

# Semiconductor Factory and Supply Chain Operations

NSF/SRC /SEMATECH Partnership

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## Program Solicitation

NSF 04-532

*Replaces Document 97-44*



### National Science Foundation

Directorate for Engineering

Division of Design, Manufacture and Industrial Innovation

### Semiconductor Research Corporation Factory Sciences Program

### International SEMATECH

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

March 19, 2004

## SUMMARY OF PROGRAM REQUIREMENTS

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### General Information

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#### Program Title:

Semiconductor Factory and Supply Chain Operations

#### Synopsis of Program:

This is a continuation of a collaborative research program, begun in 1997 between the Division of Design, Manufacture, and Industrial Innovation of the National Science Foundation (NSF), International SEMATECH (ISMT), and the Factory Sciences Program of the Semiconductor Research Corporation (SRC). The purpose of the solicitation is to jointly support research activities directed at the development of innovative new operational methods that will enable factory performance to keep pace with ongoing technical advances in equipment and processes, increases in wafer sizes, and the increasing complexity of semiconductor supply chain. The major theme of this initiative is the development of modeling, analysis, and optimization techniques based on fundamental principles leading to models that allow for effective control of semiconductor manufacturing operations and supply chain.

#### Cognizant Program Officer(s):

- Janet M. Twomey, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 590 N, telephone: (703) 292-7061, fax: (703) 292-9056, email: [jtwomey@nsf.gov](mailto:jtwomey@nsf.gov)
- Michael Schwartz, International SEMATECH, 2706 Montopolis Drive, Austin, Texas, 78741, USA telephone: (512) 356-3926, fax: (512) 356-7631, email: [mike.schwartz@sematech.org](mailto:mike.schwartz@sematech.org)
- Frank Robertson, Factory Systems Program Manager, SRC c/o Intel Corporation, 1501 South MoPac Expressway, Suite 400 m/s AN1, Austin, Texas, 78746, USA telephone: (512)314-0109, fax: (512)314-0290, email: [frank.h.robertson@intel.com](mailto:frank.h.robertson@intel.com)
- KJ Stanley, International SEMATECH, 2706 Montopolis Drive, Austin, Texas, 78741, USA telephone: (512) 356-3889, fax: (512) 356-7631, email: [k.j.stanley@sematech.org](mailto:k.j.stanley@sematech.org)

#### Applicable Catalog of Federal Domestic Assistance (CFDA) Number(s):

- 47.041 --- Engineering

#### Eligibility Information

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- **Organization Limit:**

Proposals may be submitted by U.S. academic institutions in support of individual investigators or small groups. Synergistic partnerships with industries are encouraged when appropriate; however, NSF awards will be made only to U.S. academic institutions.

International academic institutions must apply to SRC directly. Email proposals to Lisa Green at SRC. ([Lisa.Green@src.org](mailto:Lisa.Green@src.org))

- **PI Eligibility Limit:**

Only one proposal may be submitted by a Principal Investigator, and he/she may only collaborate on one other proposal as a co-Principal investigator.

- **Limit on Number of Proposals:** None Specified.

#### Award Information

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- **Anticipated Type of Award:** Other - Standard or Continuing Grant (NSF), or Contract (SRC and IMST).
- **Estimated Number of Awards:** 6 to 8
- **Anticipated Funding Amount:** \$2,700,000 pending availability of funds and the quality of proposals. Two types of award: 1) Research projects - approx. \$150,000/yr, for a period of 3 years, or 2) Exploratory research - \$100,000 (\$150,000 for teams) for a 12-18 month period.

#### Proposal Preparation and Submission Instructions

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##### A. Proposal Preparation Instructions

- **Full Proposal Preparation Instructions:** This solicitation contains information that supplements the standard Grant Proposal Guide (GPG) proposal preparation guidelines. Please see the full text of this solicitation for further information.

##### B. Budgetary Information

- **Cost Sharing Requirements:** Cost Sharing is not required.
- **Indirect Cost (F&A) Limitations:** Not Applicable.
- **Other Budgetary Limitations:** Not Applicable.

#### C. Due Dates

- **Full Proposal Deadline Date(s)** (due by 5 p.m. proposer's local time):  
March 19, 2004

#### Proposal Review Information

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- **Merit Review Criteria:** National Science Board approved criteria. Additional merit review considerations apply. Please see the full text of this solicitation for further information.

