



SYRACUSE CENTER OF EXCELLENCE
in ENVIRONMENTAL and ENERGY SYSTEMS

Request for Applications
Collaborative Activities for Research and Technology Innovation
October 30, 2006

SUMMARY OF PROGRAM REQUIREMENTS

Synopsis of Program:

The Syracuse Center of Excellence in Environmental and Energy Systems (Syracuse CoE) seeks applications for competitively awarded “Collaborative Activities for Research and Technology Innovation (CARTI)” projects. CARTI projects will address research questions associated with either air quality or water resource management, in support of the development of technology innovations for improving environmental quality in built and urban environments.

Award Information:

Type of award: Sub-recipient agreement from Syracuse University under prime X-83232501-0.

Estimated number of awards: 12 awards

Anticipated funding available: Up to \$3.0 million

Funding per award: Three award levels are available: (i) up to \$100,000 total costs for 12-month exploratory projects or planning activities; (ii) up to \$300,000 total costs for 24-month projects; (iii) up to \$600,000 total costs for 36-month projects.

Eligibility Information:

Syracuse CoE member higher education or not-for-profit research institutions are eligible to apply. Non-member institutions may apply as collaborators with a member institution serving as lead applicant. (Syracuse CoE member institutions are listed in Section III, *Eligibility Information*.)

Application Materials:

Applications must be made electronically to cynieman@syr.edu by **5:00 p.m. December 8, 2006**, using the application package available at <http://www.syracusecoe.org/CARTI/index.aspx>

Contact persons:

Technical contact: Suresh Santanam; Phone: 315-443-4445; Email: ssantana@syr.edu

Eligibility contact: Gina Lee-Glauser; Phone: 315-443-1824; Email: leegloug@syr.edu

Electronic submissions: Cynthia Nieman; Phone: 315-443-4445; Email: cynieman@syr.edu

I. FUNDING OPPORTUNITY DESCRIPTION

Introduction

The mission of the Syracuse Center of Excellence in Environmental and Energy Systems (Syracuse CoE) is to create innovations that improve health, productivity, security, and sustainability in built and urban environments. The Syracuse CoE supports projects across the full spectrum of innovation—from basic and applied research to technology application and demonstration—in multiple areas, including indoor environmental quality, air quality, water resource management, and energy systems.¹ This solicitation for “Collaborative Activities for Research and Technology Innovation” (CARTI) projects is targeted for basic and applied research in two focused areas: air quality and water resource management. This competitive program, in its second funding cycle, is supported by the U.S. Environmental Protection Agency under award X-83232501-0. Abstracts of the awarded projects in the prior CARTI funding cycle are available at: <http://www.syracusecoe.org/CARTI/index.aspx>

The long-term vision for CARTI activities supported through this solicitation is to advance the development of technology innovations required to create envisioned new “Intelligent Environmental Quality Systems” (*i*-EQS). The *i*-EQS vision includes three primary components:

- 1) real-time monitoring of conditions at multiple locations across a broad range of scales, from “global” to “local”;
- 2) analysis of sensor data, including linkages with simultaneous computational modeling;
- 3) responses that improve an environment, including the services it provides (*e.g.*, occupant comfort in built environments, drinking water and/or recreation from surface waters) and its impact on humans (*e.g.*, health and performance effects) and natural resources (*e.g.*, materials, energy, ecosystems).

Potential applications of envisioned *i*-EQS include a variety of situations in which assurance and/or optimization of environmental conditions is highly valued. Two applications of current interest to the Syracuse CoE are: (a) control of building systems to create comfortable, healthier indoor environments, while reducing contaminant emissions from buildings into the surrounding airshed, and (b) monitoring of surface waters that are sources of drinking water and ecological and recreational benefits. Motivations for these applications include improving human health, productivity, and security, as well as promoting sustainability of urban ecosystems.

