Supporting Statement for Paperwork Reduction Submission

Grantee Reporting Requirements for Engineering Research Centers Program (3145-0220)

A. Justification

A.1. Circumstances Requiring the Collection of Data

At the request of the White House and the National Academy of Engineering, the ERC program was established in 1984 at the National Science Foundation (NSF) to develop a new interdisciplinary culture in engineering research and education in partnership with industry to strengthen the competitiveness of U.S. industry. The goal was to educate new generations of engineers who would be capable of integrating fundamental knowledge across disciplines to advance systems-level technology. The first generation of 18 successful ERCs, established between 1985 and 1990, focused on next-generation technological systems and the expansion of design and manufacturing in the academic engineering experience. The second generation of 22 successful ERCs, established from 1994 to 2006, focused on transformational engineered systems with the potential to transform industrial processes and product lines, became more multi-university in configuration, included pre-college education, and focused on significantly increasing the diversity of their faculty and students. Both generations of these ERCs functioned with sustained partnerships with industry and practitioners to bring knowledge of industrial and professional practices and needs to academe and speed the translation of their research into useful products, processes, and services. Gen-3 Engineering Research Centers (ERC) build on two generations of achievement of 40 successful ERCs funded through ERC solicitations between 1985 and 2006.

The Engineering Research Center (ERC) program provides multiyear (up to ten years) support to ERCs as continuing awards that are among the largest (up to $4 million a year) awarded by the NSF. Since the duration and size of these awards are extensive, it is necessary for the NSF to ensure that its

substantial investment is spent appropriately, that each of the centers meets the goals stated in its own strategic plan, and that each center's activities satisfy the goals and objectives of the ERC program. The ERC program currently funds a total of 17 Centers—3 beginning in 2003, 5 beginning in 2006, 5 beginning in 2008, and 4 beginning in 2011. To enable effective oversight of its investment, NSF requires that each currently funded Center submit an annual progress report that describes all activities of the Center. Each existing Center began submitting an annual report at the end of its first year. In the third and sixth-year, in lieu of an annual report, the ERCs may submit a renewal proposal. If they chose not to seek a renewal, they submit an annual report during their two-year phase down period before the award expires.

The annual reports and renewal proposals contain qualitative and quantitative information that contributes to NSF's efforts to answer broad evaluative research questions: 1) What is the overall value-added of the NSF ERC program? 2) What is the quality and impact of the research conducted in the Centers? 3) What is the quality and impact of education supported by the Centers? 4) What is the quality and impact of the knowledge transfer of the Centers? 5) Do the Centers effectively encourage the participation of US citizens and permanent residents, underrepresented minorities, women, and persons with disabilities in their activities? 6) Do the Centers create and sustain organizational connections and linkages within and among academia, government, and industry?

Additionally, to enable effective oversight of its investment, NSF requires that each currently funded center provide data annually to NSF and its contractor (ICF International). ICF International maintains a web-based database, currently known as ERCWeb. The database is used for the production of various reporting tables and charts that are used by the Centers in the preparation of their Annual Reports, Renewal Proposals, and by the Leader of the ERC Program for other NSF reporting requirements. Our contractor prepares summary tables representing aggregate information contained in the detail of the source tables that provide for easy program monitoring. Ad hoc reports

on special topics also are prepared by the contractor to assist the Program in documenting and

monitoring specific areas of interest.

Centers are responsible for submitting quantitative indicators for their most recently completed award

year of activity, updated annually. These data are used for NSF internal reports, historical data,

analytical studies, assessing program impact and recommending changes to strengthen the program,

as well as for strengthening the program and to ensure the program remains responsive to a changing

environment in order to secure future funding for continued ERC program maintenance and growth.

The data entered by a Center are also available for that Center's access and use in preparing their

Annual Reports. The indicators are both quantitative and descriptive.

