NATIONAL SCIENCE FOUNDATION
DIRECTORATE FOR ENGINEERING
ENGINEERING RESEARCH CENTERS PROGRAM

**FY 2012
GUIDELINES FOR
PREPARING
ANNUAL REPORTS
AND
RENEWAL PROPOSALS**

**for the
ENGINEERING RESEARCH CENTERS
CLASSES OF 2003-2011**

January 2012

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Major Changes since the Release of the FY 2011 Guidelines

CHANGES IN ANNUAL REPORT

We would like to emphasize the following in the annual reporting guidelines:

- *Reporting on Translational Research Awards.* Centers are requested to include a 2-3 page write-up of their ERC-SBIR and other ERC Translational Research Awards in the appropriate section of the annual report. See Section 4.5 for additional guidance.
- *Reporting on Graduate Research Supplements.* Centers are requested to include a 2-3 page write-up of their Graduate Research Supplements in Volume II.
- *New contact information for Courtland Lewis.* See Section 6.2 for the new mailing address for hardcopies of the annual report.
- *Matrix of educational activities.* A new requirement this year is a center-produced matrix that displays your university and pre-college education activities for the lead and partner universities. See Section 4.5.3 for additional details.
- *Clarification for Table 2.* Additional clarification is provided for reporting sponsored and associated projects. See Section 4.5.2.2 for more information.
- *IRB Certification.* If data are collected on the performance of ERC students (REU or regular and the impact of pre-college programs on students) and these data are presented to the public through a publication or talk at a conference, an IRB Human Subjects approval is required.
- *Bibliography moved to Volume I.* See Section 4.7 for additional information.

CHANGES TO DATA ENTRY IN ERCWEB

The ERCWeb Annual Data Reporting System underwent a substantial rebuild in FY2011. The numerous changes to the database will not be detailed here; Centers are strongly encouraged to review the rebuilt ERCWeb and all data entry requirements, in addition to the revised *Guidelines for ERCWeb Data Entry*.

1 INTRODUCTION

The purpose of this document is to provide information to Engineering Research Centers (ERCs) in the Classes of 2003 through 2011 regarding the requirements for the preparation of their respective annual performance report or renewal proposal. The special features required of the Gen-3 ERCs starting with the Class of 2008 are also noted in the following guidelines. The function of the Annual Report (submitted as a renewal proposal in the case of centers in their 3rd or 6th years) is to communicate the ERC's vision, activities, plans, and achievements in all aspects of center operations. Because a renewal proposal has the same general structure and content as the Annual Report, in these Guidelines the term "Annual Report" will also refer to the renewal proposal. Where there are differences, they will be noted. The Annual Report is an opportunity for each center to present a unified picture of the strategic scope of their research, education, and industrial collaboration programs; details about individual research projects and how they fit into the center's vision; and the progress and impacts they are making and milestones they have achieved. The Annual Report also contains plans for the next year and, for renewal proposals, contains plans for the next four to five years. In addition, the Annual Report is used by the NSF Program Director and site visit team members to assess an individual ERC's performance. The ERC Program Leader also uses the full set of reports to monitor the aggregate of all the centers' performance and to prepare reports regarding the outcomes and impacts of the ERC Program to NSF management, the Office of Management and Budget (OMB), and Congress. Finally, the leadership team of each ERC also uses its Annual Report as a valuable internal management tool and record of center accomplishments.

2 PLANNING FOR THE ANNUAL REPORT

Although the deployment of the on-line database system, ERCWeb, has made producing the required tables and charts easier, producing the Annual Report itself is still a major undertaking and one of the main responsibilities of the Administrative Director during the year. The center leadership team should meet several months before the report is due to develop a plan and schedule for the preparation of the document and assign chapter and section responsibility. The Director and Deputy Director must be directly involved throughout the process by writing sections and supervising the preparation of the content for the remaining sections, reviewing drafts, and ensuring the integration of all portions. The goal is a final document that is a strong, accurate, and complete reflection of the center's activities and accomplishments during the year. The better the report and data quality, the easier it is for the reviewers to understand a center's achievements and plans and for the ERC's NSF Program Director to prepare a recommendation for the next year's funding or renewal approval recommendation. Additional information and suggestions helpful to the Administrative Director can be found in Chapter 6, Administrative Management, and Chapter 9, Multi-University ERCs, of the on-line ERC Best Practices Manual at http://www.erc-assoc.org/manual/bp_index.htm.

2.1 Report Preparation Steps

The Center Administrative Director should review the important documentation that establishes the ERC reporting requirements when planning for the Annual Report begins. These include the following documents:

- *Center's Cooperative Agreement.* The center's Cooperative Agreement is the mechanism by which the ERC is funded and it is updated annually based on the results of the previous year's performance review. It includes the center's responsibilities and NSF's responsibilities and describes annual reporting and performance review procedures and requirements.
- *FY ~~2011~~ 2012 Guidelines for Preparing Annual Reports and Renewal Proposals* (this document)
- *Performance Review Criteria*. The criteria define the characteristics, behaviors and results that describe high quality performance and low quality performance as a function of the age of the center. The site visit review team and NSF staff use these criteria to perform their evaluation of the center.
- *ERCWeb Annual Report Data Entry System* contains data entry screens, associated explanations and help screens. Available at https://www.erc-reports.org; log in using userID and password, select Data Entry for your Center.
  - Guidelines for ERCWeb Data Entry. The *Guidelines for ERCWeb Data Entry* contains screen by screen instructions for data entry into the ERCWeb Annual Report Data Entry System organized by data entry "tabs" as seen on the entry screens. It also contains a complete glossary of terms that will supplement the glossary contained in this document.
- *NSF Proposal and Award Policies and Procedures Guide*

Table 2.1.1 summarizes the steps to be taken in preparing the Annual Report together with the data submission.

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                         │              Review Documents:                   │
                         │ NSF Proposal and Award Policies and Procedures Guide │
                         │           Center's Cooperative Agreement         │
                         │           Performance Review Criteria            │
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FY2011 Guidelines for Preparing Annual Reports	Guidelines for ERCWeb Data Entry

	• Obtain ERCWeb Account • ERC Web Tutorial • Learn Data Entry Screens

• **Develop Timeline For Report:** • Due Date for ERCWeb - produced tables • Volume I Sections • Volume II Project Summaries • Assign Section Responsibilities	**Develop Data Collection Mechanism** Data Due Dates (ongoing vs. end of Reporting Year)

• Prepare drafts, review, edit: • Volume I: Narratives, Certifications, Budget Requests • Volume II: Project Summaries, Biographical Sketches, Bibliographies	Collect required ERC Data Enter Data on ERCWeb Data Entry Screens
	Download Annual Report Tables from ERC Web

Analyze Data Tables; integrate tables into report

Internal Review; Final Edit Cycles

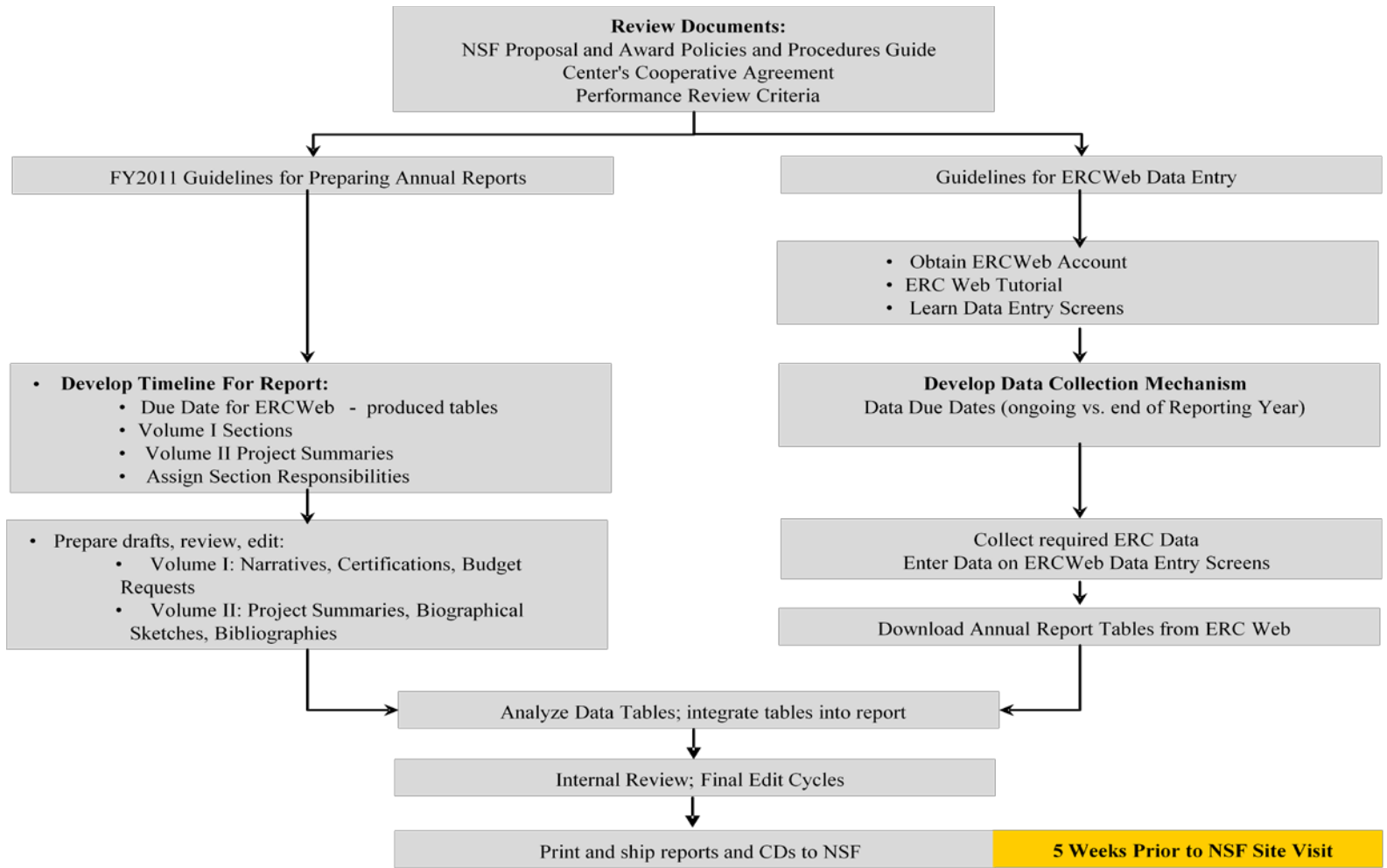| Print and ship reports and CDs to NSF	**5 Weeks Prior to NSF Site Visit**

Table 2.1.1: Annual Report and Data Submission Process

2.2   Requirements for New Centers:

2.2.1   Development of a Data Collection System

Each center must develop a data collection system and associated timeline to ensure that all necessary data are collected from the lead, partner and collaborating institutions in time to compile and enter it into the ERCWeb database. This is described more completely in the *Guidelines for ERC-Web Data Entry.* The center inserts several tables produced by the ERCWeb database, as well as center-created tables and figures, into the Annual Report as directed in this document. The center needs to base its timeline on the end of its Reporting Year. It is important to review the ERCWeb input screens and the *Guidelines for ERC-Web Data Entry* so that the requirements for data are understood. The sources of data needed should be identified early in the process and a system of collecting that data should be developed. Any changes in NSF required data should be noted and adjustments/additions made to the data collection process.