#### Award Administration Information

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- **Award Conditions:** Additional award conditions apply. Please see the full text of this solicitation for further information.
- **Reporting Requirements:** Additional reporting requirements apply. Please see the full text of this solicitation for further information.

#### TABLE OF CONTENTS

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### Summary of Program Requirements

- I. **Introduction**
- II. **Program Description**
- III. **Eligibility Information**
- IV. **Award Information**
- V. **Proposal Preparation and Submission Instructions**
  - A. Proposal Preparation Instructions
  - B. Budgetary Information
  - C. Due Dates
  - D. FastLane Requirements
- VI. **Proposal Review Information**
  - A. NSF Proposal Review Process
  - B. Review Protocol and Associated Customer Service Standard
- VII. **Award Administration Information**
  - A. Notification of the Award
  - B. Award Conditions
  - C. Reporting Requirements
- VIII. **Contacts for Additional Information**

## IX. Other Programs of Interest

### I. INTRODUCTION

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This is a continuation of a collaborative research program, began in 1997 between the Division of Design, Manufacture, and Industrial Innovation of the National Science Foundation (NSF), International SEMATECH (ISMT), and the Factory Sciences Program of the Semiconductor Research Corporation (SRC). The purpose of the solicitation is to jointly support research activities directed at the development of innovative new operational methods that will enable factory performance to keep pace with ongoing technical advances in equipment and processes, increases in wafer sizes, and the increasing complexity of semiconductor supply chain. "Operational methods" refers to tools and techniques that enable decision makers to direct the efficient operation of the factory (including product flow, equipment maintenance, labor planning, materials handling, etc.) and the factory's integration with semiconductor manufacturing supply chain (backend manufacturing facilities). The major theme of this initiative is the development of modeling, analysis, and optimization techniques based on fundamental principles leading to models that allow for effective control of semiconductor manufacturing operations and supply chain. While individual process and equipment performance are important elements of this initiative, the focus of the initiative is on fundamental research at the system (or factory and supply chain) level. The development of this capability will have a profound impact on the performance of the current and future semiconductor manufacturing factory (beyond the year 2010).

This solicitation is intended to initiate research, which can lead to improved operational decision making in the semiconductor manufacturing environment. The research supported will lead to better understanding of factory and supply chain performance, of the effect of introducing new products, tools and processes in the manufacturing environment, and of the performance of new factory and supply network designs.

This solicitation will support two types of research efforts:

- 1) Multiple year (typically 3 years) awards for research that enables near term (2007 and beyond) systems level improvements consistent with the directions laid out in the International Technology Roadmap for Semiconductors. See Research Needs Document ([http://www.src.org/fr/FORCe2\\_announce\\_03.asp](http://www.src.org/fr/FORCe2_announce_03.asp)) for details. The Research Needs document was derived from the International Technology Roadmap for Semiconductors and input from member companies.
- 2) Twelve to 18-month awards to explore novel lines of basic research that enable the design and operation of the semiconductor manufacturing factory and supply chain of the future (year 2010 and beyond).

### II. PROGRAM DESCRIPTION

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#### Background and Research Overview

The semiconductor industry is expected to witness technology acceleration according to technology analysts and the International Technology Roadmap for Semiconductors. Realizing the potential of Moore's Law requires taking full advantage of device feature size reductions, yield improvement to near 100%, wafer size increases, and other manufacturing productivity improvements. This in turn requires a factory that can fully integrate the production equipment and systems that are the foundation to realizing Moore's law and the International Technology Roadmap for Semiconductors with other factory components needed to efficiently produce the right products in the right volumes on schedule. Preserving the decades-long trend of 30% per year reduction in cost per function requires capturing all possible cost reduction opportunities in addition to improving speed of product delivery.

This solicitation seeks proposals of two viewpoints addressing the needs of the semiconductor industry: 1) new methods for making operational advancements in the near term, and 2) exploratory research for semiconductor manufacturing factory and supply chain, 2010 and beyond.

### **Research Projects for Near Term Operational Advancements (Factory 2007 and beyond)**

This portion of the solicitation seeks fundamental research leading to new models and analytical tools for making operational decisions in the high mix semiconductor factory and across the supply chain for years 2007 and beyond (both near term dealing with 45nm and longer term dealing with 32nm and beyond). The research should consider issues related to the integration of increasingly complex factories, production equipment performance and extendibility, the realization of 300 mm conversion efficiencies and post bulk CMOS and 450 mm wafer manufacturing paradigms.

