the students in each institution will derive benefit from the ERC’s education program and means to facilitate this integration across the universities.

 Include a description and rationale for the ERC’s educational outreach and any connectivity initiatives designed to involve students at all levels from other types of institutions in the ERC, attract young students to engineering, advance the capacity of the technical workforce, etc.

* **Infrastructure of the ERC: Institutional Configuration, Leadership, Management and Organization, Equipment, University Policies.**

 Justify the institutional configuration of the ERC. Describe its leadership and management team. Describe the ERC’s management system and organizational structure, its advisory system, and its method of project selection and evaluation. Provide an organization chart showing its configuration, reporting, and advisory system. An ERC Director usually reports to the Dean of Engineering; however, when the ERC involves a major component of faculty from other schools, such as the Business School or the College of Arts and Science. etc., the Director should report to the Dean of Engineering but provision should be made to team the other relevant Dean(s) with the Dean of Engineering. If this is a multi-institutional ERC, describe the management and communication systems that will be used to develop a fully integrated ERC. Briefly describe the extant and needed experimental and enable equipment of the ERC. Indicate how university tenure, reward, and other policies will facilitate the ERC culture.

**(7) References Cited** (NSF Form 1361). Not included in the narrative page limit.

**Appendices:** All the appendices below are required. **(Pre-proposals with appendices other than those required below will be returned to the proposer without review)**

**A. Letters of support from University Official of Lead University and any Core Partner University(ies).**

Letters are required from the lead university and any core partner academic institution(s), signed by the Dean of Engineering, other Deans as appropriate, and Provost or other Institutional representative. This letter should indicate the role of the proposed ERC within the institution’s strategic plan. Institutional cost-sharing is not expected or required at the pre-proposal stage. Letters should not be included from the institutions of any outreach faculty.

**B. Letter Expressing Interest from Potential Industrial and other Partners of the ERC.**

Letters from industrial and other partners are required indicating how this ERC will be of value to the firm/partner and of value to the industry/practitioners in general. These should include statements of how the firm/partner anticipates it will participate in the ERC. Financial commitment is not expected or required at this stage.

**Budget Estimates**

Complete a budget estimate for the expected support from NSF for Year 1, using **NSF Form 1030**. Cost-sharing should not be listed at the pre-proposal stage.

**For multi-university ERCs and research and education outreach:** The lead school officials sign the 1030. Current “estimates” of the amount of funds anticipated to be distributed to the other core partner universities to fulfill their role in the ERC should be shown on Section G, line 5, Subawards. Actual distributions would depend upon the role and productivity of their faculty in the ERC’s strategic plan. Funds to be distributed to universities and other institutions through the ERC’s research and education outreach programs should be included in Section G, Line 5, Subawards. A notation should be made in the budget explanation as to the allocation for each institution. NSF prefers that there be a minimal processing charge by the lead university to transfer these funds; however, the maximum allowable charge would be 25 per cent of the total amount in Section G, Line 5, Subawards.

**D. Biographical Sketches** (NSF Form 1362): Provide biographical sketches of the Director, Associate Director(s), other research team leaders, and other key faculty committed to the ERC at the pre-proposal stage. (maximum length, two pages each).

**E.** **Facilities and Equipment (**NSF Form 1363) This form should support the description of the infrastructure of the ERC in the body of the pre-proposal by describing the equipment and facilities available to support the ERC.

**F.** **Current and Pending Support** (NSF Form 1239) for the Director, Associate Director(s) other members of the leadership team, and key faculty.