Achieving the *i*-EQS vision will require advances in fundamental knowledge, technology innovation, technology application and demonstration, and system integration. Supported by grants and contracts from multiple sources, the Syracuse CoE is pursuing a broad portfolio of activities to realize the envisioned revolutionary *i*-EQS, including extensive research efforts to improve indoor environmental quality and a multi-year collaborative effort to establish a network of water quality monitors in the Seneca River watershed. The Syracuse CoE seeks to extend the breadth of its *i*-EQS research efforts via CARTI projects in the specific research areas of interest described below.

Specific Research Areas of Interest

A. Air Quality. The Syracuse CoE seeks to address selected issues of national and international significance concerning harmful indoor and outdoor air pollution. Specifically, the

¹ The Syracuse CoE includes activities of the Environmental Quality Systems (EQS) Strategically Targeted Academic Research (STAR) Center and the New York Indoor Environmental Quality (NYIEQ) Center, Inc. d/b/a. Syracuse CoE – Office for Industry Collaboration

Syracuse CoE seeks to extend the breadth of its research efforts to include studies that address the source, fate and transport of airborne pollutants throughout indoor environments; the linkages between outdoor and indoor air quality; and the monitoring and modeling of urban airsheds.

The overarching motivation for this research is developing and implementing *i*-EQS for buildings in urban settings that will reduce potential health impacts and improve productivity of building occupants. Envisioned *i*-EQS will include capabilities for monitoring the local airshed and the transport of outdoor contaminants through the building envelope; dynamically regulating the building control system in response to, or in anticipation of, changing outdoor conditions; and optimizing the delivery of conditioned outdoor and/or treated recirculated indoor air to individual occupants. In support of this vision, the new headquarters facility for the Syracuse CoE is being designed to serve as a testbed for prototype *i*-EQS technologies, including sensors and systems that monitor environmental conditions across a cascade of scales, from individuals' desktops to rooms, floors, and the surrounding urban airshed. In addition, the Syracuse CoE headquarters will include a variety of specialized laboratories designed for studies of the impact on human performance of multiple environmental factors, including air quality, thermal conditions, lighting, and sound. Construction of the Syracuse CoE headquarters facility is scheduled to be completed in Spring 2008.

Specific air quality research areas of interest to the Syracuse CoE include:

- What computational models and real-time monitoring of urban airsheds are required to enable development and implementation of *i*-EQS applications for buildings in urban settings?
- How can building envelopes and HVAC systems be integrated into an *i*-EQS application that achieves reductions in the exposure of occupants to harmful contaminants in indoor air?
- What are the sources and/or mechanisms that contribute to elevated levels of pollutants in indoor environments, and lead to occupant exposure to harmful contaminants in indoor air?
- How can monitoring and measurement systems, including sensors and algorithms, be developed for the indoor environment that lead to better understanding of phenomena that contribute to potential exposure to pollutants in indoor air?
- How can methods that link sources and receptors be applied to better understand the contribution of source types, components, and attributes to indoor air quality in the vicinity of building occupants and to the health effects they experience?
- How can personal environments be controlled to suit the need of each individual, while providing global optimization of the building as a whole?
- Do individuals have a persistent characteristic set of preferences for environmental conditions?

B. Water Resource Management. The Syracuse CoE seeks to address selected issues of national and international significance concerning water resource management, focusing on the development of integrated *i*-EQS that improve significantly the tools available to monitor and protect critical surface waters, including sources of drinking water and/or for recreation. We are especially interested in projects focused on watersheds in Upstate New York, including watersheds of Onondaga Lake, the Seneca River, Lake Ontario, and the St. Lawrence River. Specifically, the Syracuse CoE seeks to extend the breadth of its research efforts to include

studies of broader geographical regions in Upstate New York (beyond the Seneca River watershed) and the application of robotic monitoring to manage and protect water resources.