Of particular interest are new models and analytical tools that allow decision-makers to:

- Evaluate the impact of introducing new technology on the factory floor.
- Plan and design a new factory, e.g. models allowing for plug-and-play factory design.
- Effectively utilize factory labor, e.g. models addressing alternative labor deployment and cross-training strategies under various automation conditions.
- Direct the evolution of the factory over time, e.g., and layouts flexible enough to respond to rapidly changing technology.
- Design and control the supply chain, e.g. models directed at demand planning and incentives, and models of materials and parts procurement, including auctions.
- Effectively utilize available capital resources, e.g. models that include financial/cost issues; single wafer processing; multiple product on a wafer, etc.
- Reduce operationally-induced variability, e.g. models that address the operational control of equipment and fab output, and cycle time variability, and models that improve equipment efficiency for high mix factories.
- Models of actual equipment and fab throughput in environments of varying work in progress and high product mix.

The following additional topics are also of interest:

- Large-scale factory modeling and analysis tools that enable the full integration of operational decisions involving semiconductor manufacturing and back end manufacturing (e.g. final wafer operations, testing and assembly).
- Performance improvements of simulation models for full factory analysis, with specific consideration given to inclusion or non-inclusion of automated material handling systems (eg. inter-bay, intra-bay, and future direct transport systems).
- Innovative data management techniques with specific consideration of the storage and analysis of high volume factory data.

The above list is a compilation of topics based on input from the International Technology Roadmap for Semiconductors (Factory Integration Section) and input from SRC member companies. Please refer to Research Needs Document ([http://www.src.org/fr/FORCe2\\_announce\\_03.asp](http://www.src.org/fr/FORCe2_announce_03.asp)) for details.

In their proposals, investigators should discuss the overall system improvements that can be expected to be gained if the research is successful. Proposals should address data requirements and validation methods. This initiative seeks to develop decision-making capability based on sound fundamental principles. It is extremely important that the research not be performed in the absence of a platform (real or virtual) for experimental validation. Experimental validation should leverage available infrastructure and data to the maximum extent possible. Industrial interaction is strongly encouraged, but not mandatory. The SRC and ISMT will work to facilitate mutually beneficial interactions between successful applicants and industrial partners.

Awards will be made to support single or multiple investigators over a 3-year period for approximately \$150,000 per year. Amounts should be consistent with the scope of work proposed.

## **Exploratory Research for the Semiconductor Manufacturing Facilities 2010 and Beyond**

Proposals are sought for exploratory research of novel ideas that promise to extend the current range of focused empirical, analytical and computational techniques for design, planning and control of the semiconductor factory of the future. Awards will be limited to \$100,000 (\$150,000 for investigator teams), and durations of 12 to 18 months in the interest of gaining the widest possible participation and directing grants to lines of investigation that are new and distinguishable from ongoing efforts already sponsored by NSF or SRC. Promising ideas and topics that have not been fully explored are welcome from all qualified researchers. Support should not be sought simply to better fund research efforts that are already well established. Of particular interest are flexible modeling and analysis tools and techniques that take into consideration and account for possibilities of disruptive technology shifts in the semiconductor industry and unique manufacturing concepts.

### **III. ELIGIBILITY INFORMATION**

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Proposals may be submitted by U.S. academic institutions in support of individual investigators or small groups. Synergistic partnerships with industries are encouraged when appropriate; however, NSF awards will be made only to U.S. academic institutions.

International academic institutions must apply to SRC directly. Email proposals to Lisa Green at SRC. ([Lisa.Green@src.org](mailto:Lisa.Green@src.org))

Only one proposal may be submitted by a Principal Investigator, and he/she may only collaborate on one other proposal as a co-Principal Investigator.

Only those proposals that are responsive to this solicitation and the direction established in the National Technology Roadmap for Semiconductors (Research Needs Document [http://www.src.org/fr/FORCe2\\_announce\\_03.asp](http://www.src.org/fr/FORCe2_announce_03.asp)) will be considered for review.

### **IV. AWARD INFORMATION**

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Estimated program budget and number of awards are subject to the availability of funds. However, the anticipated total amount available is \$2,700,000. Either NSF, or SRC and ISMT, or all three may fund awards. The NSF awards will be made as standard or continuing grants. SRC and ISMT awards will be made as contracts.