**SUBMISSION OF THE PRE-PROPOSAL**

 Twenty copies of the pre-proposal, including one copy bearing the signed cover page, are required. The original signed copy should be printed on one side only and not bound. The remaining copies should be printed on both sides of the page and bound securely on the entire left side. Contrary to NSF guidelines, **they should not be stapled as staples do not hold their usual bulk and they should not be fastened with an elastic band, clip or other temporary means.**

 The pre-proposal must be mailed to arrive at the following address by the deadline, **5:00 p.m**., **November 5, 1998**

**National Science Foundation (PPU)**

**Announcement Number NSF 98-XXX, Engineering Research Centers**

**4201 Wilson Boulevard, Room P60**

**Arlington, VA 22230**

 One information copy, not the original, should be sent to:

 Lynn Preston, ERC Program Team Leader and

 Deputy Division Director

 Division of Engineering Education and Centers

 National Science Foundation

4201 Wilson Boulevard, Suite 585

 Arlington, VA 22230

 **All pre-proposals submitted in response to this announcement, which do not follow page, font, and appendix requirements, will be returned to the proposer without review.**

**SUMMARY OF REQUIREMENTS**

|  |  |  |
| --- | --- | --- |
| **Topic** | **Pre-Proposal** | **Full-Scale Proposal** |
| **Requirements** |  |  |
| Commitment of Industrial Funds | No | Yes |
| University Cost Sharing by Lead and any Long-Term Core Partner Universities | No | Yes |
| Cost Sharing by Research and Educational Outreach Institutions | No | No |
| Identification of Research Outreach Partners | Year one only | Year one only |
| **Submission Requirements** |  |  |
| Letter of Intent | Helpful, Not Mandatory, Due Sept. 15, 1998 | No |
| Pre-Proposal/Full-Scale Proposal Due Dates | November 5, 1998 | June 3, 1999 |
| # of Copies | 20 | 25 |
| **Differences in Format** |  |  |
| Inf. About PI (NSF Form 1225) | Yes | Yes |
| NSF Cover Sheet (Form 1207) | Yes | Yes |
| FastLane Submission of 1207 | Yes | Yes |
| FastLane Submission of Proposals | No | No |
| Table of Contents | Yes | Yes |
| List of Academic Participants | Yes | Yes |
| List of Interested Industrial & Other Partners | Yes | N/A |
| List of Committed and Interested Industrial & Other Partners | N/A | Yes |
| Project Summary (Form 1358) | Yes | Yes |
| Executive Summary | One Page | Two Pages |
| Narrative | 20 Pages, including charts, etc.  | 45 Pages, including charts, etc. |
| Draft Intellectual Property Policy | No | Yes |
| **Appendices** |  |  |
| Letters Confirming Academic Commitment to ERC, No Cost Sharing | Yes | No |
| Letters Confirming Academic Commitment to ERC, Cost Sharing Required | No | Yes |
| Letters Indicating Industrial Interest  | Yes | OK |
| Letters Confirming Industrial Involvement and Support | No | Yes |
| Budget - Years 1 only (Form 1030) | Yes | N/A |
| Budget - Years 1, 2, 3, 4, and 5 separately (Forms 1030) | No | Yes |
| Budget - Sum of Years 1-5, (Form 1030) | No | Yes |
| Financial Plan (Year 1 only) | No | Yes |
| Bio Sketches, (Form 1362) | Yes | Yes |
| Facilities & Equip, (Form 1363) | Yes | Yes |
| Current & Pending Support, (Form 1239) | Yes | Yes |
| Justification for Secretarial & Administrative Support | No | Yes |

**INQUIRIES**

For general inquiries about the ERC Program, the ERC concept, and this announcement, contact:

**Lynn Preston**, Deputy Division Director and ERC Program Team Leader

Engineering Education and Centers (EEC) Division,

Directorate for Engineering

National Science Foundation

4201 Wilson Boulevard, Suite 585

Arlington, VA 22230

Telephone: 703- 306-1380

FAX: 703-306-0326 or 0290

email: lpreston@nsf.gov

The ERC oversight system provides each ERC with a team of NSF Program Directors (PD). That team is comprised of a lead ERC PD, supported by other PDs as required to bring the appropriate disciplinary expertise. The following is a list of lead ERC PDs who can address questions on developing an ERC Proposal:

**Cheryl Cathey,** EEC. Product development, chemical engineering, biochemical/biomedical engineering (ccathey@nsf.gov) 703-306-1380