A summary of the major changes to the Annual Report from 2010 to 2011 is provided at the beginning of this document. A summary of the ERCWeb produced tables and the corresponding data entry screens is provided in Section 3.1. Figure 2.2.1 gives a visual depiction of the information and the data entry screens.
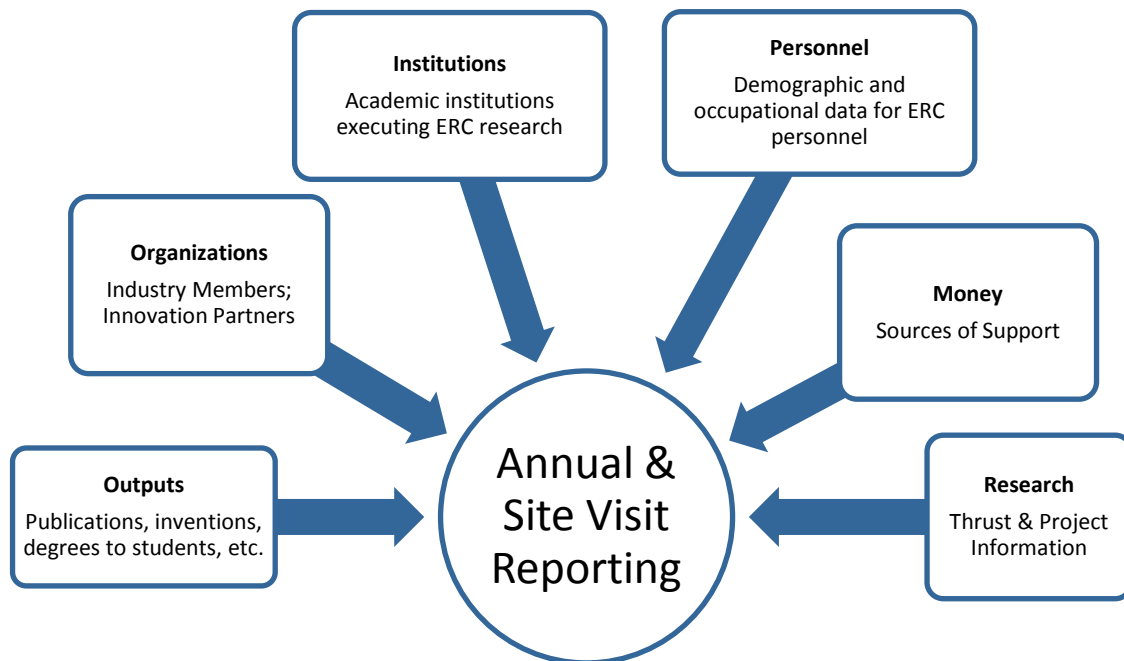

Figure 2.2.1: ERCWeb input screens have six data entry screens to enter the required data

2.2.2   Financial Management System

One of the first things that new centers must contend with is establishing a financial management system. As soon as the first year of ERC support reaches the lead institution, the

center must be ready to begin allocating and spending it. All cash support from NSF, industry member fees and other sources along with sponsored project support awarded to the center should be placed in an account(s) controlled by the center. A center's sponsored projects office may be able to split large awards from other sources in which the ERC is one of multiple recipients so that the center's funds go into the center's account. This allows the center to get "credit" for receiving the support and gives the ERC control over the funds.   Given the magnitude of NSF ERC Program support, all ERCs must have financial management systems that can successfully survive an audit by NSF auditors from the Office of the Inspector General (OIG), or the Division of Institution and Award Support (DIAS), which is connected with the unit that oversees the awarding of ERC cooperative agreements. Any questions about financial management may be posed to Charlie Zeigler, czeigler@nsf.gov, 703-292-4578 from DIAS. He has extensive experience helping ERCs improve their cost accounting and financial documentation and is available to help.

3   CONTENT AND STRUCTURE OF AN ANNUAL REPORT

The Annual Report consists of two separate volumes, aptly titled Volume I and Volume II. Volume I provides the reviewers and NSF with an integrative summary of the evolution of the vision and plans, activities, infrastructure, and impacts of the ERC. Volume I should communicate the full scope of the ERC with sufficient technical depth that the reader fully understands the breadth, depth, and value added of the ERC. It contains data representing the impacts of the center, its personnel, sources of support, and expenditures. Volume II provides further in-depth support to Volume I through brief summaries of the individual research and education projects and other supporting information.

The Annual Report should be developed in a manner that best suits an individual center's strategic research plan and accomplishments within the structure outlined in this document. It should describe how the support provided to the center has resulted in a synergy of research, education, outreach, diversity, and industrial collaboration efforts (innovation ecosystem for Gen-3) and their impacts that could not have been achieved by a collection of single awards. This guidance represents the baseline information to be included; beyond that, the ERC may include other pertinent information to yield an informative document that will communicate in the best fashion for that center.

It is advisable for the Center Director to prepare the draft of the Systems Vision, Value Added, and Broader Impacts section first to assure that the report has a high level, integrated summary of its vision, structure and impacts. This will serve as a reference for those preparing the separate sections. When those sections are complete, this first section should be finalized, accounting for new findings and impacts.

- Volume I has the following structure. Each component is described in further detail in Section 4.
- Cover Pages
- Project Summary
- Table of Participants
- Table of Contents
- Narrative
    - Systems Vision and Value Added/Broader Impacts of the Center

- o Strategic Research Plan and Overall Research Program
- o University and Pre-college Education
- o Industrial/Practitioner Collaboration, Technology Transfer and New Business Development (*Innovation Ecosystem* for Gen-3)
- o Infrastructure
  - Configuration & Leadership
  - Diversity Strategy and Impact
  - Management
  - Resources & University Commitment
- References Cited
- Budget Requests (NSF Form 1030)
- Appendices
  - o Summary List of Appendices
  - o Appendix I: Glossary and Acronyms
  - o Appendix II: Agreements and Certifications
  - o Appendix III: ERCWeb Table 7

- Volume II has the following structure and content. Each component is described in further detail in Section 5.
- Table of Contents
- List of ERC Projects
- Project Summaries
- Associated Project Abstracts
- Bibliography of Publications
- Biographical Sketches
- Current and Pending Support

3.1 Annual Report Tables and Figures

The Annual Report contains several tables and figures. Many of the required tables and figures are generated within ERCWeb; however, there are several that are Center-generated. The summaries below identify the ERCWeb and Center-produced tables and figures required in the Annual Report. Please be sure to include all required tables and figures before submitting the Annual Report.

3.1.1 ERCWeb-Produced Table and Chart Summary

Data Entry Tab in ERCWeb	Tables Produced	Data Based on
I. Organizations	**Table 4** Industrial/Practitioner Members, Innovation Partners, Funders of Sponsored Projects, Funders of Associated Projects and Contributing Organizations	**Award Year**
	Table 4a: Organization Involvement in Innovation and Entrepreneurship Activities	**Reporting Year**

		Award Year
	Table 5: Innovation Ecosystem Partners and Support by Year	**Award Year**
	Figure 5a: Technology Transfer Activities	**Reporting Year**
	Figure 5b Lifetime Industrial/Practitioner Membership History	**Award Year**
	Figure 5c Total Number of Industrial/Practitioner Members	**Award Year**
	Figure 5d Industrial/Practitioner Membership Support, by Year	**Award Year**
II. Institutions	**Table 6** Institutions Executing the ERC's Research, Technology Transfer, and Education Programs	**Reporting Year**
	Figure 6a Domestic Location of Lead, Core Partner, Outreach, and REU and RET Participants Institutions	**Reporting Year**
	Figure 6b Foreign Collaborating Participants' Institutions (Gen-2) or Location of Foreign Partner Institutions (Gen-3)	**Reporting Year**
	Figure 6c Country of Citizenship for ERC Foreign Personnel	**Reporting Year**
III. Personnel	**Table 3b** Ratio of Graduates to Undergraduates	**Reporting Year**
	Table 7 ERC Personnel	**Reporting Year**
	Table 7a Diversity Statistics for ERC Faculty and Students	**Reporting Year**
	Figure 7b Women in the ERC	**Reporting Year**
	Figure 7c Underrepresented Racial Minorities in the ERC	**Reporting Year**
	Figure 7d Hispanics/Latinos in the ERC	**Reporting Year**
	Figure 7e Persons with Disabilities in the ERC	**Reporting Year**
	Table 7f Center Diversity, by Institution	**Reporting Year**
IV. Research	**Table 2** Estimated Budgets by Research Thrust and Cluster	**Award Year**
	Figure 2a Research Project Investigators by Discipline	**Award Year**
V. Money	**Table 8** Current Award Year Functional Budget	**Award Year**
	Table 8c Education Functional Budget	**Award Year**
	Figure 8a Functional Budget as a Percentage of Direct Support	**Award Year**
	Figure 8b Functional Budget as a Percentage of Associated Project Support	**Award Year**
	Table 9 Sources of Support	**Award Year**
	Table 10 Annual Expenditures and Budgets	**Award Year**
	Table 11 Modes of Support by Industry and Other Practitioner Organizations to the Center	**Award Year**
VI. Outputs & Impact	**Table 1** Quantifiable Outputs	**Reporting Year**
	Table 1a Average Metrics Benchmarked Against All Active ERC's and the Center's Tech Sector	**Reporting Year**
	Table 3a Educational Impact	**Reporting Year**

rt Summary

Center-Produced Table and Chart Summary	
Section 4.3 - Participants Tables	
	Partnering Institutions
	List of the Leadership Team
	Thrust Table
	Non-University Partners
	Scientific Advisory Board
Section 4.5.2.1 ERC's Strategic Research Plan	
	Three-Plane Strategic Chart
	Milestone Chart
Section 4.5.2.2 ERC's Strategic Research Plan	
	Translational Research Partners Table

Section 4.5.3 University and Pre-College Education Programs	
	Education Activities Matrix
Section 4.5.4.3 Technology Transfer and New Business Development	
	ERC Intellectual Property Table
	Technology Transfer Table
	Technology Transfer Chart
Section 4.5.4.4 Innovation	
	ERC Start-Up Firms Table
	Technology Translation Innovation Proposals Submitted by the Center
Section 5.3 - Management Effort	
	Table 8b: Portion of Current Award Year Budget, by Institution
	Table 9a: History of ERC Funding of the Center
	Table 9b: Cost Sharing by Institution
	Table 9c: Funding by International Partner Universities (Gen-3)
	Table 10a: Unexpended Residual in the Current Award and Proposed Award Year

4   VOLUME I REQUIREMENTS

Volume I contains the body of the report (or renewal proposal for centers in their 3rd or 6th year) and is ideally 100 pages in length or less. This count excludes required NSF graphics and tables, required NSF forms, appendices and budget pages. Volume I contains narrative interspersed with required NSF tables and charts produced by ERCWeb as described in this section. The ERCWeb tables and charts should be placed within the narrative after the first time they are discussed (they are not to be collected and presented at the end of the document, except as noted in the instructions) and must be sized and presented to be easily readable. All required tables must be included in the Annual Report or the ERC funding will be withheld until the required tables are submitted.

4.1   Cover Pages

The ERC's own cover page should be the outermost cover page of the Annual Report. It should include the title of the center, followed by "an Engineering Research Center" (if that is not in the title). Next it should list the lead and any core partner institutions involved and the names of the Director and Deputy Director. It should also indicate the following information:

> (a) The year of the Annual Report, e.g. first Annual Report (or the year of the renewal proposed, e.g., third or sixth-year renewal proposal);
> (b) The due date of the report (i.e., day, month, year); and
> (c) The cooperative agreement number.

The following page will be page 1 of the official NSF cover page (NSF Form 1207). The appropriate certification boxes, e.g., Human Subjects and Animal Subjects, etc., should be checked. If human and/or animal subjects are included in the ERC, the report or renewal proposal must include Institutional Review Board Certifications in the appendices.

4.2   Project Summary

The Project Summary is a <u>one-page summary</u> of the goals, programs, and achievements of the ERC. This summary must be prepared according to the instructions in the *NSF Proposal and Award Policies and Procedures Guide*. The summary must provide specific reference and information relevant to the NSF Intellectual Merit and Broader Impacts review criteria. To do this, <u>the summary must contain headings marked "Intellectual Merit" and "Broader Impact"</u> where the respective information is reported. An Annual Report that does not include a project summary with these references or does not address these criteria **will be returned without review**. The summary should be written in the third person and in a style that will be easily understood by an educated lay audience. NSF should be able to use the narrative in documents for the public without having to rewrite it or request clarification from the center before using it. NSF ERC program staff also use the Project Summary as part of the documentation taken forward to NSF approval boards for renewal proposals so it is important that this page be accurate and up-to-date.

4.3   Participants Tables

A required component that MUST be included in the report to assist the reviewers in determining the team members, their disciplines and affiliations, and in determining conflicts-of-interest.

The ERC should develop Participants Tables with the following sections.