### **V. PROPOSAL PREPARATION AND SUBMISSION INSTRUCTIONS**

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#### **A. Proposal Preparation Instructions**

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##### **Full Proposal Instructions:**

Proposals submitted in response to this program announcement/solicitation should be prepared and submitted in accordance with the general guidelines contained in the NSF *Grant Proposal Guide* (GPG). The complete text of the GPG is available

electronically on the NSF Website at: <http://www.nsf.gov/cgi-bin/getpub?gpg>. Paper copies of the GPG may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [pubs@nsf.gov](mailto:pubs@nsf.gov).

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**THE PROPOSAL MUST INCLUDE A SEPARATE DISCLOSURE AUTHORIZATION PAGE (Supplementary Documentation). THIS PAGE MUST STATE THE FOLLOWING:**

AUTHORIZATION TO DISCLOSE PROPOSAL AND REVIEW MATERIALS TO the Semiconductor Research Corporation (SRC) and International SEMATECH (ISMT)

We acknowledge by submission of this proposal that we understand that the program solicitation "Semiconductor Factory and Supply Chain Operations" is a joint solicitation of the National Science Foundation, the Semiconductor Research Corporation, and International SEMATECH, and the submitted proposals and review materials will be shared with the Semiconductor Research Corporation, and International SEMATECH for the purposes of proposal evaluation. We authorize the National Science Foundation to disclose this proposal and all associated materials and review documents to the Semiconductor Research Corporation, and International SEMATECH and their representatives for the purpose of evaluation and selection of proposals.

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NOTE THAT SUBMISSION OF A PROPOSAL AND CONSENT TO DISCLOSE ARE VOLUNTARY. HOWEVER, FAILURE TO AUTHORIZE DISCLOSURE WILL PRECLUDE REVIEW OF YOUR PROPOSAL UNDER THIS JOINT SOLICITATION AND WILL RESULT IN INELIGIBILITY FOR AN AWARD UNDER THIS SOLICITATION.

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Proposers are reminded to identify the program announcement/solicitation number (04-532) in the program announcement/solicitation block on the proposal Cover Sheet. Compliance with this requirement is critical to determining the relevant proposal processing guidelines. Failure to submit this information may delay processing.

**B. Budgetary Information**

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**Cost Sharing:**

Cost sharing is not required in proposals submitted under this Program Solicitation.

**C. Due Dates**

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Proposals must be submitted by the following date(s):

**Full Proposal Deadline(s)** (due by 5 p.m. proposer's local time):

March 19, 2004

## D. FastLane Requirements

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Proposers are required to prepare and submit all proposals for this announcement/solicitation through the FastLane system. Detailed instructions for proposal preparation and submission via FastLane are available at: <http://www.fastlane.nsf.gov/a1/newstan.htm>. For FastLane user support, call the FastLane Help Desk at 1-800-673-6188 or e-mail [fastlane@nsf.gov](mailto:fastlane@nsf.gov). The FastLane Help Desk answers general technical questions related to the use of the FastLane system. Specific questions related to this program announcement/solicitation should be referred to the NSF program staff contact(s) listed in Section VIII of this announcement/solicitation.

*Submission of Electronically Signed Cover Sheets.* The Authorized Organizational Representative (AOR) must electronically sign the proposal Cover Sheet to submit the required proposal certifications (see Chapter II, Section C of the [Grant Proposal Guide](#) for a listing of the certifications). The AOR must provide the required electronic certifications within five working days following the electronic submission of the proposal. Proposers are no longer required to provide a paper copy of the signed Proposal Cover Sheet to NSF. Further instructions regarding this process are available on the FastLane Website at: <http://www.fastlane.nsf.gov>

## VI. PROPOSAL REVIEW INFORMATION

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### A. NSF Proposal Review Process

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Reviews of proposals submitted to NSF are solicited from peers with expertise in the substantive area of the proposed research or education project. These reviewers are selected by Program Officers charged with the oversight of the review process. NSF invites the proposer to suggest, at the time of submission, the names of appropriate or inappropriate reviewers. Care is taken to ensure that reviewers have no conflicts with the proposer. Special efforts are made to recruit reviewers from non-academic institutions, minority-serving institutions, or adjacent disciplines to that principally addressed in the proposal.