**Deborah Crawford**, Division of Design, Manufacture, and Industrial Innovation (DMII), electrical engineering, imaging, and multimedia. (dcrawfor@nsf.gov) 703-306-1390, ext. 5262

**Frederick Heineken**, Division of Bioengineering Systems (BES), biochemical engineering. (Fheineke@nsf.gov) 703-306-1320, ext. 5017

**John Hurt**, EEC. Materials engineering, including electronic materials and materials. (jhurt@nsf.gov) 703-306-1380

**George Lea**, Division of Electrical and Communications Systems (ECS) Computational engineering and fluid dynamics. (glea@nsf.gov) 703-306-1339, ext. 5049

**Tapan Mukherjee**, EEC. Chemical/biochemical engineering, polymeric and composite materials engineering, renewable energy, minerals and metals, water supply and purification, and environment engineering (tmukherj@nsf.gov) 703-306-1383

**Joy Pauschke**, EEC. Structure and civil and mechanical infrastructure systems, and ERC education programs. (jpauschk@nsf.gov) 703-306-1380

**Mary Poats**, EEC (for information on post-award ERC Program supported summer research experiences for undergraduates from non-ERC institutions and minority outreach programs in ERCs) (mpoats@nsf.gov) 703-306-1380

**ACKNOWLEDGMENT OF NSF SUPPORT AND DISCLAIMER**

Appropriate acknowledgment of NSF support should be given to NSF-supported projects. Individual programs will inform grantees of specific requirements for funding credit. Generally, NSF funding credit, including the NSF logo, is required at the beginning and end of media programs and on the cover of publications. A disclaimer must appear in publications of any material, whether copyrighted or patented on, or developed under, NSF-supported projects:

“This material is based upon work supported by the National Science Foundation under Grant No. (grantee should enter NSF Grant number).”

The following disclaimer should also be included:

“Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.”

**COMMERCIAL PUBLICATION OR DISTRIBUTION OF NSF-SUPPORTED MATERIALS**

The NSF encourages the broad dissemination of materials resulting from NSF awards. If this award involves the development of materials or publications which will be disseminated commercially, the awardee is responsible for developing, documenting and implementing a publication or distribution plan which includes, at a minimum, the following elements:

procedures to be followed for selection of a publisher or distributor so as to ensure reasonable competition or justification for non-competitive selection;

delineation of the criteria used in the selection of the publisher or distribution; and steps taken to prevent conflicts of interest in the selection of a publisher or distributor.

The awardee shall ensure that the publisher or distributor of any material supported under this NSF award agrees to provide the Government with a royalty-free license to use the materials for Government purposes as described in Grant General Conditions GC-1 Article 18. Any publication or distribution agreement must be consistent with GC-1 Article 20. Any materials developed under an award to a Federal Demonstration Project, must ensure that the publisher or distributor of any material supported under the NSF award agrees to provide the Government with a non-exclusive, nontransferable, irrevocable, royalty-free license to exercise or have exercised for or on behalf of the United States throughout the world all the exclusive rights provided by the copyright. Such license does not include the right to sell copies or photo records of the copyrighted works to the public. Any publication or distribution agreement must be consistent with FDP-III, Article 10.

Normally, income generated as a result of commercial publication and/or distribution of NSF-supported materials will be subject to guidance provided in Section 750 of the Grant Policy Manual (GPM), NSF 95-26, with the exception that royalty income earned during the life of the project should be used to further project objectives. The grantee is required to retain appropriate financial and other records relating to project income earned during the grant period and for three years beyond the end of the grant period. The grantee’s understanding and acceptance of these income procedures should be provided in the proposal.

**LEGAL RIGHTS TO INTELLECTUAL PROPERTY**

NSF normally allows awardees to retain principal legal rights to intellectual property developed under its awards. This policy provides incentive for development and dissemination of inventions, software, and publications that can enhance their usefulness, accessibility, and upkeep. It does not, however, reduce the responsibility of PIs and their institutions to make results, data, and collections available to educational and other appropriate communities.