- List of partnering institutions (domestic for Gen-2 centers, and domestic and foreign for Gen-3 centers)
  - Column Headings: Name, City, State / Country (if not U.S. institution)
  - One institution per row, start with lead institution and bold lead institution's name

Name of Institution	City	State / Country
Lead Institution		

- List of the Leadership team
  - Column Headings: Position title, Name, Department (or ERC Staff), Institution
  - One individual per row

Position Title	Name	Department (or "ERC Staff")	Institution
e.g. Director			

- List each thrust in separate thrust table.
  - Title each table with the name of the Thrust
  - Column Headings: Position title, Name, Institution, Department
  - One individual per row (the first row should be the thrust leader)
  - List all faculty members involved in that thrust

Thrust Name			
Position Title	Name	Department	Institution
e.g. Thrust Leader			
e.g. Faculty Researcher			

- List of other non-university partners carrying out ERC's mission such as pre-college institutions, and, for Gen-3 centers, innovation partners (organization devoted to promoting entrepreneurship and innovation) and small business partners carrying out translational research. Create a separate table for each type of non-university partner with the following features:
  - Column Headings: Name of institution, organization or partner, City, State
  - One institution per row

Name of institution / organization/ partner	City	State

- Scientific Advisory Board, Industrial Advisory Board, and other advisory boards, make one table per board
  - Column Headings: Name, Title, Organization
  - One individual per row

Name	Title	Organization (Department or Division)	Institution or Firm

4.4   Table of Contents

The Table of Contents should indicate the page numbers and titles of all the sections and appendices. The Table of Contents should also list the title and page number for each ERCWeb table or figure under the relevant section. Each section should be tabbed with text titles.

4.5   Narrative

The reference point for the narrative is the reporting year in the context of the age of the center. There is a different level of expectations for centers in their first three years of operation than for centers in their second three years or in their last years of NSF/ERC support. This can be seen in the ERC performance review criteria that can be found on the library website link on the ERCWeb log-in page http://www.erc-reports.org   in the Performance Review section in the Criteria and Protocol documents. The narrative text should provide information for NSF and the reviewers to assess the extent and quality of the ERC's progress and plans within the context of the ERC performance review criteria.

It must be clear to the reader which results were made in the last year and which were made in earlier years.   This is especially true for renewal proposals where the prior three-year performance period is assessed.

In addition, each section of the report must address future plans, including describing how any requested growth in funding will be expended and how the project(s) to be supported by the additional funds fit within the strategic plan and benefit the center overall.

ERCWeb charts and tables should be inserted into the report sections as indicated and discussed in the text. The font must be a size that is easily legible when the report is printed. Except for ERCWeb Table 7, which comprises Appendix III, they should not be grouped together at the end of the report or in an Appendix.

Renewal Proposals. For renewal proposals, clear statements of any new directions proposed in research, education, or industrial partnerships should be provided. In addition, trend charts, to show progress over the previous years of funding, on diversity, total financial support, and the number of industrial/practitioner members should be provided. Only data on member firms that have signed a membership agreement with the ERC and provided the requisite membership fees (these must be cash or in-kind support) should be shown in these trend charts. For third-year renewal proposals, data for the current year and each of the two previous years should be included in the trend charts; for sixth-year renewal proposals, data for the current year and each of the five previous years should be included in the trend charts.

ERC Innovation Awards and/or ERC-SBIR Partnership Awards. Centers that have received ERC Innovation Awards and/or ERC-SBIR and other ERC Translational Research Awards (e.g. SECO awards) should report on the results of the awards in the appropriate section of the Annual Report. For example, centers receiving testbed or translational research awards would report on

the progress in the Strategic Research Plan and Overall Research Program section; centers receiving awards related to innovation or technology transfer would report on the progress in the Industrial/Practitioner Collaboration, Technology Transfer and New Business Development section. For each award, the goals and objectives should be summarized along with the progress made toward achieving those goals.

The headings that follow throughout section 4.5 of these Guidelines should appear, in the order shown, as the headings in the Annual Report.

4.5.1 Systems Vision and Value Added of the Center

This section should provide the reader with 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. It is important for our review and recommendation system that these impacts be presented in both technical and quantitative terms as well, if appropriate. Summary information on actual and potential economic impacts of the ERC's research and technology should be presented, such as the potential or actual market impacts, people impacted if the technology is realized, energy saved, etc. as appropriate to the vision.

4.5.1.1 Systems Vision

The current systems vision statement should be short and clear, focusing the reader on the systems-level goal(s) and potential impact. There should also be a statement of the systems vision at the time of funding for new ERCs or provided in the latest renewal proposal for older ERCs to show the evolution of the vision over time. A rationale should be provided as to why the systems technology is transformational. The fundamental barriers that the center is addressing should be discussed. This should be supported by an analysis of what is lacking now without the achievement of the fundamental research and the systems-level goals, how industry/practice has been or will be strengthened or transformed by its realization, and why this is important for society in general. The theory and science underpinning the center's research and the evolution of the vision over time should be discussed in summary here with more detail in the research section.

This section must also include direct actions actually taken (not just planned) by the ERC in response to major weaknesses and any threats regarding the vision that were identified in the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the prior annual or renewal review site visit report.

4.5.1.2 Value Added and Broader Impacts

The overall goal of this section is to convey to the reader, in a summary form, the significant and cumulative impacts that the center has made since its inception, including its impacts on knowledge, education, technology and industry/practice (including impacts on innovation for Gen-3 centers) society in general, and on the quality and diversity of the science and engineering workforce. This section should deliver a clear message about the outcomes and impacts that have resulted from or, for centers in their first year, are expected by the integrative construct of an ERC as opposed to the type that would emanate from a series of single investigator awards.

The following specific areas should be summarized in the narrative of this section. More detailed information should be presented in later sections of the report.

Research:
- *Engineered Systems-level Approach and Advances*. Indicate how the research program is contributing (or, for newer ERCs, positioned to contribute) to systems-level advances. Discuss the role of key systems level testbeds. Discuss the lessons learned and any corrective measures taken.
- *Research Productivity.* Address the ERC's research productivity using indicators such as publications, patents granted, licenses issued, recognition awards to center faculty and students, scientific breakthroughs in knowledge and technology (not just incremental advances), front cover articles in journals, etc.
- *Translational Research Awards.* For Gen-3 centers and Gen-2 centers receiving translational research awards or carrying out translational research in collaboration with innovation partners and/or small businesses, summarize the translational research work and results to date.

Education Outcomes:
- For Gen-2 and Gen-3 centers, provide evidence that the ERC has effectively developed *a culture* that is developing ERC graduates who are more effective in industrial and academic practice.
- In addition, for Gen-3 centers in their third year and beyond, provide evidence that the ERC is developing engineers who are prepared to be *more creative, adaptive, and innovative* in a global economy.
- Summarize any significant educational exchanges with industry and the external community, including workshops, efforts to provide students with information about regulatory bodies that impact the use of the ERC's technology, etc. and the results of such exchanges.
- Highlight interdisciplinary curriculum impacts.
- Summarize the ERC's pre-college program efforts and results.

Industrial Collaboration and Technology Transfer Interactions (*Innovation Ecosystem for Gen-3)*:
- *Summarize the role of industry/practitioners* in the ERC as sponsors and participants.
- *Summarize major technology transfer events* including licenses for technology that are being developed actively and/or have been commercialized, and spin off firms or product lines that resulted from ERC research.
- If applicable, *identify any workshops or other efforts* focused on standards, regulatory issues, or policy issues that impact the ERC's technology.

Team and its Diversity:
- *Describe the interdisciplinary makeup* of the team.
- *Summarize progress on the participation of underrepresented groups* as members of the leadership faculty, research faculty and student teams since the center's inception.

The ERCWeb **Table 1**, "Quantifiable Outputs", and **Table 1a**, "Average Metrics Benchmarked Against All Active ERCs and the Center's Tech Sector" should be inserted in this section. The information in these tables should be used to support the center's analysis of the impacts of the ERC *vis-à-vis* those in the center's technology sector and all ongoing ERCs.

4.5.1.3 Highlights of Significant Achievements and Impacts

Also required in this section of the Annual Report are specific "nuggets" or "highlights" of significant achievement and impact that are a result of the integrative, interdisciplinary construct of the ERC. NSF has placed a new emphasis on writing highlights for a broad public audience; the targeted audiences for the requested highlights include Congress and other federal/state policymakers; business and industry; the general public; and NSF (for internal briefings, speeches, and websites). The NSF Office of Legislative and Public Affairs (OLPA) adapts these highlights for the new public website *"Science, Engineering, and Education (SEE) Innovation."* To preview the website, see: http://www.research.gov/seeinnovation .

In addition to a title, each highlight should include the following three sections in narrative form:

- Outcome/Accomplishment. Describe the outcome using language anyone can understand; all highlights should emphasize major impacts achieved because of the interdisciplinary construct of the ERC, especially those things that could not have been achieved by a single investigator type project alone;
- Impact and Benefits. Describe the benefits to society, economy, industry, nation, region, science & engineering in a style that is intended for the educated lay reader and tells a story about what happened, why it is significant, what its impact has been or will be, and why it took an ERC to achieve it; and
- Explanation and Background. Provide additional explanation of the outcome and its impact (e.g. the technical background).

Each highlight must include an image that illustrates the concept or shows the technology that anyone can understand.

The better the examples and accompanying narratives are, the more effectively the center will communicate its impacts to its reviewers and to NSF.

Additional Highlights Reporting Requirements
- The highlights reported should cover achievements made during the last year; and for a renewal, during the last three years, with the year of achievement marked.
- There is no explicit requirement for, or limit on, the number of highlights, but they should have the following characteristics: 1) be accomplishments of major significance; and 2) have passed a significant milestone or have come to fruition during the reporting year—and not be simply a report of incremental advancement of a "work in progress."
- Highlights should be reported in the following categories: Research/Technology Advancements, Education, Technology Transfer (including successful spinoff/start-up companies), and Infrastructure (including large databases that function as a national resource, large testbeds and new facilities).
- The highlights may be inserted into the report in a font less than 12 point (Times New Roman) or 10 point (Arial), if they take up too much space, but they must be readable. They must be included in this section, not in an Appendix.
- Highlights used in a previous report may not be repeated unless they provide background for major recent advances or impacts that have taken place since the highlight was first reported.

These highlights will be the principal source documents for ERC Program and NSF documents and budget requests. When a center sends their Annual Report on a CD to the ERC Program's communications consultant, Mr. Courtland Lewis, (see section 6.2), he extracts selected highlights for use in the required NSF reports. He may contact centers whose highlights are chosen for inclusion in these reports for additional information. A selected number of highlights from all the ERCs are posted on the ERC Association website (http://www.erc-assoc.org) in the achievements showcase. A few are selected by the Director of EEC who recommends them to the Assistant Director of Engineering, who in turn selects a few from across the directorate for recommendation to the NSF Director for inclusion in NSF's report to the Office of Management and Budget (OMB). Excellent ERC highlights result in recognition of an individual center's achievements and the achievements of the ERC Program throughout NSF, at OMB and the White House, and in Congress.

4.5.2 Strategic Research Plan and Overall Research Program

This section describes the ERC's strategic research plan and provides summary information on the research program that has been structured to achieve the goals of the plan. ***This section should summarize results from the previous three years (fewer if the center is less than three years old) with more detail for the last year.*** It should include a summary description of the evolution of the strategic research plan since inception to communicate how the research goals and deliverables of the ERC have changed over time in response to advances in the state of the art and practice at the ERC and elsewhere. In addition, any major new research directions for the proposed year(s), such as new thrusts and/or testbeds, should be described. Detailed project-level information is provided in Volume II.

4.5.2.1 ERC's Strategic Research Plan

The ERC's strategic plan must be represented using the ERC Program 3-Plane Strategic Planning Chart. The Class of 2011 and later must use the revised ERC Program 3-Plane Strategic Planning Chart (with barriers); older centers are encouraged to use the revised version. Regardless of the version of the 3-Plane Strategic Planning Chart used, all centers must address the key barriers that impede progress toward the realization of their vision. A template can be found in the library link at the ERCWeb website http://www.erc-reports.org/help/ann_rpt_guide.cfm under the section, "ERC Planning Information."

Strategic Research Plan Reporting Requirements
- The ERC's strategic research plan should be described in the context of the state of the art, the center's goals, and the fundamental knowledge and technological barriers that the ERC is addressing.
- It should address significant and challenging barriers that can lead to breakthroughs in knowledge; it should address breakthrough enabling technology needed to achieve the systems goals; and it should address challenging systems level research and explorations in enabling systems technology testbeds.
- The ERC's customization of the ERC Program's 3-plane strategic planning chart is required. It will illustrate how the systems-level goals of the center motivate and drive the research plan and how these goals integrate fundamental, enabling technology, and systems-level research, as well as proof-of-concept testbeds, to address barriers and to deliver discoveries, advances in knowledge, and new technology.
- Given the strategic research plan, a rationale should be provided for the structure of the research program into thrusts or groupings of projects. Specific justification should be

provided for the inclusion of significant associated projects in the ERC's strategic research plan.