Specific water quality research areas of interest to the Syracuse CoE include:

- What are the stressors to water quality in New York watersheds to Lake Ontario? Are there techniques to quantify the impacts of these stressors? Are there diagnostic indicators that can be monitored?
- How do aquatic ecosystems in the Lake Ontario watershed respond to environmental management actions and what is the time-scale of recovery?
- How can we advance monitoring techniques, such as robotic devices or remote imagery, to better manage and protect water resources, and assess mitigation activities?
- Can we link models to advanced monitoring activities to better manage and protect water resources? How can these models be tested and validated? How will the availability of advanced monitoring data alter understanding of uncertainty in model calculations?

II. AWARD INFORMATION

Up to \$3.0 million is available for awards under this announcement. Contingent upon the number of high quality of applications submitted and funds available, the Syracuse CoE anticipates making up to 11 awards across three possible three funding levels:

1. \$100,000 total costs for 12-month exploratory projects and/or planning activities;
2. \$300,000 total costs for 24-month projects; and
3. \$600,000 total costs for 36-month projects.

All proposals should plan on a start-date of May 1, 2007. Applicants are advised that a no-cost extension in time will not be available for projects requesting 36-months of support.

New to this year's program is the 36-month funding level; we may make up to two awards, one in air quality and one in water resources, to monitor, study, and assess the interaction between urban ecosystems and the built environment. The goal of these projects is to advance our knowledge and understanding of the complex nature of nested environments. Research outcomes will facilitate the identification and development of new methodologies, techniques, and potential innovations that will ultimately protect the health of human occupants of built and urban environments. These two projects must address either the Syracuse area ecosystem or the urban cluster; they will also serve as test beds for deploying conceptual designs of innovations for further research. The Syracuse CoE headquarters campus, expected to commence operation in early 2008, may also provide a unique urban built environment with laboratory and office-type occupancies where it may be feasible to evaluate the impacts of these coupled systems to advance our understanding. However, the use of this facility is not a pre-requisite for any of these projects. We desire, at the time of award of the projects, that the researchers from the two selected projects will exchange information and show commitment to interact to achieve the Syracuse CoE's overall objective of studying nested environments.

III. ELIGIBILITY INFORMATION

Eligible Institutions

Academic or not-for-profit research institutional members of the Syracuse CoE must lead each CARTI project; member institutions are:

- Alfred University
- Clarkson University
- Cornell University
- Institute of Ecosystem Studies
- Rensselaer Polytechnic Institute
- State University of New York (SUNY) College of Environmental Science and Forestry
- SUNY Upstate Medical University
- Syracuse University
- University at Albany—SUNY
- University at Buffalo—SUNY
- University of Rochester
- Upstate Freshwater Institute

As appropriate to the scale and duration of the project, applicants are encouraged to team with investigators from one or more partner institution(s), or to include collaborators from industry. Applicants are also strongly encouraged to form project teams whose members include individuals from groups traditionally under-represented in the sciences. The project team may also include investigators from non-Syracuse CoE institutions, who participate as consultants or subrecipients via their home institution.

IV. APPLICATION

The application must contain the components listed below, and be paginated consecutively at the bottom of the page. Syracuse CoE reserves the right to return or reject, without review, any application that does not comply with project guidelines

All narrative text must be in 11 point Arial or Helvetica, excluded from this requirement are figure captions or table text, which can be smaller than 11 point but must be legible. Pages must have 1 inch margins on all sides, except for documents provided in the application materials.

A. Cover Sheet with Institutional Authorization. The Cover Sheet must include:

- Brief project title,
- Principal Investigator (PI) (name and contact information, including phone number and email address), (do they sign?)
- Co-PIs, (name, affiliation)
- Funds requested ,
- Proposed project duration: 12, 24, 36 months,
- Signature, name and contact information, (e.g., address, phone, fax and email) of the authorized institutional official or representative. (This is generally someone in the Office of Research, Sponsored Programs or equivalent).

A template cover sheet is available at <http://www.syracusecoe.org/CARTI/index.aspx>

B. Project Summary. In not more than 200 words summarize in lay language: (a) the objectives of the study (including any hypotheses that will be tested, (b) the approach to be used, and (c) the expected results of the project. In the event of an award, the project summary will be made publically available.