Nevertheless, NSF remains committed to the development of high-quality programming that will be made widely available. The Foundation requires that:

* broadcasts, exhibits, books, and other materials include a clear documentation of the source(s) of support (both NSF and other contributors), as well as the NSF logo;
* two copies of all developed materials (e.g., textbooks, videos, CD-ROMs) be provided to NSF; and
* the U.S. Government must be provided a royalty-free license in perpetuity to use the materials for Government purposes.

Under normal circumstances, NSF also requires that:

* off-the-air recording rights for supported television programs be offered to educational agencies or institutions for a minimum of three years following the first broadcast; and,
* all television programs have closed captions encoded on the master broadcast tape and be broadcast with the closed captions.

**Engineering Research Centers**

Descriptions of these ERCs are available on the ERC WWW Home Page as well as through direct linkages to each ERC’s home page as indicated below.

**Biotechnology and Bioengineering**

 **Neuromorphic Systems Engineering Center** at the *California Institute of Technology.* (FY 1995[[8]](#footnote-8))

Center Director: Demetri Psaltis

Deputy Director: Pietro Perona

Main Telephone: 626-395-6255

http://www.erc.caltech.edu/

ERC Program Directors: Lead PD to be Assigned, Paul Werbos (ECS) and Kishan Baheti (ECS)

**ERC for Engineered Tissues** at the *Georgia Institute of Technology, in partnership with the Emory University School of Medicine* (an ERC to be initiated in FY 1998)

 Center Director: Robert M. Nerem

 Deputy Director: Ajit P. Yoganathan

 Main Telephone: 404-894-2768

 ERC Program Director: Cheryl Cathey (EEC) team to be assigned

**Marine Bioproducts Engineering Center** at the *University of Hawaii at Manoa, in partnership with the University of California, Berkeley*  (an ERC to be initiated in FY 1998)

 Center Director: Oskar R. Zaborsky (Hawaii)

 Associate Director: Harvey W. Blanche (UC, Berkeley)

 Main Telephone: 808-956-8146

 ERC Program Director: Cheryl Cathey (EEC) team to be assigned

**ERC for Computer-Integrated Surgical Systems and Technology** at the *Johns Hopkins University, in partnership with Carnegie Mellon University with Shadyside Hospital and Massachusetts Institute of Technology with Brigham & Women’s Hospital* (an ERC to be initiated in FY 1998)

Center Director: Russell H. Taylor

 Deputy Director: James H. Anderson

 Main Telephone: 410-955-3536

 ERC Program Director: Deborah Crawford, DMII, team to be assigned

**Biotechnology Process Engineering Center** at the *Massachusetts Institute of Technology.* (An FY 1985 ERC reestablished in FY 1994)

Center Director: Douglas Lauffenburger

Main Telephone: 617-253-0805

http:/web/.mit.edu/bpec/www

ERC Program Directors: Cheryl Cathey (EEC) and Frederick Heineken, (BES)

**Biofilm Engineering Research Center** at *Montana State University.* (FY 1990\*)

Center Director: J. William Costerton

Deputy Director: Phil Stewart

Main Telephone: 406-994-4770

http//www.erc.montana.edu

ERC Program Directors: Frederick Heineken (BES)

**Center for Engineering Biomaterials** at the *University of Washington*. (FY 1996)

Center Director: Buddy D. Ratner

Deputy Director: Thomas A. Horbett

Main Telephone: 206-616-8646

http//www.uweb.engr.washington.edu/uweb/uweb.html

ERC Program Directors: Tapan Mukherjee (EEC) and Cheryl Cathey (EEC) and Janie Fouke (BES)

**Design and Manufacturing**

**ERC for Environmentally Benign Semiconductor Manufacturing** at th*e University of Arizona* in partnership with *MIT and Stanford University*, an ERC supported by NSF and the Semiconductor Research Corporation (SRC). ( FY 1996)