This section must also include a Milestone Chart that depicts major goals and deliverables over the 10-year time frame of NSF support. Greater detail is expected within a 5-year time horizon. The Milestone Chart should contain the following information about the research program of the center:

- Deliverables and milestones as a function of the age of the center with more detail within a 5 year time horizon.
- An indication of the plane of the three plane chart in which the deliverable or milestone predominantly resides (e.g. fundamental, technology or systems level).
- The discussion of the Milestone Chart should include a discussion of progress made on previously identified deliverables and milestones including achievements as well as delays and setbacks. Any changes to the original milestones and deliverables as the center matures and new barriers or opportunities are uncovered should also be discussed.
- If the center's budget is in the phase where there is a projected increase in the base budget in the cooperative agreement, this section will include a plan for how the proportion of those funds to be dedicated to research will be used. If the center's budget is in the phase where the projected budget is in phase-down, this section will include a plan for how the reduction will impact research. A table summarizing this information should also be created.

Gen-3 ERCs. The center should discuss how the research of the foreign partner(s) adds value to the research program. Specific foreign partner research results should be presented in the appropriate thrust or testbed subsection.

4.5.2.2   Translational Research

Translational research is a relatively new area being conducted by the centers. For Gen-3 centers, translational research, funded through NSF's translational research fund, in conjunction with suitable small businesses is required when the center fundamental and technology research projects reach the appropriate phase. Some Gen-2 centers are also exploring translational research opportunities, some with supplemental funding provided by the joint SBIR-ERC projects for translational research, the recent ERC Innovation Awards, or other funding for translational research including partnerships with larger firms through sponsored project support. Translational research bridges the gap between traditional university fundamental research and innovation with transfer to industry. As such, translational research efforts span two portions of the Annual Report: the Strategic Research Plan and Overall Research Program section, and the Industrial/Practitioner Collaboration and Technology Transfer/ New Business Development section. The philosophy for reporting is that translational research itself should be reported in the Strategic Research section (this section) and the innovation and industry transfer results from the translational research should be reported in the Industry and Innovation section.

Gen-3 ERCs. More specifically, for Gen-3 ERCs, the center should discuss the planned role of small firms in translational research in preparation for the time when the ERC research reaches the appropriate phase. For Gen-2 or Gen-3 centers that are currently pursuing translational research efforts, the center should name the firm(s) involved and describe the role of their translational research in the ERC and how it contributes to the ERC's innovation goals. The center should also create a table listing the firms by name, project title(s), thrust title, funding levels and sources. An example is shown below.

Translational Research Partner Firm	Project Title	Funding Level	Funding Sources

Translational Research Partners Table, created by the Center

To bring the reader up to date on the progress from the last site visit, this section must include actual (not just planned), direct actions taken in response to major weaknesses and any threats regarding the strategic research plan resulting from the SWOT analysis in the prior annual or renewal review site visit report.

The ERCWeb **Table 2**, "Estimated Budgets by Research Thrust and Cluster," should be inserted at the end of this section. This table is used by reviewers to understand the staffing/funding strategy for the allocation of direct support to center projects and the indirect support derived from associated projects. Table 2 can be used to gauge the level of support in terms of personnel and cash devoted to the different research and technology efforts needed to achieve the Center's mission. Table 2 includes data on the disciplinary make up of the team as well as allocation of people and funds to each project receiving direct support and indirect support. It also enables the reviewers to understand the roles of the different institutions in the ERC's research. The data in Table 2 should be reported in such a way that it aggregates projects devoted to the same goal so that the result shows interdisciplinary teams conducting cluster-level research. It should not show a list that represents the budgetary allocation of funds to individuals. Table 2 shows the current year budgets at the project, cluster, and thrust levels; and the proposed budget at the thrust level only. Proposed growth or reduction in funds will have been justified earlier as discussed above.

The ERCWeb **Figure 2a**, "Research Project Investigators by Discipline," should also be inserted in this section. This is a disciplinary wheel for the ERC produced by ERCWeb from the information provided in Table 2.

4.5.2.3 ERC's Research Program (by Thrust)

This section should be organized by research thrust area. Each subsection describing a particular research thrust or testbed should begin with a brief table that shows the names of faculty participants, their institutional and departmental affiliations, and identifies the thrust leader. (This may be the same table as developed for the Participants Tables as described earlier in section 4.3.)

ERC Research Program (by Thrust) Reporting Requirements
- The construct of the thrusts derives from the strategic plan. For each thrust, the center should present a discussion of how that thrust, through its constituent clusters of projects, and testbeds as appropriate, executes the goals of the ERC. The discussion should include how specific knowledge gaps and barriers guide the selection of the specific research projects and testbeds.

- The narrative should summarize the theoretical and scientific research carried out to provide the needed fundamental knowledge, and should indicate how these achievements contribute to realizing the center's goals and their broader impacts on knowledge and technology advancement. A state of the art analysis should be provided comparing center goals with the results from other leading research groups worldwide in similar research areas. Specific project level examples should be given for key projects that serve an integrative role in the thrust so the reviewers can understand both the technical methodologies used and how the project plays an integrative role within the thrust and with another thrust.
- The role of any testbeds within the thrust should be described along with how the research and testbeds contribute to other thrusts and to the ERC's goals for enabling systems technology testbeds.
- Major achievements in transformational and incremental knowledge and technology should be discussed, including technology transferred to industry/practitioners and its impact in those sectors, as appropriate to age of the ERC.
- The specific goals and deliverables of translational research work should also be included in this section.
- The discussion should also include how any associated projects augment the thrust's ability to achieve its goals.
- At the end of each thrust section, include only those references mentioned in the narrative. A complete list of publications published since the last Annual Report should be provided in Volume I as a bibliography at the end of Volume I and grouped by Thrust/Testbed. These are manuscripts published in peer-reviewed print or web journals only and should <u>not</u> include any manuscripts in preparation, under review, or approved but not published.

Each thrust's section must include actual (not just planned), direct actions taken since the last site visit by the ERC in response to major weaknesses and any threats regarding the thrust resulting from the SWOT analysis in the prior annual or renewal review site visit report; in the case of new ERCs, in the pre-award site visit report and subsequent reviews.

ERC Innovation Awards and/or ERC-SBIR Partnership Awards. Centers that have received ERC Innovation Awards and/or ERC-SBIR Translational Research Awards (e.g. SECO awards) in a fundamental or technology research area should report on the specific results of that award in the appropriate thrust or testbed subsection. The goals and objectives should be summarized along with the progress made toward achieving those goals.

4.5.3   University and Pre-college Education Programs

This section should be organized into two sub-sections: one covering the center's university-level education (both undergraduate, graduate, and practitioners) program and another covering the center's pre-college education program.

A matrix that displays your university and pre-college education activities for the lead and partner universities that indicates the involvement of each university in each cell must be provided in this section. An example of a matrix is provided below.

	REU	RET	Young Scholar	Pre-College	General Community

Lead Institution	✅ (In Place)	✅ (In Place)	✅ (In Place)	✅ (In Place)	◆ (Future Year)
Partner University 1	✅ (In Place)	☑ (New This Year)	✅ (In Place)	✅ (In Place)	✅ (In Place)
Partner University 2	✅ (In Place)	◆ (Future Year)	◆ (Future Year)	✅ (In Place)	✅ (In Place)
Partner University 3	✅ (In Place)	☑ (New This Year)	✅ (In Place)	◆ (Future Year)	✅ (In Place)

Education Activities, to be created by the Center

= In Place =New This Year, = Future Year

4.5.3.1 ERC's University Education Program

This section should present the center's university education strategic plan to produce graduates who are successful leaders in technology advancement in industry. For Gen-3 ERCs, it is augmented by an additional section explaining how the ERC will be developing graduates who are also creative, adaptive, and innovative engineers who can succeed in a global economy. (Gen-2 ERCs who wish to take on this additional educational role are free to add this dimension to their education program.)

Gen-2 and Gen-3 University Education Program Reporting Requirements
- The discussion should include the educational activities designed to achieve the goals of the education strategic plan and an overview of the development and progress of the education program over the previous three years and plans for the future.
- Points of interface and integrating mechanisms between the center's research activities and education programs including curriculum development should be identified.
- Examples of how Research Experiences for Undergraduates (REU) students have been integrated into center research activities should be included. The discussion should include the level of funding and sources of funding (base budget, university funds, and/or an NSF REU site award, etc.), and the number of REU students supported during each year of the center.
- The goals and impacts of the ERC's alliances with NSF Diversity Awardees should be discussed in this section, if applicable.
- Examples of benefits to the students' overall educational experience due to the interdisciplinary and cross-university research/education culture of the ERC should be noted.
- A discussion of the ERC's efforts to provide students knowledge of industrial practice should be included.
- A summary of assessment results or future plans for assessment work should be presented.

Gen-2 ERCs: Also, for Gen-2 ERCs, this section should also include a table of a few (3-5) exemplary graduates of the ERC with information about their course of study, their year of graduation, their current employment, and their contributions to the field.

Gen-3 ERCs: In addition to producing graduates who are successful leaders in technology advancement in industry, this section should present the ERC's guiding hypothesis for how to develop creative, adaptive and innovative engineers who can succeed in a global economy.

The strategic plan for education should also present the student programs and activities that the ERC has designed to test that hypothesis and the assessment methodology(ies) being used to determine its effectiveness, and discuss how the ERC will provide educational expertise to test the hypotheses and assessment plans. The formative and summative assessment plans should be discussed and results provided as time progresses. The section should include a discussion of the role of collaboration between the domestic and foreign partner(s) and how it contributes educational value to both domestic and foreign students.

This section must include actual (not just planned) direct actions taken since the last site visit by the ERC in response to major weaknesses and any threats regarding the thrust resulting from the SWOT analysis in the prior annual or renewal review site visit report; in the case of new ERCs, in the pre-award site visit report and subsequent reviews.

4.5.3.2 ERC's Pre-College Program

Gen-2 Pre-College Program Reporting Requirements
- The center should provide a summary of the pre-college education strategic plan in this sub-section. The discussion should include an overview of the development and progress of the pre-college program over the previous three years and plans for the future.
- Successes and challenges of the pre-college education work should be noted along with assessment results or future plans for assessment.
- The center should also provide a discussion of the Research Experiences for Teachers (RET) program including the number of participating teachers during each year of the center, the level and source of funds (base budget, university funds, and/or an NSF RET site award, etc.).

Gen-3 ERCs Pre-College Reporting Requirements.
- The center should present the strategic plan for long-term partnerships in pre-college education with partner middle and high schools. The narrative should include a discussion of the goals, activities and expected impacts on the inclusion of engineering concepts in pre-college classrooms through involvement of teachers and students in the ERC pre-college program.
- The center's RET program and Young Scholars Program should also be discussed. The discussion of the Research Experiences for Teachers program should include the number of participating teachers during each year of the center, the level and source of funds (base budget, university funds, and/or an NSF RET site award, etc.), and the nature of teacher activities, including research projects, follow-on plans, and how the research experience will be translated to classroom practice.
- For the Young Scholars Program, the discussion should include the number of participants and the research topics being addressed.
- The narrative should also include information about the current domestic partner universities' faculty and student involvement in the pre-college program and plans for developing and expanding participation through time to impact all the partner domestic universities.
- The formative and summative assessment plans should be discussed and results provided as time progresses. This is necessary to gauge the impact of the program on the inclusion of engineering concepts in the pre-college classroom and on stimulating pre-college students to choose engineering as an educational major at the community college or university level.

This section must include actual (not just planned) direct actions taken since the last site visit by the ERC in response to major weaknesses and any threats regarding the thrust resulting from the SWOT analysis in the prior annual or renewal review site visit report; in the case of new ERCs, in the pre-award site visit report and subsequent reviews.

All ERCs: The ERCWeb **Table 3a**, "Educational Impact," and the ERCWeb **Table 3b** "Ratio of Graduates to Undergraduates," should be inserted in this section. **Table 3b**, "Ratio of Graduates to Undergraduates," will show both non-REU undergraduates and REU students, taken from Table 7 data. The center should strive for a Graduate to Undergraduate (non-REU students) ratio of 2 or less of Center funded students by Year 3 (*note*: the ratio in Table 3b is calculated using all Center students, including those funded by associated projects). If the academic year ratio is significantly more than 2, the center should explain steps being taken to increase the participation of undergraduates in center research.