The National Science Board approved revised criteria for evaluating proposals at its meeting on March 28, 1997 ([NSB 97-72](#)). All NSF proposals are evaluated through use of the two merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

On July 8, 2002, the NSF Director issued [Important Notice 127](#), Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of all proposals submitted to NSF. NSF continues to strengthen its internal processes to ensure that both of the merit review criteria are addressed when making funding decisions.

In an effort to increase compliance with these requirements, the January 2002 issuance of the GPG incorporated revised proposal preparation guidelines relating to the development of the Project Summary and Project Description. Chapter II of the GPG specifies that Principal Investigators (PIs) must address both merit review criteria in separate statements within the one-page Project Summary. This chapter also reiterates that broader impacts resulting from the proposed project must be addressed in the Project Description and described as an integral part of the narrative.

Effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary. It is believed that these changes to NSF proposal preparation and processing guidelines will more clearly articulate the importance of broader impacts to NSF-funded projects.

The two National Science Board approved merit review criteria are listed below (see the [Grant Proposal Guide](#) Chapter III.A for further information). The criteria include considerations that help define them. These considerations are suggestions and not all will apply to any given proposal. While proposers must address both merit review criteria, reviewers will be asked to address only those considerations that are relevant to the proposal being considered and for which he/she is qualified to



make judgments.

**What is the intellectual merit of the proposed activity?**

How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields? How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of the prior work.) To what extent does the proposed activity suggest and explore creative and original concepts? How well conceived and organized is the proposed activity? Is there sufficient access to resources?

**What are the broader impacts of the proposed activity?**

How well does the activity advance discovery and understanding while promoting teaching, training, and learning? How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)? To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks, and partnerships? Will the results be disseminated broadly to enhance scientific and technological understanding? What may be the benefits of the proposed activity to society?

NSF staff will give careful consideration to the following in making funding decisions:

***Integration of Research and Education***

One of the principal strategies in support of NSF's goals is to foster integration of research and education through the programs, projects, and activities it supports at academic and research institutions. These institutions provide abundant opportunities where individuals may concurrently assume responsibilities as researchers, educators, and students and where all can engage in joint efforts that infuse education with the excitement of discovery and enrich research through the diversity of learning perspectives.

***Integrating Diversity into NSF Programs, Projects, and Activities***

Broadening opportunities and enabling the participation of all citizens -- women and men, underrepresented minorities, and persons with disabilities -- is essential to the health and vitality of science and engineering. NSF is committed to this principle of diversity and deems it central to the programs, projects, and activities it considers and supports.

**Additional Review Criteria:**

In addition to the above criteria, proposals will be judged in terms of their ability to provide new and innovative research approaches to operational methods, and in terms of the responsiveness of the proposed research to direction established by this solicitation. For details see Research Needs Document ([http://www.src.org/fr/FORCe2\\_announce\\_03.asp](http://www.src.org/fr/FORCe2_announce_03.asp)).

The Research Needs document was derived from the International Technology Roadmap for Semiconductors and input from member companies.

**B. Review Protocol and Associated Customer Service Standard**

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All proposals are carefully reviewed by at least three other persons outside NSF who are experts in the particular field represented by the proposal. Proposals submitted in response to this announcement/solicitation will be reviewed by Panel Review.

Reviewers will be asked to formulate a recommendation to either support or decline each proposal. The Program Officer assigned to manage the proposal's review will consider the advice of reviewers and will formulate a recommendation.

A summary rating and accompanying narrative will be completed and submitted by each reviewer. In all cases, reviews are

treated as confidential documents. Verbatim copies of reviews, excluding the names of the reviewers, are sent to the Principal Investigator/Project Director by the Program Director. In addition, the proposer will receive an explanation of the decision to award or decline funding.

NSF is striving to be able to tell applicants whether their proposals have been declined or recommended for funding within six months. The time interval begins on the date of receipt. The interval ends when the Division Director accepts the Program Officer's recommendation.

In all cases, after programmatic approval has been obtained, the proposals recommended for funding will be forwarded to the Division of Grants and Agreements for review of business, financial, and policy implications and the processing and issuance of a grant or other agreement. Proposers are cautioned that only a Grants and Agreements Officer may make commitments, obligations or awards on behalf of NSF or authorize the expenditure of funds. No commitment on the part of NSF should be inferred from technical or budgetary discussions with a NSF Program Officer. A Principal Investigator or organization that makes financial or personnel commitments in the absence of a grant or cooperative agreement signed by the NSF Grants and Agreements Officer does so at their own risk.