Center Director: Farhang Shadman

Associate Director: Raphael Reif (MIT)

Main Telephone: 520-621-6051

http://www.erc.arizona.edu

ERC Program Directors: John Hurt (EEC), Daniel Herr, Semiconductor Research Corporation (SRC) and Maria Burkha, Chemical and Thermal Systems (CTS)

**Center for Innovation in Product Development** at the *Massachusetts Institute of Technology.* (FY 1996)

Center Director: Warren Seering

Executive Director: Conger Gabel, on loan from the Xerox Corporation

Main Telephone: 617-253-3645

http://mit.edu/cipd/

ERC Program Directors: Cheryl Cathey (EEC), Joe Hennessey, Office of the Assistant Director (ENG), and Susan Sanderson, Social, Behavioral and Economic Research, Directorate for Social Behavioral and Economic Sciences (SBER/SBE)

**ERC for Reconfigurable Machining Systems** at the *University of Michigan.* (FY 1996)

Center Director: Yoram Koren

Deputy Director: A. Galip Ulsoy

Main Telephone: 313-764-3312

http://www.erc.engin.umich.edu

ERC Program Directors: Joy Pauschke (EEC), Delcie Durham (DMII), and Ming Leu (DMII)

**ERC for Computational Field Simulation** at *Mississippi State University.* (FY 1990\*)

Center Director: Donald Trotter

Main Telephone: 601-325-8278

http://www.erc.msstate.edu/

ERC Program Directors: George Lea (ECS), Joy Pauschke (EEC), and John VanRosendale, Advanced Scientific Computing, Directorate for Computer and Information Science and Engineering (ASC/CISE)

**Center for Collaborative Manufacturing** at *Purdue University.* (An FY 1985 ERC reestablished in FY 1994\*\*[[9]](#footnote-9)\*\* )

Center Director: James J. Solberg

Assistant Director: David Anderson

Main Telephone: 765-494-7715

http://erc.www.ecn.purdue.edu/erc

ERC Program Directors: Lynn Preston (EEC) and Susan Sanderson (SBER/SBE)

**Optoelectronics, Microelectronics, and Information Technology**

**Data Storage Systems Center** at *Carnegie Mellon University.* (FY 1990\*)

Center Director: Mark H. Kryder

Deputy Director: James E. Williams, Jr.

Main Telephone: 412-268-3513

http://www.ece.cmu.edu/afs/ece/www/httpd\_doc/research/dssc.html

ERC Program Director: John Hurt (EEC) and Rajinder Khosla (ECS)

**ERC for Low-Cost Electronics Packaging** at *Georgia Institute of Technology.*

(1995)

Center Director: Rao Tummala

Main Telephone: 404-894-9097

http://www.ece.gatech.edu/research/PRC/

ERC Program Directors: John Hurt (EEC) and Rajinder Khosla (ECS)

**Integrated Media Systems Center** at the *University of Southern California.*

(FY 1996)

Center Director: C.L. (Max) Nikias

Deputy Director: Alexander Sawchuk

Main Telephone: 213-740-0877

http:/imsc.usc.edu/

ERC Program Directors: Deborah Crawford (DMII) and John Hurt (EEC)

**Center for Power Electronic Systems** at the *Virginia Polytechnic Institute and State University, in partnership with the University of Wisconsin, Madison; the Rensselaer Polytechnic Institute, the North Carolina A&T State University, and the University of Puerto Rico - Mayaguez* (an ERC to be initiated in FY 1998)

 Center Director: Fred C. Lee

 Deputy Director: Dusan Borojevic

 Main Telephone: 540-231-7716

 ERC Program Director: John Hurt (EEC), team to be assigned

**Materials Processing for Manufacture**

**ERC for Advanced Engineering Fibers and Films at** *Clemson University in partnership with Massachusetts Institute of Technology*  (an ERC to be initiated in FY 1998)