4.5.4 Industrial/Practitioner Collaboration, Technology Transfer and New Business Development (For Gen-3, *Innovation Ecosystem)*

In this section, the center should discuss the industrial/practitioner collaboration portion of its strategic plan. This narrative should summarize results from the previous three years (fewer if the center is less than three years old) with more detail for the last year regarding industrial/practitioner collaborations and partnerships and plans for the future. Industry/Practitioner members are defined as those who have provided membership fees to the center, to be used at the discretion of the center director, in the form of cash or in-kind support according to the center's membership agreement. Industrial firms or practitioner organizations who only provide associated or sponsored project support are not considered members under the cooperative agreement terms.

The narrative should contain information on the following topics as described below: (i) vision goals and strategy; (ii) membership; (iii) position of member firms in the industry "value chain;" (iv) technology transfer and new business development; (v) innovation; (vi) future plans, and (vii) response to most recent site visit SWOT analysis.

4.5.4.1   *Vision, Goals, and Strategy*

The Center should present the vision and goals of the industrial/practitioner program including membership goals, technology transfer goals, and innovation goals if appropriate (required for Gen-3 Centers). This should also include the strategies the Center is pursuing to achieve its goals.

4.5.4.2   *Membership*

In the area of membership, both Gen-2 and Gen-3 ERCs should indicate their target goals for membership in terms number of firms, composition of firms of different sizes (e.g. percentages of large corporate, medium firm, small or startup) and cite the strategy for developing their industrial membership. The Center should include an identification of the relevant industry sectors that are targeted for participation by members. Once this is established, the ERC's strategy for developing and strengthening its membership should be discussed. For example, defining the avenues of communication used to keep industry members engaged in the Center, the frequency of contact, and the nature of contact (i.e. advisory to ERC or dissemination of information from ERC).

The membership discussion should also include the following information:

- A summary of the tiered membership structure of the ERC and the membership rights accorded at each level (the full agreement and IP policy will be provided in Appendix II);
- A summary of the policy for handling ERC generated IP;
- A description of the roles of the members, the Industry Advisory Board, other industry boards or focus groups and/or stakeholders;
- A summary and discussion of trends of Industrial/Practitioner Membership and Support by Year, supported by the following QRC tables and figures: **Table 4,** "Industrial/Practitioner Members, Innovation Partners, Funders of Sponsored Projects, Funders of Associated Projects and Contributing Organizations," **Table 4a, "**Organization Involvement in Innovation and Entrepreneurship Activities (Gen-2) Innovation Partner Involvement/Activities**," (Gen-3 only)** **Table 5**, "Innovation Ecosystem Partners and Support by Year" **Figure 5a,** "Technology Transfer Activities," **Figure 5b, "**Lifetime Industrial/Practitioner Membership History," and **Figure 5c**, "Total Number of Industrial/Practitioner Members," and **Figure 5d,** "Industrial/Practitioner Member Support, by Year."

4.5.4.3   *Technology Transfer and New Business Development*

In the areas of technology transfer and new business development, the Center should discuss their strategy to move ERC-developed technologies to market and their progress and results to date. To facilitate this discussion, the Center should create two tables and one chart, described as follows.

First, a table of all patents and licenses derived from the ERC's research over the lifetime of the Center, including their titles and numbers, should be included. An example is shown below.

IP License Number or Name	IP License Title or Name	IP Category: FP, PP, C, T	Brief Description of Technology	Owner of IP	Year Awarded

FP= full patent; PP = provisional patent; C= copyright; T= trademark
ERC Intellectual Property Table, to be created by the Center

Second, a table should be created by the Center entitled "Technology Transfer" with the format shown below that includes technology used by both established firms and start-up firms. All technologies transferred from the Center to industry and other users over the last three years and their impacts should be inserted in this table. The discussion regarding this table should include information specifically about market impact or the benefits to society of the technologies that have been transferred. To the extent that industry is willing to release the information, quantified examples, such as productivity gains in terms of man-hours saved or production costs in terms of dollars saved, or market impact should be provided in the table.

		Industrial Application		
Adopting Company	Technology	When transferred (date)	Use in Company	Impact (e.g., cost savings; productivity gain, market impact, etc.)

Finally, the Center should create the Technology Transfer Chart (see figure below) to depict major technologies or methodologies that the ERC expects industry/practitioners to adopt over the 10-year time frame of NSF support. The technology transfer chart is a qualitative chart that plots the maturity level of a particular technology or methodology on the x-axis and the expected type of impact of the technology or methodology on the y-axis. The technology maturity level range is from "idea stage" to "technology transferred to industry" (this is similar to the NASA Technology Readiness Level, TRL, scale, see http://esto.nasa.gov/files/TRL_definitions.pdf and the technology impact range is from "incremental impact" to "breakthrough technology." The center should place a marker on the chart for each major technology or methodology expected to be transferred, and include a brief description of the technology or methodology in the narrative or refer the reader to the appropriate Project Summary reference in Volume II.
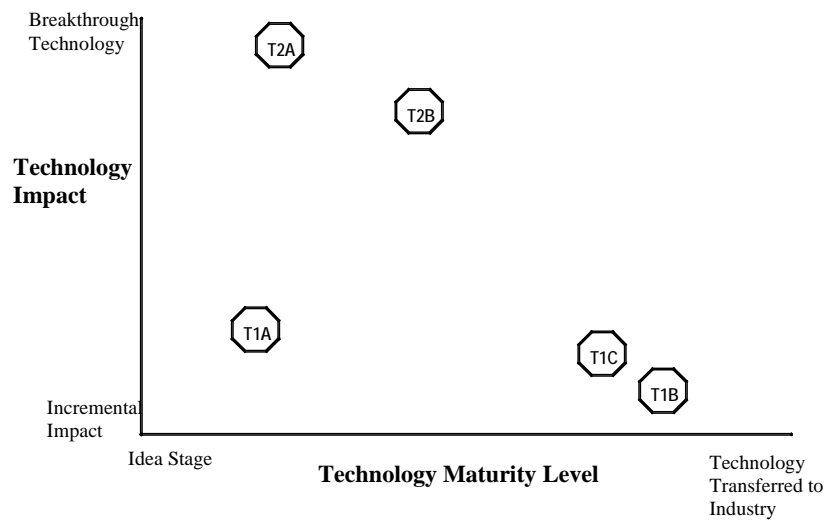

Figure 4.5.4.1: Technology Transfer Chart Example (T1A=Thrust 1, Project A, etc)

4.5.4.4 Innovation

Innovation activities are required of Gen-3 Centers and in many cases, Gen-2 Centers also have activities in this area as well. If applicable, Gen-2 Centers should also discuss their innovation activities as described in this section. Some examples of innovation activities include events that educate Center personnel about entrepreneurship or technology transfer, and events that link researchers with industrial users or potential investors.

One requirement of Gen-3 ERCs is the development of a culture that links discovery to innovation (e.g. an innovation ecosystem) to achieve the Center's vision and this section should describe the Center's strategy for developing such an ecosystem. The concept of the innovation ecosystem stresses that the flow of technology and information among people, enterprises, and institutions is key to an innovative process. It contains the interaction between the entities who are needed in order to turn an idea into a process, product, or service for the market. In this context, the entities will include the innovation partners and may include the IAB, state and local governments, and university or other organizations devoted to entrepreneurship and innovation. The intent of such an ecosystem is to speed the translation of ERC developed knowledge into innovation and then to the market; and if developed properly, should continue to support the

Center's vision after graduation.   This discussion should include the following points (when applicable):

- The strategy for translational research by engaging membership in translational research through sponsored projects and, if member firms fail to license new IP, working with non-member firms within the ERC's research program with the intent of developing and translating Center generated innovations;
- The strategy for deciding when it is appropriate to launch new firms and a description of the process for launching them should also be discussed in detail here, and should be consistent with NSF's translational research guidelines;
- The strategy for developing the people (graduate students, post docs, or faculty) who take on the role of championing[1] the innovations to be translated;
- The strategy for speeding technology translation through the establishment of formal partnerships with state and local government, university, or other organizations devoted to entrepreneurship and innovation;
- The communications strategy for insuring that all ERC team members are aware of the technology translation processes available to them;
- The identification of any critical tools or other resources that are specifically developed within the innovation ecosystem nexus to help speed the translation of ERC developed innovations to the market (e.g. testbeds, incubators, etc.);
- The discussion should include any activity by advisory boards or focus groups that has a particularly high impact on the innovation capability of the ERC (e.g. technology roadmap development).
- The narrative should indicate any concrete accomplishments and impacts that specifically enhanced the ERC's innovation ecosystem and its impacts during the prior year.

One aspect of innovation is the creation of new businesses. **Both Gen-2 and Gen-3 Centers** should create a table entitled "ERC Start-Up Firms."   This table should show all start-up companies that have spun-off based on ERC research. In addition to the table, the narrative text within this section should include more detailed information about start-up firms based on ERC research such as growth since inception, number of employees, funding and sales. An example is shown below.

Name of Firm	Contact Information at Firm	Date Established	Name of Principle & Relationship to ERC (e.g. faculty, student, graduate, if any)	Funding status (SBIR, 1st round, positive tax income, etc.)	Technology	Market Impact or Societal Benefit (in terms of value added)

ERC Start-Up Firms Table, to be created by the center.

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[1] Champion—the person who takes on the responsibility of championing an innovation through the translation process to insure that it will be commercialized. Often, the champion is not the same person as the inventor.

Volume I, Appendix 2 must include a description of the ERC's and lead university's Conflict of Interest (COI) policies regarding start-up firms where ERC faculty are involved in the firms. See Section 4.5.5.3 for the specific requirements, and Section 4.9.2(6) for the specific requirements.

Both Gen-2 and Gen-3 Centers should discuss any partnerships that were formed in the prior year, or are under negotiation, for the purpose of translating ERC technology; this will include sponsored projects, ERC-SBIR funded collaborations, and other NSF-funded translational research partnerships. Specific activities initiated with innovation partners or the initiation of a formal program that encourages teaming between the ERC participants and a business school to develop innovation should also be reported here. A table in the format shown below should be used to summarize the technology translation innovation proposals that ERC personnel submitted or won during the award year, with a status column indicating awarded, declined, or pending. Results from these collaborations, such as the impact on new product development, should be reported in the narrative.

Proposal #	Innovation Proposal Title	Status

Technology Translation Innovation Proposals Submitted by the Center

4.5.4.5 Future Plans

The Center should discuss future planned actions and activities for the upcoming year(s) to further progress to their stated industry/practitioner, technology transfer, and innovation goals.

Finally, the Center must include actual (not just planned) direct actions taken by the ERC in response to major weaknesses and any threats regarding industrial collaboration and technology transfer resulting from the SWOT analyses prepared by the IAB and in the prior annual or renewal review site visit report. For new ERCs this section should update the reviewer on progress in response to the pre-award site visit report and subsequent reviews of the ERC.

4.5.5 Infrastructure

This section should provide the reader with information on the institutional configuration of the ERC, its team and their diversity, organization and management, sources of and deployment of resources, facilities and equipment, and university commitment to achieve the ERC's vision, goals, and strategic plan. The four subsections of this section match the four subsections of the ERC performance review evaluation criteria under the Infrastructure heading.

There are several required ERCWeb tables that should be included in this section. Additionally, the ERCs are encouraged to use any extra figures, tables, charts, pictures, etc. to communicate useful quantitative information. Analyses of the data and trends in the data should be presented in the narrative at the point where the corresponding table or figure is presented.

In addition, included in this section must be direct actions taken by the ERC in response to major weaknesses and any threats regarding the resource planning and management resulting from the SWOT analysis in the prior annual or renewal review site visit report and also the most recent IAB and Student Leadership Council SWOT. For new centers, this section should update the

reviewers on major infrastructure changes resulting from the pre-award site visit report and subsequent reviews.

4.5.5.1   Configuration and Leadership Effort

Given the ERC's vision and goals, the institutional configuration and its rationale should be justified. For Gen-3 ERCs, this section would include the rationale for the foreign university and innovation partners. The disciplinary configuration of the team, significant changes, and plans for hiring key personnel should be included. The role of the leadership team in developing and implementing the center's various strategic plans, as well as making major decisions, should be presented.

