Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Office of Sponsored Programs
460 Turner Street, Suite 306
Blacksburg. Virginia 24060

February 28, 2005

Director for Homeland Security Grants Administration
Office of the Deputy Mayor for Public Safety and Justice
1350 Pennsylvania Ave., NW
Suite 327
Washington, DC 20004

To Whom It May Concern:

Please find enclosed an original and five (5) copies of a research proposal entitled, "Increasing On-Site and Emergency Generation Capabilities in the National Capital Region (Proposal Rsf #12-1)." This proposal was prepared by Dr. Frederick Krimgold from our Alexandria Research Institute.

All correspondence related to this proposal should reference Proposal Number 05-1625-02.

The enclosed information relating to an application for funding of a program is confidential and for use by the funding agency only. It may be distributed only to those persons whose evaluation is required to determine if the proposed research merits approval and funding by the agency. It is understood that other parties may have access for purposes as specified under 5 USC 552(a).

Access to the general public of the information enclosed herewith is prohibited until notice has been received of the name and affiliation of the requestor, and the purpose of the request. The investigator and Virginia Tech shall be allowed sufficient time to review the application and to redact those portions considered to be confidential. In the event that the funding agency disagrees with the request for redaction made by the investigator and/or Virginia Tech, the investigator and/or Virginia Tech reserves the right of appeal prior to release of the enclosed confidential information

The University appreciates the opportunity to submit this proposal. If questions or a budgetary or fiscal nature arise, please contact Mrs. Lauren Magruder at (540)231-8054. Questions of a technical nature should be addressed to the principal investigator.

Sincerely,

Lauren Magruder

Lauren Magruder
Contracts and Grants Administrator

lmg
Enclosures
Cc: Dr. F. Krimgold
Dr. S. Rahman
Dr. D. Eckel
University File

GOVERNMENT OF THE DISTRICT OF COLUMBIA

APPLICANT PROFILE

FY 2005 Homeland Security Grant Program: Urban Areas Security Initiative	
PROJECT TITLE:	Increasing On-Site & Emergency Generation Capabilities in the NCR
EMERGENCY SUPPORT FUNCTION:	ESF 12
PROJECT PERIOD:	10/1/05-1/31/07
PROJECT SYNOPSIS:	Analysis on non-government, civilian emergency generation capacity in the National Capital Region. Development of recommendations for documentation, coordination and management of distributed emergency generation facilities
IMPLEMENTING JURISDICTION:	In collaboration with Montgomery County & City of Alexandria

AGENCY: Alexandria Research Institute/ Virginia Tech
ADDRESS: 206 N. Washington St, Suite 400
Alexandria, VA 22314

AUTHORIZATION OFFICIAL

NAME: David W. Richardson
TITLE: Director, OSP
ADDRESS: 460 Turner St, Suite 306
Blacksburg, VA 24060
TEL: 540-231-5281
FAX: FAX: 540-231-3599
EMAIL: daverich@vt.edu

PROJECT DIRECTOR

NAME: Dr. Fredrick Krimgold
TITLE: Director
ADDRESS: 206 N. Washington St, Suite 400
TEL: 703-535-3444
FAX: 703-518-8085
EMAIL: krimgold@vt.edu

FINANCIAL OFFICER

NAME: David W. Richardson
TITLE: Director, OSP
ADDRESS: 460 Turner St, Suite 306
TEL: 540-231-5281
FAX: 540-231-3599
EMAIL: daverich@vt.edu

2-28-05

Signature of Authorized Official | **Date**

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Tables & Figures

I. Proposal Summary (Max 5 Pages)

Background

There are hundreds of on-site, emergency generators installed in the National Capital Region (NCR) that are designed to provide a significant source of power and support infrastructure security during emergencies. Many critical government activities and private sector infrastructure operations depend upon the proper operation of these facilities at times when the electric utility grid is having problems. During an emergency situation when electric service is not available, the many political jurisdictions in the NCR are fully dependent upon continued operation of communications and computer-based systems to coordinate their efforts, to maintain citizen health and safety, and to maintain security throughout the region.

Problem Description

Previous studies[1, 2, 3] by the Alexandria Research Institute (ARI) staff and consultants found that many, if not most, of these on-site, emergency generators do not operate properly when called upon during an emergency. Some problems were due to improper design, installed hardware, or quality of installation; some to lack of training and/or the experience of facilities personnel; but most were due to inadequate maintenance and regular testing of the units. This situation is true at both government (federal, state, and local) and private commercial and industrial facilities.

When Hurricane Isabel struck the NCR in September 2003, it highlighted an additional significant problem many of these installations have: on-site fuel storage at most facilities is very limited and many organizations do not have refueling contracts in place or procedures set out to processes. In most cases, operation is limited to just a few hours before refueling is needed. After Isabel struck, the combination of extensive damage to the electric distribution infrastructure in all sectors of the NCR region and, unfortunately, outages lasting several days saw many of these emergency generating facilities running out of fuel. A large number of facility owners had not made arrangements for refueling their facilities on a timely basis to ensure continued operation of their equipment. In addition, this necessary refueling process involves the irregular movement of fuel-laden trucks to and from public and private facilities, is

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[1] Rahman, S. and J. Bigger. ***Improving Virginia's Attractiveness for High-Technology Industries.*** Alexandria, VA: Alexandria Research Institute. October 2001. Available at http://www.cimap.vt.edu/a_report.htm (Accessed: 12/12/03).