 Center Director: Dan D. Edie

 main Telephone: 864-656-5422

**ERC for Particle Science and Technology** at the *University of Florida.* (FY 1994)

Center Director: Brij M. Moudgil

Main Telephone: 352-846-1194

http://www.erc.ufl.edu

ERC Program Directors: Tapan Mukherjee (EEC), Fred Betz (EEC), and Michael Roco ( CTS)

**Center for Interfacial Engineering** at the *University of Minnesota.* (FY 1988\*\*)

Center Director: D. Fennell Evans

Main Telephone: 612-626-2230

http://www.cie.umn.edu

ERC Program Directors: Tapan Mukherjee (EEC) and Bob Wellek (CTS)

**Center for Advanced Electronic Materials Processing** at *North Carolina State University and other North Carolina Institutions.* (FY 1988\*\*)

Center Director: John R. Hauser

Main Telephone: 919-515-5012

http://www2.ncsu.edu/ncsu/CIL/aemp/httnl/aemp.html

ERC Program Directors: John Hurt (EEC) and Rajinder Khosla (ECS)

**Resource Recovery and Utilization**

**Offshore Technology Research Center** at *Texas A&M University and The University of Texas at Austin.* (FY 1988\*\*)

Center Director: Jose Roesset

Associate Director: Skip Ward

Telephone: 409-845-6000

http://otrc5.tamu.edu/

ERC Program Directors: Joy Pauschke (EEC) and Ron Sack, Civil and Mechanical Systems (CMS)

**Self-Sustaining ERCs graduated from NSF Support in FY 1999 or Earlier**

**Center for Telecommunications Research** at *Columbia University*  (FY 1985 )

 Center Director: Thomas E. Stern

 Main Telephone: 212-854-3119

 http://www.ctr.columbia.edu

**Institute for Systems Research** at the *University of Maryland.* (An FY 1985 ERC reestablished in FY 1994)

Center Director: Gary W. Rubloff

Main Telephone: 301-405-6632

http://www.isr.umd.edu/

**Advanced Combustion Engineering Research Center** at *Brigham Young University and the University of Utah.* (FY 1986)

Center Director: Thomas H. Fletcher

Main Telephone: 801-378-2804

http://www-acerc.byu.edu

**Engineering Design Research Center (Institute for Complex Engineered Systems)** at *Carnegie Mellon University. (* FY 1986)

Center Director: Daniel P. Siewiorek

Institute Director: Pradeep Khosla

Main Telephone: 412-268-2272

Http://www.edrc.cmu.edu/

**Center for Compound Semiconductor Microelectronics** at the *University of Illinois, Urbana-Champaign.* (FY 1986)

Center Director: Stephen Bishop

Main Telephone: 217-333-3097

http://www.ccsm.uiuc.edu/ccsm/

**Center for Advanced Technology for Large Structural Systems** at *Lehigh University.*

(FY 1986)

Center Director: John W. Fisher

Main Telephone: 215-758-3524

http://www.lehigh.edu/~inatl/inatl.html

**ERC for Net Shape Manufacturing** at *The Ohio State University. (* FY 1986)

Center Director: Taylan Altan

Main Telephone: 614-292-9267

http://nsmwww.eng.ohio-state.edu

**Optoelectronic Computing Systems Center** at the *University of Colorado and Colorado State University.* (FY 1987)

Center Director: John Neff

Main Telephone: 303-492-7967

 http://www-ocs.colorado.edu

**Center for Emerging Cardiovascular Technologies** at *Duke University.* (FY 1987)

Center Director: Olaf von Ramm

Main Telephone: 919-660-5137

http://bme-www.mc.duke.edu/cect.html

**Appendix 1**

**Instructions for Submission of Cover Sheets of Engineering Research Center Proposals using NSF FastLane**

You are required to electronically submit the proposal cover sheet to NSF using FastLane. To access FastLane, go to the NSF Web Site http://www.nsf.gov, then select "FastLane" or go directly to FastLane at http://www.fastlane.nsf.gov.