The ERCWeb **Table 6**, "Institutions Executing the ERC's Research, Technology Transfer, and Education Program," should be inserted in this section. The roles of the different types of organizations listed in Table 6 should be explained. Changes since the last Annual Report or pre-award review should be noted. A description of collaborations with other ERCs or other centers not previously mentioned should be included. This includes both those funded by center funds and those collaborations that do not involve any transfer of funds across centers.

Figure 6a, "Domestic Location of Lead, Core Partner, Outreach, and REU and RET Participants' Institutions" and **Figure 6b**, "Foreign Collaborating Participants' Institutions" (for Gen-2), and "Location of Foreign Partner Institutions" (for Gen-3 ERCs) should be inserted in this section. These figures show maps of lead, core partner and outreach institutions, foreign and domestic, and institutions of REU and RET participants. Figures 6a and 6b cannot be produced automatically by the ERCWeb system but will be produced on your behalf by QRC. Please email QRC at erc@qrc.com once you have marked the "Organizations and Institutions" tab complete and they will produce these maps for you. **Figure 6c**, Country of Citizenship for ERC Foreign Personnel will also be produced by QRC in a fashion similar to 6a and 6b and should be inserted in this section. Figure 6c will show a world map with the countries of citizenship of the foreign personnel marked. **The process of producing the maps will take about a week from request to delivery.** A center may also produce Figures 6a, 6b, and 6c locally if preferred.

4.5.5.2   Diversity Effort and Impact

This section will present a summary of the diversity portion of the ERC's strategic plan and progress in the past year in relation to the milestones in the diversity plan. The role of the education program in the overall center's diversity plan should also be discussed in this section. The ERC's diversity plan should include the center's diversity goals and tactics used to increase diversity, and report quantitatively on results benchmarked against engineering wide academic averages.   Plans are not allowed to have quantitative targets according to guidance from the NSF Office of the General Counsel. The plans will include the partnership between the ERC and its supporting Deans and Department Chairs to increase diversity at all levels. It should be noted that in FY 2007, the cooperative agreements of ERCs were revised to assure inclusion of persons with disabilities within the ERCs' diversity strategic plans. Therefore, the centers should be sure to address the current involvement and the plans to increase the involvement of persons with disabilities in their ERCs.

ERCWeb **Table 7**, "ERC Personnel", should appear in *Appendix III* of Volume I and not in this section. However, the summary table and figures, Tables 7a and 7f and Figures 7b through 7e, should be presented in this section.

ERCWeb **Table 7a**, "Diversity Statistics for ERC Faculty and Students" should be inserted in this section. It will show the diversity statistics at the center level for women, underrepresented racial minorities, Hispanics/Latinos, and persons with disabilities for the leadership team, faculty, doctoral students, master's students and undergraduate students. There will be two sections of this table: one for U.S. citizens and permanent residents only and the other for foreign nationals.

Next, four figures produced by ERCWeb should be inserted that represent the information of Table 7a in a bar chart format. These are ERCWeb **Figure 7b**, "Women in the ERC," ERCWeb **Figure 7c**, "Underrepresented Racial Minorities in the ERC," ERCWeb **Figure 7d**, "Hispanics/Latinos in the ERC," and **Figure 7e**, "Persons with Disabilities in the ERC."

Finally, the ERCWeb **Table 7f**, "Center Diversity, by Institution" should be inserted.

4.5.5.3   Management Effort

The organization and management system of the ERC should be discussed and an organizational chart presented. The Center is reminded that the Center Director must report to the Dean of Engineering.

Management System Reporting Requirements
- The roles of its advisory boards, including project review and assessment, and the role of the Student Leadership Council should be explained.
- This section should also include discussion of the ERC's methods for: (1) determining which projects are needed to achieve the center's strategic plan; (2) determining funding allocation to implement the strategic plan; (3) assessing the quality and impacts of the projects; (4) identifying associated projects awarded to center faculty members' departments that are needed by the center to achieve the strategic plan; (5) forming the research team, including research outreach; (6) integrating the REU and RET Programs into the research program; and (7) a description of the mentoring activities for any postdoctoral researcher that is currently or will be supported by the Center.
- The statement of mentoring activities for postdoctoral researchers is required in annual reports and renewal proposals. In addition, it is extremely important in any renewal proposal because the proposal will be underlined returned without review if the Center shows a budget for postdoctoral researchers but does not have a statement of mentoring activities. Likewise, in the Annual Report, if the Center has shown support for a postdoctoral researcher over the reporting period, a statement of mentoring activities must be provided or the Annual Report will be returned for correction. This is NSF policy in accordance with the America COMPETES Act.

Financial Support Reporting Requirements
- Describe the financial management system of the ERC -- its financial support, budget allocation, expenditure and fiscal planning systems. The required tables below will be used as a basis for an analytical discussion of trends in financial support and budget allocations and the reasoning behind them.
- Information on major sources of cash and in-kind support such as facilities, buildings or shared equipment should be provided. Major expenditures in the past year (three years if this is a renewal proposal) that are not discussed elsewhere in the Annual Report should be discussed here.

- Additional charts, tables or figures may be added if the ERC feels it is necessary to present the full financial picture of the center.
- Growth requested in the proposed budget for the following year/three years should be briefly justified with a reference to the appropriate earlier sections of the Annual Report/Renewal proposal that contain the more detailed explanation of activities to be funded by the requested growth.

Conflict of Interest Reporting Requirements

- In addition to the university policy Conflict of Interest (COI) information to be included in the Appendix (see 4.9.2 (6)), the Center should provide specific information about the policies and procedures the ERC follows regarding potential COI situations between ERC faculty and his or her firm(s) and the source of these policies and procedures (e.g. internally developed or from the lead university, etc). Faculty who are in ERC leadership positions, and therefore are responsible for allocations of ERC funds, may be in the position of making decisions that could financially impact their firm(s). For example, a certain decision may result in support of their firms' projects, or result in sole source purchases from their firm(s). Conversely, a decision might result in unjustified exclusion of projects or products from competing firms. The Center should provide a description of how this type of situation would be handled. For example, a member of the ERC leadership team who is involved with a start-up firm could recuse him- or herself from a funding decision which might be beneficial (or detrimental) to his or her firm(s). The Center should have a formal oversight process in place to handle these types of situations.

Strategic Self-Sufficiency Business Plan Reporting Requirements

- Starting in the fifth year, the Annual Report must include a strategic business plan for self-sufficiency as a subsection of this section, up to five pages in length. If the full strategic business plan exceeds five pages, it may be added as an Appendix and a five page (maximum) synopsis of the plan should be placed here. It will include the envisioned features of the post-graduation ERC, cost and income projections, plans for gaining sources of support and plans for expenditures. Cost projections will include support for planned core staff, such as the AD, ILO, and/or Education Director. This plan will be updated in the 6th year renewal proposal and in each subsequent Annual Report.
- Centers in years eight and nine in which a change in the center's configuration upon graduation is under consideration or already decided should describe the reconfiguration plans and provide an explanation of the changes.
- All centers should discuss their strategy and any actions associated with obtaining increased support from industry and other sources after the ERC Program funds cease. Also, the long-term commitments from lead and core partner institutions to help ensure the continuation of the Center's administrative, industrial, and education components and retention of the research and office space should be presented.

The following tables should be inserted and discussed:

ERCWeb **Table 8a,** "Current Award Year Functional Budget." should be presented in this section. Table 8a should cover Current Award Year data only.

Table 8b, "Allocation of Current Award Year Budget, by Institution, FY 2010," should be developed and presented by the center (it is <u>not</u> an ERCWeb table) according to the format shown below. This table shows the portion of direct cash (unrestricted and restricted) and associated project support in the current year budget by institution. This includes the lead, core partner(s), and, collectively, all other institutions reported in Table 6 receiving direct center cash and associated project support.

Institutional Distribution of Current Award Year Budget					
Institution	Direct Cash	Associated Projects	Total Cash and Associated Projects	Percent of Total Direct Cash	Percent of Total Associated Projects
Lead					
Core Partner 1					
Core Partner 2					
etc.					
All Other Institutions					
Grand Total					

Sample Table 8b Portion of Current Award Year Budget, by Institution, FY 2010,
to be created by the center

Table 8c, "Education Functional Budget," is an ERCWeb table and should be inserted here by the center   In Table 8c, the REU and RET budgets are shown separately from the rest of the Research and Education and Outreach program. As a minimum, each ERC is expected to budget $42,000 annually for an RET site and $42,000 annually for an REU site for FY 2010, not including overhead.

ERCWeb **Table 9,** "Sources of Support", should be presented next. For Gen-3 ERCs, the amount of money contributed to the center's mission from the foreign university partners should be displayed in the appropriate "foreign university" row. For example, projects conducted at the foreign university that support the ERC should be reported as associated projects funded by a foreign university. As such, they should also be reported in Volume 2, see Sections 5.3 and 5.4.

Table 9a, "History of ERC Funding of the Center," should be developed and presented by the center (it is <u>not</u> an ERCWeb table) according to the format shown below. This table chronologically lists every separate award from the ERC Program: base award, each increment, renewal award, and supplement (e.g., REU, RET, diversity program support, etc., Graduate Research Supplement (GRS) Award, ERC/SBIR Translational Research Award), and special purpose awards (e.g. connectivity, equipment, Innovation etc.) In addition, this table should also include the NSF RET and NSF REU site awards that have been made to the center outside of the ERC Program. (Starting in FY 2007 the RET and REU awards were not made through the ERC Program, rather they were awarded as part of a broader solicitation; and if the ERC received one of these site awards, they should be included in the table.)   The table below provides some examples.

Award Number	Award Type	Award Title	Award Duration	Amount	Status	Final Report Approved?
0111111	Base	Center for Widget Systems	5 years	$15,000,000	In progress	N/A

| 012345 | REU Supplement | Research Building Widget Systems | 2 years | $70,000 | Completed | Yes |
| Total | | | | $XX,XXX,XXX | | |

Sample Table 9a History of ERC Funding of the Center, to be created by the center

For Gen-2 ERCs, the Iowa State University Gen-3 ERC, and the Class of 2011 Gen-3 ERCs, **Table 9b**, "Cost Sharing by Institution," should be developed and presented (it is <u>not</u> an ERCWeb table) according to the format shown below to include each year of the center. Table 9b and the university cost sharing amount placed on line M of the NSF budget form (NSF form 1030) in the Budget Request section should reflect the center's university cost sharing requirements specified in the center's cooperative agreement. The purpose of this table is to show the committed cost sharing, based on the original proposal or the last renewal proposal and the cooperative agreement, for the lead and core partner institutions for the current year and all prior years of operation. The cost sharing commitment does not apply to RET/REU supplements or other special awards funded by the ERC Program, but it does apply to other supplements and the 2007 growth supplements required for the Class of 2006. All cost sharing must be provided from non-Federal sources, including both university and non-university sources. If the projected annual university cost sharing has not been met, a plan should be provided that explains how it will be met by the end of the current award period. For Gen-2 ERCs, the Iowa State University Gen-3 ERC, and the Class of 2011 Gen-3 ERCs, a certified copy of Table 9b must also be submitted in Appendix II. For more information, the cost sharing reporting terms in the present cooperative agreement template should be consulted along with the NSF requirements in the <u>Proposal and Award Policies and Procedures Guide</u>

Renewal Proposals. (Centers in Year 3 or Year 6), Table 9b should be extended to show the proposed university cost-sharing commitments for the extension of the support requested. Thus for a third-year renewal, the cost sharing table would be extended to show the proposed university cost-sharing commitments through year 8, and for a sixth year renewal, the cost sharing table would be extended through year 10.

| Institution | Award Year 1… | | … Current Award Yr | | Cumulative Amount Transferred to ERC Account |
	Committed	Amount transferred to ERC Account	Committed	Amount transferred to ERC Account (to date)	
Lead University					
Core Partner #1					
Core Partner #2					
…					
TOTAL					

Sample Table 9b Cost Sharing by Institution, to be prepared by the center

<u>Class of 2008 Gen-3 ERCs</u>, except the Iowa State ERC. Table 9b should be entitled "University Financial Support by Institution" with the same format as shown above. This will show the non-cost sharing financial support proposed and provided by the lead and some or all of the partner

institutions. For Gen-3 ERCs, except the Iowa State ERC, a certified copy of this table is not required.

Gen-3 ERCs also need to create another funding table, Table 9c, "Funding by International Partner Universities" to show the amount of funding provided by the foreign university partner institutions toward the foreign institution's projects that are associated with the Center's mission. An example is shown below.