## VII. AWARD ADMINISTRATION INFORMATION

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### A. Notification of the Award

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Notification of the award is made to *the submitting organization* by a Grants Officer in the Division of Grants and Agreements. Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Program Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided automatically to the Principal Investigator. (See section VI.A. for additional information on the review process.)

### B. Award Conditions

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An NSF award consists of: (1) the award letter, which includes any special provisions applicable to the award and any numbered amendments thereto; (2) the budget, which indicates the amounts, by categories of expense, on which NSF has based its support (or otherwise communicates any specific approvals or disapprovals of proposed expenditures); (3) the proposal referenced in the award letter; (4) the applicable award conditions, such as Grant General Conditions (NSF-GC-1); \* or Federal Demonstration Partnership (FDP) Terms and Conditions \* and (5) any announcement or other NSF issuance that may be incorporated by reference in the award letter. Cooperative agreement awards also are administered in accordance with NSF Cooperative Agreement Terms and Conditions (CA-1). Electronic mail notification is the preferred way to transmit NSF awards to organizations that have electronic mail capabilities and have requested such notification from the Division of Grants and Agreements.

\*These documents may be accessed electronically on NSF's Website at [http://www.nsf.gov/home/grants/grants\\_gac.htm](http://www.nsf.gov/home/grants/grants_gac.htm). Paper copies may be obtained from the NSF Publications Clearinghouse, telephone (703) 292-7827 or by e-mail from [pubs@nsf.gov](mailto:pubs@nsf.gov).

More comprehensive information on NSF Award Conditions is contained in the NSF *Grant Policy Manual* (GPM) Chapter II, available electronically on the NSF Website at <http://www.nsf.gov/cgi-bin/getpub?gpm>. The GPM is also for sale through the Superintendent of Documents, Government Printing Office (GPO), Washington, DC 20402. The telephone number at GPO for subscription information is (202) 512-1800. The GPM may be ordered through the GPO Website at <http://www.gpo.gov>.

### Special Award Conditions:

#### 1. Notification of the Award

The final award recommendations will be a joint decision of a working group comprised of program officers from NSF, and representatives from SRC and ISMT. Awards will be funded totally by either NSF or SRC and ISMT, or impart by all three. Notification of Program Officers' recommendation will be made to the Principal Investigators.

Notification of an award from NSF is made to the submitting organization by a Grants Officer in the Division of Grants and Agreements (DGA). Organizations whose proposals are declined will be advised as promptly as possible by the cognizant NSF Division Director of the Division administering the program. Verbatim copies of reviews, not including the identity of the reviewer, will be provided to the Principal Investigator. SRC contracts will be administered in accordance with SRC policies and procedures.

## **2. Award Conditions**

All awards made under this solicitation require an agreement on intellectual property, including publication and patent rights, signed by representatives of the university and SRC. Such an agreement shall not be inconsistent with the requirements of 35 USC 200 et seq. Investigators should notify their sponsored research office of this requirement so that appropriate institutional authorities are informed. No award will be made unless the executed intellectual property agreement is in place.

## **3. Grant Review Meetings**

All SRC and ISMT grantees of this initiative will be expected to attend several grant review meetings for the purpose of sharing research progress with SRC member company representatives as well as other interested individuals. The first such meeting will be held approximately nine months after the awards are made.

## **C. Reporting Requirements**

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For all multi-year grants (including both standard and continuing grants), the PI must submit an annual project report to the cognizant Program Officer at least 90 days before the end of the current budget period.

All grants supported entirely or in part by NSF are required to follow the standard NSF reporting requirements for annual and final projects.

Within 90 days after the expiration of an award, the PI also is required to submit a final project report. Failure to provide final technical reports delays NSF review and processing of pending proposals for the PI and all Co-PIs. PIs should examine the formats of the required reports in advance to assure availability of required data.

PIs are required to use NSF's electronic project reporting system, available through FastLane, for preparation and submission of annual and final project reports. This system permits electronic submission and updating of project reports, including information on project participants (individual and organizational), activities and findings, publications, and other specific products and contributions. PIs will not be required to re-enter information previously provided, either with a proposal or in earlier updates using the electronic system.