**Instructions for the Principal Investigator (PI):**

Begin your FastLane ERC proposal cover sheet and budget information as early as possible.

Contact your Sponsored Research Office (SRO) for a PIN number to gain access to the FastLane "Proposal Preparation" application.

If you have not submitted a proposal to NSF in the past, you must contact your SRO to be added to the NSF PI database. Please do this as soon as you decide to prepare an ERC proposal.

As early as possible, enter your cover sheet and budget information using the FastLane "Proposal Preparation" application. In the field labeled "Program Announcement," type in "NSF 98-xx" exactly as shown, with no additional spaces or characters.

Click on the "Allow SRO Access" button. Allow time for your SRO to approve, copy and mail the proposal to meet the deadline. Contact your SRO to inform them of the proposal ID.

If you save your forms as a "template," you can re-use the data on the forms in future proposals.

Print the cover sheet (and budget, if desired) and insert into the printed copy of the proposal.

**Instructions for the Sponsored Research Office:**

Print the second page of the cover sheet in time to obtain the required institutional signatures.

Before assembling the proposal for copying, submit the cover sheet to NSF via FastLane using the "Submit Proposal" function within the "Institutional Management of FastLane" application. This will generate a proposal number. Allow at least a business day for this process.

Print a copy of the cover sheet; it will have the proposal number on it.

Substitute the first page of the cover sheet for the one produced by the PI.

Make copies of the proposal and submit to NSF according to the usual procedures for a paper proposal. The hard copies of the proposal MUST be received at NSF by 5:00 p.m. Eastern Standard Time, November 5, 1998, in order to be eligible.

Direct questions concerning FastLane or problems utilizing FastLane to fastlane@nsf.gov. Direct ERC program questions to the contacts listed in the program announcement under the section “Inquiries.”

OMB# 3145-0058

P>T> (Program Type) and K.W.(Keyword)

NSF 98-xxx Electronic Dissemination Only

1. An engineered system is derived from integrating a number of components, processes, and devices to perform a function. The system may be living or inanimate in origin. It must be complex and challenging enough to justify a ten-year program of research. Analysis, modeling, or development of the individual components of a system, without their integration into a complex engineered system, is not an appropriate focus for an ERC. [↑](#footnote-ref-1)
2. The results of evaluations of the effectiveness of ERC graduates in industry and the effectiveness of ERC industrial collaboration and technology transfer activities are available on the ERC WWW Home Page at the following address: http://www.eng.nsf.gov/eec/erc.htm [↑](#footnote-ref-2)
3. Proof-of-concept testbeds in ERCs are used to explore an ERC’s next-generation engineered system to determine if all components work together as planned and the system is feasible. These testbeds help to ensure that the research outcomes are integrated and tested and supply a framework for faculty, students, and industry representatives to work together and gain a better understanding of the realities of the system they are exploring and demonstrating. [↑](#footnote-ref-3)
4. Foreign firms may be involved in an ERC, if they agree to operate on a *quid pro quo* basis, providing financial support, exchanging personnel, and sharing their own facilities to the same degree as the other participating U.S. firms. Foreign firms are strategically and financially governed and controlled by corporate headquarters outside the Unites States. [↑](#footnote-ref-4)
5. Advances or deliverables emanating from ERC include fundamental knowledge advances, advances at the engineered systems level, and enabling or intermediate technology advances needed to achieve systems level advances. [↑](#footnote-ref-5)
6. NSF expects that the lead university would pass funds through to the partner and outreach institutions with a minimum fee for the service. Overhead would be changed by the recipient partner or outreach university. [↑](#footnote-ref-6)
7. Government agencies who will use the research and medical or other types of practitioners who will participate for purposes of technology transfer, as opposed to research, should be listed here. [↑](#footnote-ref-7)
8. The date of establishment of the ERC. [↑](#footnote-ref-8)
9. \*\* Scheduled for self-sufficiency in FY 1999. [↑](#footnote-ref-9)