International Partner University	Foreign Funding Entity	Current Award Year Funding for International Partner Associated Projects Cash		Funding type	Role of Partnership (Research or Student Experience)
		Rec'd	Promised		
Helsinki University of Technology	Finnish Government	US $250,000	US $100,000	Cash Support	Student Exp.
Hannover Medical School	Industry Consortium	US $20,000		In Kind Support	Research

Sample Table 9c Funding by International Partner Universities

ERCWeb **Table 10,** "Annual Expenditures and Budgets," and ERCWeb **Table 11**, "Modes of Support by Industry and Other Practitioner Organizations to the Center," should be presented next. An analysis of these tables should be provided in the narrative that discusses their implications for the financial health of the ERC, especially for centers in their sixth year or later as they plan for graduation.

Table 10a, "Unexpended Residual in the Current Award and Proposed Award Year," should be developed and presented by the center (it is not an ERCWeb table) according to the format shown below. This table presents information regarding unexpended (residual) funds that were moved into the current award year at the end of the preceding award year. In the event that the center is planning to move residual cash at the end of the current award year into the proposed award year, the center should distinguish between (1) residual funds that are committed, encumbered, or obligated for specific uses from (2) residual funds for which the center has no plans. The current year spending plans for the residual funds moved into the current year at the end of the preceding year shown in Tables 8, 9, and 10 should be discussed in the narrative. A certified copy of Table 10a must also be submitted in Appendix II.

	Previous Award Year to Current Award Year	Current Award Year to Proposed Award Year
Total Unexpended Residual Funds		
Committed, Encumbered, Obligated Funds		
Residual Funds Without Specified Use		

Sample Table 10a: Unexpended Residual in the Current Award and Proposed Award Year

4.5.5.4 Resources and University Commitment

The headquarters space, its facilities for research and collaboration, and its proximity to the lead institution's ERC research space should be described. Communications equipment to facilitate cross-campus communication should be presented. A discussion of how the lead university and the core partner universities support the ERC's interdisciplinary, team culture should be presented. This should include a description of factors considered for tenure; for example, how the center encourages and supports young investigators in interdisciplinary research in light of concerns about how tenure and promotion committees view it.

Gen-3 ERCs. This section should include information on how the participating partner universities are rewarding faculty and students for their efforts in mentoring university faculty, students, and postdocs, and pre-college students and teachers. ERC cross-university partnership agreements facilitating collaboration in research and education also will be explained.

4.6   References

In this section of the Annual Report, the source for any citations should be listed. The center may choose the exact formatting of the references.

4.7   Bibliography of Publications

A bibliography of center publications should be included, grouped by Thrust/Testbed. These must be complete listings that include only publications in print at the time of submission of the report and do not include manuscripts in preparation, in review, awaiting publication, or previously reported in an Annual Report. Education publications should also be included. Also include a note in Volume II directing the reader to the new location in Volume I.

4.8   Budget Requests

In this section, the Summary Proposal Budget, provided on the official NSF budget form available in FastLane, is required. For an Annual Report, the budget request is required for the following Award year. Growth along the prescribed trajectory up to $4.0M must be justified in the appropriate section of the Annual Report by explaining how the additional funds will be used and how they would benefit the strategic plan and the center overall. Any forward funding listed in an annual report received in the prior award year must be deducted from subsequent annual budget requests.

All classes of ERCs begin at the base level of support provided for year one. The projected level of annual growth that may be requested is $250,000 until the annual level of support is $4,000,000. Occasionally, the ERC program will add extra money to the base for new thrusts, etc so the maximum limit might be $4,200,000 depending upon the base level to which the increment is added. Once that limit is reached, assuming successful 3rd and 6th year reviews, funding is flat until the base support is reduced by 33 percent in both years 9 and 10. Thus, the budget request for year 9 will be 67% of year 8 and the budget request for year 10 will be 67% of year 9. These are budget requests; the actual level of support will depend upon performance and availability of funds. As stated in the previous paragraph, plans for expending the growth funds must be discussed.

Subaward budgets do not need to be submitted for current subawards in Annual Reports, unless the amount allocated to one of the subawardees has increased or decreased significantly (20 percent if the original subaward is over $100,000). If the center wishes to add a new subaward that is over $100,000, the center must provide a subaward budget and the NSF Division of Grants and Agreements will incorporate the subawardee into the center's cooperative agreement through an amendment after the center's Program Director has approved the addition. If the subawards are added after the submission of the Annual Report, the request must be submitted through FastLane.

Renewal Proposals. An NSF Budget Form is required for each of the years of support requested along with a summary of the total support requested (years four through eight for a third-year renewal and years seven through ten for a sixth-year renewal). FastLane will calculate the summary or cumulative budget. All annual subawardee budgets must be provided, regardless of size, and all budgets must be signed by the AOR at each institution For sixth-year renewal proposals, the request for the last two years of support should reflect a phased down level at the rate of 67 percent of the prior year. The actual level of phased-down support will depend upon performance and availability of funds.

Gen-2 ERC's, the Iowa State Gen-3 ERC's, and the Class of 2011 Gen-3 ERCs. For annual report budget requests and renewal proposals, the lead university cost sharing amount placed on line M of NSF form 1030 must reflect the center's university cost sharing requirements specified in the center's cooperative agreement. Budgets for core partner institutions should include their individual portion of the total cost sharing on line M of their individual NSF forms 1030.

4.9 Volume I Appendices

There are three required appendices in Volume I for FY 2011. The center may add additional appendices if it is necessary to better explain their operations and/or achievements. The appendices should be tabbed in text for easy access by the reader. The required appendices and their descriptions are given next. The name of each appendix and the pages it covers should be provided in the table of contents. In addition, a list of all the appendices, and corresponding page numbers, should be provided at the beginning of the Appendix Section.

4.9.1 Volume I, Appendix I – Glossary and Acronyms

Appendix I is the glossary of acronyms and special terms used in the Annual Report.

4.9.2 Volume I, Appendix II – Agreements and Certifications

Appendix II is the Agreements and Certifications portion of the Annual Report and it contains the following documents. The certifications listed here (items 4,5,6,7) must be certified by an Authorized Organizational Representative (AOR) in the sponsored projects office of the lead institution. The lead institution is responsible for reporting and obtaining certifications for the entire center.

1. ERC's Current Center-Wide Industrial/Practitioner Membership Agreement.
2. ERC's Intellectual Property Agreement (if not part of the Generic Industrial/Practitioner Membership Agreement).

3. A copy of the Animal and/or Human Subjects approval from the relevant Institutional Review Boards (IRBs). This must be obtained prior to the submission of the Annual Report/Renewal proposal. The appropriate box on the cover page of the report should be checked if there is a project(s) supported that involve animal or human subjects. If data are collected on the performance of ERC' students (REU or regular and the impact of pre-college programs on students) and these data are presented to the public through a publication or talk at a conference, an IRB Human Subjects approval is required.

4. Certification of the Industry/Practitioner Membership list that includes the total number of memberships paid since the last Annual Report, certified by an AOR. The private sector firms should be separated from the non-private sector organizations. Similar to ERCWeb Tables 4 and 5, firms or agencies that have not signed the membership agreement or have not paid their membership fee may not be included in the list, even if they have satisfied one but not all of the industrial/practitioner membership requirements.

5. Certification of Cumulative and Current Cost sharing (Table 9b), certified by an AOR. In addition to reporting the certification here, the AOR must submit the cost sharing certification via the standard Notifications/Requests portion of FastLane prior to the submission of the ERC Annual Report in FastLane. If the submission of the certification is delayed, the processing of annual funding increments or renewal awards will also be delayed. If there is an error in a prior year cost-sharing amount, FastLane will not allow correction of the amount. Instead, the Center should adjust the current year amount so that the cumulative total cost sharing is accurate. The certification requirement does not apply to the Class of 2008 except for Iowa State University.

6. The ERC Lead Institution's Conflict-of-Interest Policy, certified by an AOR. The ERC should collect and maintain on file certified copies of COI policies from all of the partner institutions.
   - Specific COI policy information from the ERC lead institution regarding ERC faculty or student involvement in start-up firms or small businesses. In particular, the lead university's oversight policies with respect to COI for the following circumstances should be explained:
   - Situations where ERC faculty or students spin-out start-up firms
   - Situations where it is necessary for the ERC to purchase products from a firm for which ERC faculty have fiduciary interests

7. Certification of Unexpended Residual Funds (Table 10a), certified by an AOR.

4.9.3 Volume I, Appendix III – Table 7

Appendix III is the ERCWeb-produced **Table 7**, "ERC Personnel." Table 7 lists personnel at both the center-wide summary level and the institutional levels. The table should be sized so that it can be easily read.

5 VOLUME II REQUIREMENTS

Volume II contains supporting documents and must be a separate document from Volume I. It should include project descriptions, a bibliography of center publications, and faculty and leadership team biosketches. Only renewal proposals require current and Pending Support documentation, NSF Form 1239, for the Director, Deputy Director and any Associate Directors, the Research Program Thrust Leaders, the Education Program Director, and for any faculty receiving $80,000 or more from the ERC. Volume II should be assembled as follows. As with Volume I, the headings that follow should appear, in the order shown, in Volume II.

5.1 Table of Contents

The Table of Contents should include page numbers.

5.2 List of ERC Projects

The center will provide a list of all projects (research, education and outreach, and technology transfer, ERC innovation) in the center's strategic plan that are funded by direct support from the center and all associated projects that are supported by indirect support. The center should provide on this list the names of the projects, the names and departmental/institutional affiliations of the faculty members, and the names of the sponsoring organization(s). The research projects should be listed by thrust, then by the education and outreach projects, and then by the technology transfer projects. This project list should cover all the research projects listed in the ERCWeb-produced Table 2 plus the education and outreach projects, translational research projects, and ERC Innovation and/or Translational Research projects regardless of the source of funds. Within each section, the projects should be grouped by the type of support—direct or indirect, and then grouped by content. If listing an associated project would compromise the sponsor's interests, the project should be listed by title if possible with no mention of source of support.

5.3 Project Summaries

Three- to five-page project summaries for all projects with direct support, organized by Research Thrust and Education/Outreach Program should be provided. *Although potentially challenging, it is expected that centers will adhere to the requested page limit for the project summaries; in fact, three page summaries are strongly encouraged!* Project summaries do not have to be included for proprietary projects where such a summary would compromise the sponsor's interests. A project summary should also be included for each ERC Program supplementary and special-purpose award such as ERC-SBIR Translational Research awards, ERC Innovation Awards, Graduate Research Supplements (GRS), etc. In general, project summaries do not have to be included for associated projects; rather an abstract of the project should be included as instructed in Section 5.4. However, although some Innovation Awards and ERC-SBIR and other NSF-funded Translational Research awards may be considered associated projects because the award was not made directly to the center or the center PI, full project summaries are required for these projects in Volume II. For Gen-3 ERCs, foreign partner associated projects may include a project summary rather than only an abstract if the project is of particular importance to the achieving the vision of the center.

Each project summary should include:
- Project title;
- Names of ERC team members involved with the project (project leader, other faculty and their departments, students from undergraduate through postdoctoral) and industrial participants;
- A statement of the project goals (what the work is intended to accomplish);
- The project's role in support of the strategic plan;
- A discussion of fundamental research or technology advancement barriers and the methodologies used to address them;
- A short description of achievements in previous years with more detail on accomplishments in the past year;

- Summary of other relevant work being conducted within and outside of the ERC and how this project is different;
- Plans for the next year (for an Annual Report), or the next five years (for a renewal proposal);
- Expected milestones and deliverables for the project; and
- Member company benefits.
- If relevant, commercialization stuff

5.4   Associated Project Abstracts

Project abstracts for all projects reported as "associated" should be provided in the relevant thrust areas along with the project summaries above.

5.5   Data Management Plan

The NSF Proposal & Award Policies & Procedures Guide (PAPPG) (NSF 11-1) contains a clarification of NSF's long standing data policy. All proposals must describe plans for data management and sharing of the products of research, or assert the absence of the need for such plans. FastLane will not permit submission of a proposal that is missing a Data Management Plan. The Data Management Plan, submitted in the "supplementary documents" section of the proposal and limited to two pages, will be reviewed as part of the intellectual merit or broader impacts of the proposal, or both, as appropriate. Links to data management requirements and plans relevant to specific Directorates, Offices, Divisions, Programs, or other NSF units are available on the NSF website at: http://www.nsf.govbfa/dias/policy/dmp.jsp. See Chapter II.C.2.j of the GPG for further information about the implementation of this requirement.