## **VIII. CONTACTS FOR ADDITIONAL INFORMATION**

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General inquiries regarding this program should be made to:

- Janet M. Twomey, Program Director, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 590 N, telephone: (703) 292-7061, fax: (703) 292-9056, email: [jtwomey@nsf.gov](mailto:jtwomey@nsf.gov)
- Michael Schwartz, International SEMATECH, 2706 Montopolis Drive, Austin, Texas, 78741, USA telephone: (512)

356-3926, fax: (512) 356-7631, email: [mike.schwartz@sematech.org](mailto:mike.schwartz@sematech.org)

- Frank Robertson, Factory Systems Program Manager, SRC c/o Intel Corporation, 1501 South MoPac Expressway, Suite 400 m/s AN1, Austin, Texas, 78746, USA telephone: (512)314-0109, fax: (512)314-0290, email: [frank.h.robertson@intel.com](mailto:frank.h.robertson@intel.com)
- KJ Stanley, International SEMATECH, 2706 Montopolis Drive, Austin, Texas, 78741, USA telephone: (512) 356-3889, fax: (512) 356-7631, email: [k.j.stanley@sematech.org](mailto:k.j.stanley@sematech.org)

For questions related to the use of FastLane, contact:

- Veronica T. Calvo, Program Technology Specialist, Directorate for Engineering, Division of Design, Manufacture, & Industrial Innovation, 550 S, telephone: (703) 292-7056, fax: (703) 292-9056, email: [vcalvo@nsf.gov](mailto:vcalvo@nsf.gov)

## IX. OTHER PROGRAMS OF INTEREST

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The NSF *Guide to Programs* is a compilation of funding for research and education in science, mathematics, and engineering. The NSF *Guide to Programs* is available electronically at <http://www.nsf.gov/cgi-bin/getpub?gp>. General descriptions of NSF programs, research areas, and eligibility information for proposal submission are provided in each chapter.

Many NSF programs offer announcements or solicitations concerning specific proposal requirements. To obtain additional information about these requirements, contact the appropriate NSF program offices. Any changes in NSF's fiscal year programs occurring after press time for the *Guide to Programs* will be announced in the NSF *E-Bulletin*, which is updated daily on the NSF Website at <http://www.nsf.gov/home/ebulletin>, and in individual program announcements/solicitations. Subscribers can also sign up for NSF's *Custom News Service* (<http://www.nsf.gov/home/cns/start.htm>) to be notified of new funding opportunities that become available.

## ABOUT THE NATIONAL SCIENCE FOUNDATION

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The National Science Foundation (NSF) funds research and education in most fields of science and engineering. Awardees are wholly responsible for conducting their project activities and preparing the results for publication. Thus, the Foundation does not assume responsibility for such findings or their interpretation.

NSF welcomes proposals from all qualified scientists, engineers and educators. The Foundation strongly encourages women, minorities and persons with disabilities to compete fully in its programs. In accordance with Federal statutes, regulations and NSF policies, no person on grounds of race, color, age, sex, national origin or disability shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NSF, although some programs may have special requirements that limit eligibility.

*Facilitation Awards for Scientists and Engineers with Disabilities* (FASSED) provide funding for special assistance or equipment to enable persons with disabilities (investigators and other staff, including student research assistants) to work on NSF-supported projects. See the GPG Chapter II, Section D.2 for instructions regarding preparation of these types of proposals.

The National Science Foundation promotes and advances scientific progress in the United States by competitively awarding grants and cooperative agreements for research and education in the sciences, mathematics, and engineering.

To get the latest information about program deadlines, to download copies of NSF publications, and to access abstracts of awards, visit the NSF Website at <http://www.nsf.gov>

- **Location:** 4201 Wilson Blvd. Arlington, VA 22230
  
- **For General Information** (NSF Information Center): (703) 292-5111
  
- **TDD (for the hearing-impaired):** (703) 292-5090 or (800) 281-8749
  
- **To Order Publications or Forms:**  
  
Send an e-mail to: [pubs@nsf.gov](mailto:pubs@nsf.gov)  
  
or telephone: (703) 292-7828a
  
- **To Locate NSF Employees:** (703) 292-5111

#### PRIVACY ACT AND PUBLIC BURDEN STATEMENTS

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