C. Table of Contents.

D. Project Narrative. The project narrative should include:

- Statement of Problem, Need or Hypothesis to be tested
- Rationale, justification for work (including, if appropriate, differentiation from previous or ongoing work performed under funding though the Syracuse CoE)
- Specific aims/objectives to address problem, need or test hypothesis
- Experimental design and/or computational approach and methodologies
- Workplan (timeline) and management plan (if appropriate)
- Expected results and practical outcomes
 - Assessment/evaluation
 - Potential benefits
 - Collaboration benefits

Page limits for project narrative:

12 month projects: 5 pages

24 month projects: 10 pages

36 month projects: 15 pages

E. Quality Assurance Statement For any project involving data collection or processing, conducting surveys, environmental measurements, modeling, or the development of technology (whether hardware-based or via new technologies) for pollution control, a two-page statement describing the processes that will be used to assure that the results of the research satisfy the intended project objectives must be provided. The Syracuse CoE is particularly interested in the quality controls for data generation and acquisition, and how data validation and usability will be verified.

In the event an application is recommended for funding, prior to expenditure of awarded funds, PIs must develop in collaboration with the Syracuse CoE QA Director a Quality Assurance Project Plan (QAPP) that complies with the Syracuse CoE's EPA-approved QMP, and perform approved work accordingly.

E. Budget. The proposed budget should be presented using the template available at <http://www.syracusecoe.org/CARTI/index.aspx> A budget narrative (2 pages) should include the rationale and need for requested expenses (i.e., personnel, fringe benefits, travel, equipment, supplies, and other costs associated with the project). The budget must include funds for participating in, and presenting the project results at the Syracuse CoE annual Symposium, which is held in Syracuse each fall.

F. Resumes. Provide resumes for the PI, co-PIs, and senior personnel. Each resume must not exceed two pages (single spaced, 12-point type, 1-inch margins). The recommend that NSF biosketch format be used...

G. References. Provide a list of references, including all authors and titles, not to exceed 3 pages.

V. SUBMISSION INSTRUCTIONS

All application materials should be assembled into a single PDF file, and emailed to Cynthia Nieman at cynieman@syr.edu by **5:00 p.m. December 8, 2006**. Acknowledgement of application receipt will be sent to the PI and authorized institutional official.

VI. APPLICATION REVIEW INFORMATION

CARTI proposals will be evaluated using a two-tiered process; the first for scientific and technical merit as determined by an external panel of reviewers, and the second for programmatic balance by the Executive Director of the Syracuse CoE in consultation with the Scientific Advisory Committee and external ad hoc reviewers, as appropriate.

Review Criteria for Scientific and Technical Merit

- *Innovation* - Does the project employ novel concepts, approaches or methods? Are the aims original and innovative? Does the project challenge existing principles/dogma, develop new methodologies or technologies, or address under-explored or unexplored areas?
- *Approach* - Are the research design and methods appropriate to achieve the proposal's aims? Are the conceptual framework, hypotheses, design methods and analyses adequately developed, and well integrated with the project's aims? Does the applicant acknowledge potential problem areas and consider alternative methods/approaches? While preliminary data are not required, if provided, do they support the scientific rationale for the study? If the project develops useful results, how might subsequent work be funded?
- *Applicant's Qualifications* - Does the principal investigator (and any collaborators) have the appropriate background to carry out this work? Are all areas of expertise needed to conduct the study adequately represented? If the investigator is not yet established or is new to environmental systems research, what is the investigator's potential to contribute significantly to the field?
- *Resources* - Are research requirements adequately supported by the necessary resources, and are any collaborative arrangements proposed? Is there evidence of appropriate institutional resources?
- *Interdisciplinary Involvement in the Proposed Research* - If applicable, is the combination of disciplines proposed likely to advance the frontiers of environmental systems research and generate meaningful results? Are the plans for collaboration well developed and realistic?
- *Budget Justification* - Is the budget reasonable and well justified for the proposed research? Is the project period reasonable and realistic for the proposed scope of work?