[2] ***Infrastructure Security in the Metropolitan Washington Region.*** Washington, D.C: Metropolitan Washington Council of Governments. Draft Submitted: October 2002.

[3] ***Impact of Hurricane Isabel on National Capitol Region Infrastructures.*** Washington, D.C : U.S. Department of Homeland Security. Draft Submitted: December 2003.

not addressed in emergency operating plans and procedures of most government jurisdictions in the NCR region.

Although millions of public and private dollars have been invested in these emergency facilities, this poor performance during emergency situations is especially troubling as it adds significantly to the problems of emergency managers, coordinators, and responders and to the primary energy infrastructure organizations as these facility loads will fall back on the electric utilities. If the utility distribution system is having problems, as in Hurricane Isabel, the choice for emergency managers, then becomes, for example, a) increasing restoration priority at the utility, b) evacuating patients or inmates, or c) taking fuel from other critical uses and refueling the facility. Situations and choices, such as these, do not have to be made if proper preparations have been made.

II. Project Goals, Objectives, & Schedule (Max 5 Pages)

Project Goals & Objectives

Even before the events of September 11, 2001, governments at all levels have become aware that all social, economic, etc. aspects of this nation increasingly rely on its critical infrastructures. At the federal level, a number of task force studies and conferences have resulted in a series of Presidential Directives, government reports and regulations, and industry actions to increase the security, reliability, and resilience of the nation's infrastructure.

When Congress passed legislation creating the U.S. Department of Homeland Security, it demonstrated its special concern for the U. S. Capital area by creating the Office of National Capital Region Coordination.

The **Overall Goal** of this proposed project is to **"Increase the capability, reliability, and security of the on-site and emergency generation facilities in the National Capital Region."** The proposed project will directly result in an increased capability of one significant part of the emergency energy and services facilities that have been installed in the NCR: on-site and emergency electric generation facilities.

The specific, individual goals of the proposed project are not only to support the Overall Goal but also to provide accurate information to government agencies and private firms to support informed decisions regarding needed changes in public policy, emergency procedures, and agency/private firm actions. These specific goals will also provide information to private firms and industries regarding actions to increase the capability, reliability, and security of their facilities. The proposed project's Specific Goals are listed below along with first-level objective information. A more in-depth discussion of each project task is given in Section III Project Description. The proposed Project Schedule is shown below in Figure II-1.

1. **Goal 1** - Document the existence and characteristics of all emergency and on-site generation units in the NCR, both government (federal, state, and local) and privately owned.
   - 1.1 **Objective 1** – Conduct mail survey, with telephone/visit support, of all public- and privately owned on-site and emergency generation facilities in the NCR.
   - 1.2 **Objective 2** – Develop database of all on-site and emergency generation facilities for use by emergency managers in each jurisdiction in the NCR.
2. **Goal 2** - Document the "demonstrated" capabilities of the emergency and on-site generation units in the NCR; this includes not only the mechanical, electrical, and operational capabilities but also the maintenance and testing histories.
   - 2.1 **Objective 1** – Develop on-site and emergency generation facility demonstration plan(s).
   - 2.2 **Objective 2** – Monitor the conduct of facility demonstrations at selected facilities and document capabilities and limitations.

3. **Goal 3** - Develop strategic options and processes for refueling emergency and on-site generation facilities, both public and private, during emergencies and support integration of these processes into each NCR regional jurisdiction's Emergency Operating Plans.

   3.1 **Objective 1** – Develop facility-refueling strategies with support of government emergency managers, petroleum industry distributors, and facility owners/operators.

   3.2 **Objective 2** - Develop facility-refueling processes and with government emergency manager and facility owner/operator support, initiate the integration of these processes into individual jurisdictions' Emergency Operating Plans.

4. **Goal 4** - Determine the feasibility (technical, financial, and institutional) of developing coordinated NCR Regional Emergency Generation Networks at each government level (federal, state, and local) to increase security and capability of electric service to vital public facilities.

   4.1 **Objective 1** – Determine feasibility of using "micro-grid" concept to interconnect government-owned emergency generation facilities.

   4.2 **Objective 2** – Develop example(s) of NCR area Emergency Generation Network(s) and examine the technical, financial, and institutional benefits and costs.

5. **Goal 5** - Conduct workshops and disseminate project documents to provide direct feedback and information to facility owners (both public and private) on project findings and "best practices."

   5.1 **Objective 1** – Develop and conduct two workshops for government (federal, state, and local) facility owners and operators to review project findings and "best practices" for emergency generation facility equipment.

   5.2 **Objective 2** - Conduct two workshops to review project findings, "best practices," and refueling strategies for privately owned on-site and emergency generation facilities and petroleum industry firms.