ERC Program proposers must follow the ENG Directorate specific data management guidelines available at http://nsf.goveng/general/ENG_DMP_Policy.pdf, and also refer to the ERC Program solicitation for additional details in Sec. 11), "Supplementary Documents, Data Management Plan." While there are no specific ERC Program Guidelines with respect to the Data Management Plan, proposers must follow the ENG Directorate specific data management guidelines.

Specifically, the basic level of digital data to be archived and made available includes (1) the analyzed data and (2) the metadata that define how these data were generated. These are data that are or that should be published in theses, dissertations, refereed journal articles, supplemental data attachments for manuscripts, books and book chapters, and other print or electronic publication formats.

- Analyzed data are (but are not restricted to) digital information that would be published, including digital images, published tables, and tables of the numbers used for making published graphs.
- Necessary metadata are (but are not restricted to) descriptions or suitable citations of experiments, apparatuses, raw materials, computational codes, and computer-calculation input conditions.

5.6 Biographical Sketches

Two-page Biographical Sketches of each member of the ERC's faculty and leadership team should be included per instructions specified in the <u>NSF Proposal and Award Policies and Procedures Guide, Part I: Proposal Preparation and Submission Guidelines</u>

5.7 Current and Pending Support (Only required for Renewal Proposals)

The Current and Pending Support documentation, NSF Form 1239, for the Director, Deputy Director and any Associate Directors, the Research Program Thrust Leaders, the Education Program Director, and for any faculty receiving $80,000 or more from the ERC should be included.

6 FORMATTING AND SUBMISSION REQUIREMENTS

6.1 Formatting

The center should comply with the following guidelines when preparing the Annual Report.

- Standard letter-sized paper with one-inch margins.
- Times New Roman font size 12, Arial font size 10, or equivalents:
  - Tables, the list of participants, the highlights of significant achievement and impact, references, biosketches, and non-narrative text may be provided one font size smaller but must be readable.
- Single-line spacing for the narrative.
- One-or two-column text.
- Insert tables, figures, photos and charts in appropriate places in the text, not at the end of a section or the end of the report.
- Tabs to mark the different sections of the report (including the subsections of the Infrastructure portion).
- Label the tabs with the names of the sections, not numbers.
- Use both sides of a page when producing copies.
  - If a color illustration bleeds through the page, a one-sided page may be used.
- Do not alter the numbering of the required data tables and make sure all required tables/charts are submitted:
  - For additional tables and charts, retain the numbers of the required tables and number the extra tables in a logical manner corresponding with the section number. Graphics, photographs, etc. may be numbered and labeled as the center wishes.
- Submit the original copy as an unbound, one-sided copy, held together with a binder clip.
- All additional copies should be <u>spiral bound</u> and <u>double-sided</u> in two separate volumes: Volume 1 and Volume 2. Do not bind both volumes together and do not submit the Annual Report or Renewal Proposal in a 3 ring binder.
- Include the first page of NSF form 1207 in the printed copies of the report, but include the signature page only in the one unbound original.
- Keep the Information About the Principal Investigators/Project Directors (NSF Forms 1225, one for each Principal Investigator / Project Director) with the original, unbound copy and do not include it with the other copies.
- Make sure that all tables and charts are legible and size the ERCWeb-produced ones appropriately.

- Make sure all specified tables and charts are included in the report. Funding for the ERC will be withheld until all specified tables and charts are submitted.
- Do not alter the content of ERCWeb-produced tables; however, the font size can be increased so that the tables are readable.

6.2   Submission

The center should comply with the following guidelines when submitting the Annual Report or Renewal Proposal. It must arrive at NSF at least <u>five</u> weeks before a scheduled site visit.

- Make 5 paper copies and 6 CD copies with PDF versions of the Annual Report, all Volumes;
- Place the name of the center and the calendar year of the annual report or renewal proposal on all CDs; and
- Mail 5 copies of the report, 5 of the CDs, and the original unbound signed copy of the report in a package to:

> Mr. Marshall Horner, Program Assistant
> Engineering Research Centers Program
> Division of Engineering Education and Centers, Suite 585
> National Science Foundation
> 4201 Wilson Boulevard
> Arlington, VA 22230
> Phone: (703) 292-2308
> Facsimile: (703) 292-9051
> Email: mhorner@nsf.gov

- Mail the remaining CD to Mr. Courtland Lewis, the ERC Program's Communications Consultant, at the following address. Court uses it to prepare reports and documents for the ERC Program on outcomes and impacts.

> Mr. Courtland S. Lewis
> 310 Meadowview Lane
> Unicoi, TN 37692

For ERCs that cost share, the lead institution's AOR must submit the cost sharing certification via the Notifications/Requests portion of FastLane prior to submission of the ERC Annual Report or Renewal Proposal in FastLane.   Delaying submission of the certification holds up the processing of annual funding increments or renewal awards and prevents the ability to submit the Annual Report or Renewal Proposal into FastLane. This must be done 90 days or less prior to the award date. FastLane will not accept submission earlier than 90 days but a delay in submitting the cost sharing certification will delay the incremental or renewal funding.

- Submit the Annual Report or Renewal Proposal to FastLane:
  - Insert all of Volume I and Volume II in the body of the FastLane Annual Report template:
    - Enter the award number and PI name.
    - Insert Volume I and Volume II of the Annual Report in the "Activities and Findings" section of the template. There is no need to include any additional information or data in this template.

- o Again, FastLane will not accept submission earlier than 90 days prior to the award date but the Annual Report should be submitted as soon as possible within the 90 day limit because the requested funding cannot be processed until this is done.
- o A separate interim report in FastLane is required for each supplement received by the ERC and for an ERC Innovation award received by the ERC or any member of the ERC.

Table 6.2.1 summarizes the renewal and increment submission protocol.

End of Award Year	Report Due in FastLane*, under original Award Number	Renewal / Increment Due	Submit Cover Sheet & Budget in FastLane **	Action to submit in FastLane	Wording for "Project Summary" field within FastLane	Wording for "Justification for Supplement" field within FastLane	Wording for "Biographical Sketch" field within FastLane	Cost Sharing Certification under notifications and requests in FastLane under original Award Number	Updated IRB approvals for Human subjects or Vertebrate Animals submitted in supplementary documents section of Supplement or Renewal Request, as applicable
1	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 2 budget	supplement	"This action is to request the 2nd yr increment"	"This action is to request the 2nd yr increment"	"No Bio Data Provided"	Yes	if applicable
2	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 3 budget	supplement	"This action is to request the 3rd yr increment"	"This action is to request the 3rd yr increment"	"No Bio Data Provided"	Yes	if applicable
3	Annual Report due 90 days before anniversary date *	**RENEWAL (yrs.4-8)**	Yes; yrs 4-8 budget	renewal	"This action is to request 3rd year renewal and 4th year increment. See annual report for annual report and renewal documents"	n/a	"No Bio Data Provided"	Yes	if applicable
4	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 5 budget	supplement	"This action is to request the 5th year increment"	"This action is to request the 5th year increment"	"No Bio Data Provided"	Yes	if applicable
5	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 6 budget	supplement	"This action is to request the 6th year increment"	"This action is to request the 6th year increment"	"No Bio Data Provided"	Yes	if applicable
6	Annual Report due 90 days before anniversary date *	**RENEWAL (yrs. 6-10)**	Yes; yrs 7-10 budget	supplement	"This action is to request the 6th year renewal and year 7 increment"	"This action is to request the 6th year renewal and year 7 increment"	"No Bio Data Provided"	Yes	if applicable
7	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 8 budget	supplement	"This action is to request the 8th year increment."	"This action is to request the 8th year increment."	"No Bio Data Provided"	Yes	if applicable
8	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 9 budget	supplement	"This action is to request the 9th year increment."	"This action is to request the 9th year increment."	"No Bio Data Provided"	Yes	if applicable
9	Annual Report due 90 days before anniversary date *	CAGR Increment	Yes; yr 10 budget	supplement	"This action is to request the 10th year increment."	"This action is to request the 10th year increment."	"No Bio Data Provided"	Yes	if applicable
10	Final report due 90 days after expiration date (or center must request a no-cost extension, see Final Reporting Guidelines)	end of award	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 6.2.1 ERC Renewal and Increment Submission Protocol

*If anniversary date is July 1, the Annual Report is due April 1.** Budget should include budget justification and explanation for any dollars placed in budget line item G6; also subcontract budgets if dollars entered on line G5

7   GLOSSARY

The complete glossary of ERC terms can be found in the *Guidelines for ERCWeb Data Entry*. If there is a discrepancy between the definition in the Annual Reporting Guidelines and that given in the *Guidelines for ERCWeb Data Entry*, the *Data Entry* document takes precedence.

8   RESOURCES

8.1   NSF Documents

1.   The NSF Proposal and Award Policies and Procedures Guide (http://www.nsf.gov/publications/pub_summ.jsp?ods_key=papp).
2.   The Guide to Programs, which lists and describes all of NSF's programs: (http://www.nsf.gov/funding/browse_all_funding.jsp)
3.   NSF-wide REU Program Announcement can be found at: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5517&org=NSF
4.   RET program information: http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5736&org=EEC&from=home

8.2   ERCWeb

8.2.1   ERCWeb Technical Assistance

ERCWeb Technical assistance: toll-free phone 1-800-981-2852; e-mail: erc@qrc.com

8.2.2   ERC Planning Information

Strategic Implementation Planning Guidelines (Revised: September 2008) (PDF: 149K)
Project Selection Guidelines (Revised: September 2008) (PDF: 92K)
Three-Plane Chart (Revised: September 2009) (PDF: 80K)
ERC Highlights Briefing (Revised: February 2011) (Powerpoint File: 181K)

8.2.3   Annual Report

FY 2008 Final Reporting Guidelines (MS Word File: 199K)
FY2011 Annual Reporting and Renewal Proposal Guidelines (Revised: February 2011) (PDF: 379K)
FY 2011 Guidelines for ERCWeb Data entry (Revised: November 2010) (MS Word File: 330K)
Sample Output Tables (Revised: February 2009) (MS Excel File: 877K)

Sample Figures 6a, 6a-1, 6b, and 6c (Revised: May 2009) (Powerpoint File: 3,888K)
Diversity Statistics (Revised: July 2011) (MS Excel File: 37K)
NASA Technology Readiness Levels (PDF: 15K)

8.2.4   Performance Review

- Criteria

  Gen-2 Performance Criteria (Revised: February 2009) (PDF: 122K)
  Gen-3 Performance Criteria (Revised: February 2011) (PDF: 117K)

- Protocol

  Gen-2 ERC Annual Review Protocol (Revised: January 2009) (PDF: 432K)
  Gen-2 ERC Renewal Review Protocol (Revised: January 2009) (PDF: 426K)
  Gen-3 ERC Annual Review Protocol (Revised: February 2011) (PDF: 172K)

8.2.5   Site Visit Information

- Guidelines

  Annual (Revised: January 2011) (PDF File: 74K)
  Renewal (Revised: January 2011) (PDF File: 64K)

- Site Visit Team Review Briefing

  Years 1-2 (Revised: July 2011) (Powerpoint File: 548K)
  Year 3 Renewal (Revised: April 2011) (Powerpoint File: 283K)
  Years 4-5 (Revised: February 2011) (Powerpoint File: 461K)
  Year 6 Renewal (Revised: June 2010) (Powerpoint File: 354K)
  Years 7-9 (Revised: April 2011) (Powerpoint File: 420K)
  Sample Summative Review (Yr 10) Briefing (Revised: April 2008) (Powerpoint File: 161K)

- Site Visit Team Report Template

  Year 1-2 (Revised: February 2009) (MS Word File: 115K)
  Year 3 (renewal) (Revised: March 2011) (MS Word: 36K)
  Year 4-5 (Revised: February 2009) (MS Word File: 107K)
  Year 6 (renewal) (Revised: February 2009) (MS Word File: 106K)
  Year 7-9 (Revised: April 2011) (MS Word File: 31K)
  Year 10 (celebration) (MS Word File: 59K)

8.2.6   Relevant ERC and other Engineering Program Studies

List of Studies (MS Word File: 31K)
ERC Program-Level Evaluations (Powerpoint File: 122K)

8.2.7   ERC Association Web Site

ERC Association Web Site