In addition, review criteria will include an evaluation of overall significance of the project:

- To what extent will the project, if successful, make an original and important contribution to the mission of the Syracuse Center of Excellence in Environmental and Energy Systems?

Review and Selection Process

An external team of technical peer reviewers, including ad-hoc reviewers, will review all applications. Each proposal will be assigned to at least two referees—one primary reviewer and one or more secondary reviewers, whose expertise is closely aligned with the proposal's topic or methodologies. In making reviewer assignments, consideration also will be given to the avoidance of conflicts of interest. Reviewers will prepare written evaluations and score proposals for scientific and technical merit.

A Review Panel, consisting of members of the Syracuse CoE Scientific Advisory Committee (SAC), will meet and deliberate on each proposal. The SAC will make recommendations of meritorious projects to the Syracuse CoE Executive Director. From the pool of meritorious proposals recommended by the Review Panel, the Executive Director will select the projects to receive funding based on programmatic balance and funds available. The Executive Director may invite additional comments from the Review Panel, as necessary, to aid in the final selection. Every applicant will receive a copy of the review summary prepared by the SAC on their proposal.

It is anticipated that the PIs of the proposals will be notified of selection process results by March 2007.

VII. SUBRECIPIENT AGREEMENT INFORMATION

Syracuse University will flow-down applicable terms and conditions contained in its EPA prime award to subrecipients. In addition, applicants are notified of the following specific terms that will be incorporated into these agreements:

1. **Copyrights**
Subrecipient shall grant to University an irrevocable, royalty-free, non-transferable, non-exclusive right and license to use, reproduce, make derivative works, display, and perform publicly any copyrights or copyrighted material (including any computer software and its documentation and/or databases) first developed and delivered under this Subaward Agreement solely for the purpose of and only to the extent required to meet University's obligations to the Federal Government under its Prime Award.
2. **Data Rights**
Subrecipient grants to University the right to use data created in the performance of this Subaward Agreement solely for the purpose of and only to the extent required to meet University's obligations to the Federal Government under its Prime Award.
3. **Quality Management Plan and Quality Assurance Project Plans**
Project management processes and responsibility are articulated in the Syracuse CoE's Quality Management Plan (QMP). Collaborator PIs are responsible for developing the Quality Assurance Project Plans (QAPPs) in compliance with the Syracuse CoE's EPA-approved QMP, and for performing the work accordingly. Subrecipient research work cannot proceed before completing and securing approvals of the relevant QAPPs.
4. **Acknowledgement**
In addition to the 40 CFR Parts 30 & 40 Publications and Other Public Release Results requirement, Collaborators agrees to specifically acknowledge the Syracuse CoE support under the EPA grant X-83232501-0 in all presentations and publications including on Web pages and stated during all media interviews.
5. **Dissemination and outreach**
The Syracuse CoE CARTI PIs and co-PIs and their students agree to participate at least one CoE event in person during the award period.
6. **Program sustainability**
As part of the Syracuse CoE Federation member, the recipient of the CARTI grant agrees to cooperate with the Syracuse CoE executive team in exploring future funding opportunities with industries, foundations, and other government agencies for the Syracuse CoE projects to advance the common objectives of the Syracuse CoE. If a project involves multiple

Syracuse CoE Federation members, as appropriate to research objectives, the recipient agrees to subcontract to the other members including Syracuse University.

Progress reporting requirements

Annual Progress Report:

Submission of brief annual progress reports will be required of multi-year project awards, according to a schedule to be established. The annual progress report will contain a brief summary of work completed to date for each proposed objective, and any challenges encountered during the project performance and resolutions reached. Information on products associated with CARTI funding (abstracts, publications, etc) will also be requested.

Final Progress Report:

A Final Progress Report, required of all awards, will contain a summary of work completed over the entire project period; the project objectives originally proposed and success(es) in achieving them. Information on products associated with CARTI funding (abstracts, publications, etc) will also be requested.