Quantifiable Indicators include:

- Publications and Information Dissemination

    o Publications resulting from ERC support
    o Publications resulting from Associated Projects
    o Publications resulting from Sponsored Projects

- ERC Influence on Curriculum

    o Approved courses based on ERC research
    o Courses, modules, and instructional media with ERC context
    o Textbooks based on ERC research
    o New full degree, minors, or certificate programs based on ERC research

- Outreach and Information Dissemination

    o Workshops, Short Courses, and Webinars
    o Seminars, Colloquia, Invited Talks
    o ERC-Sponsored Educational Outreach Events for K-16 Students

- Personnel Exchanges

    o Student internships in Industry
    o Faculty working at Member Firm
    o Member Firm personnel working at ERC

- Educational Impact:

    o New courses currently offered
    o Currently offered, ongoing courses with ERC content

- o Workshops, short courses, and Webinars
- o New textbooks based on ERC research

- Technology Transfer

  - o Inventions Disclosed
  - o Patent Applications Filed
  - o Patents Awarded
  - o Licenses Issued
  - o Spinoff Companies Started, including estimated number of employees
  - o Building Codes Impacts
  - o Technology Standards Impacts

- ERC Student Degrees and Hires:

  - o Degrees to ERC students and type of degree earned
  - o Total ERC Graduates hired by Industry, Government, Academic Institutions

- Organization Involvement in Innovation and Entrepreneurship Activities

  - o Industrial Practitioner Members
  - o Affiliated Members
  - o Contributing Organizations
  - o Funders of Associated Projects

- ERC Personnel

  - o Diversity of ERC Personnel
  - o Research Project Investigators by Discipline
  - o Diversity of University Students involved in ERC research

- Functional Budget

  - o Research, by Thrust and Cluster
  - o Education Programs
  - o Industrial Collaboration/Innovation Program
  - o Major Equipment and Facilities
  - o Leadership Administration

- Sources of Support
  - o NSF Support
  - o Other NSF Support
  - o Other U.S. Government, State and Local Government Support
  - o Domestic and Foreign Industry Support

Descriptive Indicators include:

- A clear statement of the Center's vision and the historical evolution of the vision to the present, and impacts of the center through time.

- A strategic research plan described in the context of the state of the art, the ERC's goals, and the fundamental knowledge and technological barriers that the ERC is addressing
- Deliverable and milestones as a function of the age of the ERC
- Highlights of significant achievements and impacts
- A summary of the ERC's University and Pre-College Education efforts and results.
- A summary narrative of the role of industry/practitioners in the ERCs as sponsors and participants and a summary of the ERC's impact on new process and product development and innovation
- A discussion of the planned role of small firms in the ERC's translational research efforts
- Information on the institutional configuration and leadership effort of the ERC
- A description of the interdisciplinary makeup of the ERC team, and a summary of the progress on the participation of underrepresented groups

NSF has prepared the ERC Annual and Renewal Reporting Guidelines and ERCWeb Database Reporting Guidelines, to assist the ERCs in complying with the reporting requirements of the ERCWeb and the Annual Report, respectively.

The Annual Reports are used to:

- **Evaluate annual progress of a Center**. The primary purpose of the Annual Reports is to provide the information necessary for the NSF to monitor and evaluate the progress and accomplishments, as well as to identify problems of individual ERCs. The Annual Reports provide background information for the annual site visit reviews of each of the Centers that are conducted by teams of external reviewers and the NSF staff. The annual site visit review provides feedback to the Center and the NSF about its strengths, weaknesses, opportunities, and threats. In cases of significant weaknesses a Center is provided advice and a time schedule for addressing any weaknesses. The purpose and configuration of the renewal proposal is similar but there is added reporting on trends in outcomes and impacts over time and more extensive future plans.

- **Develop internal performance indicators and controls for a center**. The Annual Reports and Renewal Proposal provide information that is used by the leadership of each ERC to create and monitor metrics or performance indicators in the management of their Centers.

- **Make funding decisions**. The ERCs are funded under cooperative agreements, and funds are allocated to each Center on an annual basis for up to ten years, pending performance and availability

of funds. The first award is for five years, if the ERC is successful in its request for renewal another three years are added to the agreement to provide support through year eight. In year six, if the second renewal request is successful, two more years are added to the agreement to provide support through year 10. In either renewal case, if the renewal is denied, the funds are phased down during the last two years covered by the agreement. The NSF staff uses each Center's Annual Report together with the written input from the external reviewers responsible for the annual site visit review of a Center to make decisions on the continuation and level of funding for the Center. Renewal Proposals provide information to the site visit teams about past progress and impact and future plans, which are the basis for recommendations to add time and funds to the agreement.

- **Evaluate overall effectiveness of the ERC program**. The aggregate reports from all ERCs are used by NSF in evaluating the effectiveness of the ERC Program on an ongoing basis.

A.2. Purpose and Use of Data

The reports are used in the:

- **External Reviewer Annual and Renewal Review Site Visits.** External site visit teams (one for each Center) are convened by the NSF each year to evaluate the individual ERCs. The external site visit team for a Center is selected each year by NSF program staff. Each year for each ERC, the site visit team is comprised of at least 60% of the past reviewers for continuity. Typically a site visit team will have 6-9 members that have scientific, educational, and management expertise that corresponds to the specific Center's activities. The teams use the information in the annual reports/renewal proposals to assist in the on-site evaluation of each ERC's progress relative to its stated goals and objectives and to its performance during the previous year using the ERC Program's performance review criteria. After reading the annual progress report/renewal proposal, the site visitors convene at the site visit, receive briefings from the ERC's team, and spend time at the Center's site in discussion with the Center's researchers, educators, staff, students, industrial members, and administrators to review the Center's progress. The external site visit team summarizes its findings regarding the

ERC's strengths and weaknesses and any threat to future success in a site visit report, which NSF shares with the ERC.

- **NSF Staff Evaluation of Center's Progress and Funding Decision for Following Year.** The Leader of the ERC program is responsible for the program as a whole and for the post-award oversight system. There is a team of staff who manage the overall performance oversight systems and the database system. There is a team of ERC Program Directors, NSF staff, who are responsible for the oversight of one or more ERCs. They use the database and reporting system as the base of information provided to the site visit teams they develop and manage during the post-award site visits.

A.3. Use of Automation

All data is submitted electronically.

A.4. Efforts to Identify Duplication

No other federal agencies or organization within NSF collects data pertaining to the Engineering Research Centers.

A.5. Small Business Consideration

N/A

A. 6. Consequences of Less Frequent Collection

The reports and tables generated by the annual data collection comprise one of the primary mechanisms used by the NSF for approving funding for the ERCs on an annual basis. Less frequent data collection would preclude NSF's annual monitoring and documentation of the progress of each ERC and, thus, would not allow for informed decisions about funding and timely correction of any weaknesses identified in a Center's activities. The ERCs collect and aggregate data annually for

internal management and to monitor their own performance vis-à-vis program-wide benchmarks. The consequence of less frequent collection would manifest itself in lack of an effective way to continuously monitor the large investments of resources and time that NSF has committed to the Engineering Research Centers Program. Less frequent data collection would provide a greater burden on the individual Centers' management in determining their own progress and impact.

A.7. Special Circumstances for Collection

N/A

A. 8. Federal Register Notice and Outside Consultation

The agency's notice, as required by 5 CFR 1320.8(d), was published in the *Federal Register* on April 18, 2018, at 83 FR 16905, and no comments were received.

In addition, the reporting requirements and estimates on the hourly burden are discussed with the management of the Engineering Research Centers and our contractor, ICF International. Center Directors and their management staff, the primary respondents to this data collection, were consulted for feedback on the availability of data, frequency of data collection, the clarity of instructions, and the data elements. Their feedback confirmed that the frequency of data collection was appropriate and that they did not provide these data in other data collections.

A. 9. Gifts or Remuneration

N/A

A.10. Assurance of Confidentiality

Data is collected at the individual level within the Center and loaded into the ICF database in that fashion. However, aggregate data is reported to NSF and ICF has masked the database so NSF staff cannot view individual data.

A. 11. Questions of a Sensitive Nature

No questions of a sensitive nature are used. Only questions pertaining to the progress of the

Center, as stated by the program announcement, are used.

A. 12. Estimate of Burden

This request pertains to the 17 Centers that have received awards as of FY 2014. These Centers will

be joined by new centers that will be selected in FY2015. The competition for these centers started in

fall of 2013 and it is anticipated that this competition will result in 3 new awards.

Each center is required to input data and submit an annual report or renewal proposal; thus, the total

number of reports will be 20 per year. Based on the input from the management of the ERCs, we

estimate the burden of preparing annual reports, in terms of man-hours per Center, as follows:

1. Center's Director –10 hours

2. Deputy Director/Center's Administrator 40 – 50 hours

3. Education Director – 20 – 30 hours

4. Students graduate/undergraduate (material collection and preparation of project summaries) – 20 –

30 hours

Total hours per center are estimated to be 90 - 120 hours, on average approximately 100 hours; the

maximum burden is expected in the first year of reporting. In the years that follow, the burden often is

reduced given that a Center's internal practices and procedures are established. In most cases, the

burden in subsequent years is reduced to 75% of the hourly burden in the first year, although we

provide estimates allowing for the average maximum anticipated effort in the first year.

Total number of hours for 20 centers: approximately 2,000 hours.

ANNUALIZED COST TO RESPONDENTS

Estimated cost per Center, based on the most recent projections submitted in Center budgets, is as follows:

Expense category	Unit cost	Units	Total cost
1. Center Director	$110/hour	10 hours	$1,100
2. Deputy Director/Center's Administrator	$70/hour	40 –50 hours	Average $3,150
3. Education Director	$35/hour	20 – 30 hours	Average $875
4. Students graduate/undergraduate	$20/hour	20 – 30 hours	Average $500
5. Fringe benefits (30%) on items 1-3 (based on averages)			$1,691
6. Overhead costs (55%) on items 1-5			$4,024
Total cost per Center			**$11,340**
Total cost for 20 Centers			*$226,800*

The range of cost is calculated assuming the lowest and the highest number of hours.

A. 13. Annual cost burden [not included in hour cost]

There are no additional costs beyond the estimated hours of burden shown above.

A. 14. Annualized Cost to the Federal Government

The reports submitted by the ERCs are analyzed by the contractor for the purpose of providing Center profile documents, various types of data analysis, and tables for the purpose of overall program management. The following estimates of the anticipated effort are based on the input from our contractor, ICF International, and their experience with the ERCWeb. The contractor uses three types of experts: Senior Program and Task Managers, Senior Programmers, and Analysts. The research

assistant is responsible for data collection, analysis, tabulation and dissemination. The senior analyst assists with report preparation and review. The associate is responsible for report preparation, quality control, and review.

The annual estimate of their activities and role are as follows:

Expense category	Unit Cost per Hour	Hours	Total cost Per Year
Senior Program Manager	$203	120	$24,360
Technical Task Manager	$141	140	$19,740
Senior Programmer	$107	420	$44,940
Senior Analyst	$83	2,020	$167, 660
Analyst	$65	3,036	$197,340
Total cost per Center (20)			**$26,708**
Total cost for 20 Centers			**$534,160**

A. 15. Changes in Burden

There is no change in burden.

A. 16 Publication of Collection

N/A

A. 17 Approval to Not Display OMB Expiration Date

N/A

A. 18 Exception to Item 19 of OMB Form 83-I Certification Statement

N/A

B. STATISTICAL METHODS

Not applicable

Attachments

Attachment I. ERC Annual and Renewal Reporting Guidelines

Attachment II. ERCWeb Database Reporting Guidelines

Attachment III. Screen capture of ERCWeb Database