   5.3 **Objective 3** – Conduct one workshop, in coordination with several COG committees, for government emergency services managers, planners, and personnel to review project findings on capabilities of this emergency energy resource, both publicly and privately owned.

   5.4 **Objective 4** – Disseminate project results (summarized) widely throughout the NCR.

Goals and Objectives of the 2003 Homeland Security Strategy for the NCR

This proposed project directly supports three (3) of the *Goals and Objectives of the 2003 Homeland Security Strategy for the NCR*. The three Strategy Goals are paraphrased below (numbered as they appear in the RFA) along with a brief statement describing how the proposed project supports each specific Goal:

Goal 1 – Preparedness Planning

"Ensure preparedness planning efforts across the NCR, including the public, business, and non-profit sectors..."
The project team will identify, contact, document, and clarify capabilities and limitations of on-site emergency generation facilities in the NCR, both publicly and privately owned. This will provide accurate bases for any subsequent emergency operation, policy, regulatory, or industry actions to increase security, capability, and reliability of these facilities in the NCR.

*Goal 3 – **"Regularly exercise NCR response capability to ensure continued improvement..."***
The project team will work with facility owners/operators to demonstrate facility capabilities and inform/train them regarding the "best practices" of operating, maintaining, and testing equipment to maintain the security, capability, and reliability of these facilities in the NCR.

*Goal 4 – **"...manage equipment and systems to enhance preparedness, response, and recovery efforts of responders in the NCR."***
The project team will work with facility owners/operators and public emergency managers to obtain a higher level of security, capability, and reliability of these facilities in every jurisdiction of the NCR.

NCR Eight Commitments to Action

The goals and objectives of this proposed project also directly support three (3) of the eight *NCR Commitments to Action*. These commitments are listed below (numbered as they appear in the RFA) along with a brief statement of where the proposed project supports the NCR Commitment:

Commitment 3. ***Decision-Making and Coordination***
"Work in partnership to utilize a coordinated process for decision-making for significant incidents or emergency situations in the NCR"

The proposed project will identify, document, and clarify capabilities and limitations of on-site emergency generation facilities in the NCR for use by emergency managers planning purposes and during emergency events for energy-related decisions. The project will also develop and integrate refueling strategies and procedures for both public and private facility owners.

Commitment 4. ***Emergency Protective Measures***
Work in partnership to define and develop a common set of emergency protective measures to protect the health and safety of the public in the event of a major emergency event in the NCR.

The proposed project will document the present capabilities and limitations of existing on-site emergency generation facilities in the NCR – both public and private – to provide an informed basis upon which to develop public policy and procedures related to such items as facility evacuation vs. refueling of on-site generator decisions, minimal operating capabilities for specific types of facilities (e.g., EOCs and fire stations).

Commitment 5. ***Infrastructure Protection***
Work in partnership with the private sector to jointly identify and set protection priorities and guidelines for infrastructure assets and services in the NCR.

The proposed project will interact directly with a large number of public agencies (at federal, state, and local levels), private firms, and industry associations to identify and document infrastructure assets related to emergency, on-site generation facilities. The results of the study will be widely disseminated to these agencies and firms through conduct of workshops and distribution of project documents.

Project Schedule

The project is expected to take 15 months to complete. A preliminary project schedule is shown below in Figure II-1. The schedule highlights the project tasks, milestones, and major meetings/reviews. The Project Start Date (date of contract signature) will determine the exact activity dates and the Period of Performance contained in the contract.

Figure II-1 Project Schedule

III. Project Description (Max 10 Pages)

"Describe the steps that will be taken to address one or more of the following (RFA page 8):

- Establish/enhance public/private emergency preparedness programs

The proposed project is separated into five interrelated tasks. The Project Work Plan is described below. For each task, an Objective and Approach are described and at the end of the Work Plan, the list of project deliverables is described. In addition, the development of the proposed project has been coordinated with two related projects now ongoing in the NCR: 1) the NCR Project managed by George Mason University and 2) the U.S. Corp. of Engineers' Prime Power Project. If the proposed project is funded, continued coordination with and involvement of personnel in both projects will continue. A brief description of these activities is given.

Project Work Plan

Task 1: Facility and Site Survey

Objective: Identify and characterize government and private on-site and emergency generation facilities installed in the NCR.

Approach: A number of public agencies at state, county, and city levels in the NCR conducted surveys and developed lists of on-site generation facilities. However, most of these are outdated or have not been maintained so they do not contain current information. At the state level, both Maryland (Department of Emergency Services) and Virginia (Department of Environmental Quality) have conducted surveys of on-site generation facilities, but these are a number of years old. Members of the proposed project team have been in contact with persons involved in a number of these efforts.

To identify government-owned facilities, the project team will work with the General Services Administration (GSA); individual federal department facilities groups; and District, state, and local government agencies to identify and utilize existing database(s) and sources. It is anticipated that individual government agencies and departments will have to be contacted to obtain complete listings of their facilities in the NCR.

To identify privately owned facilities, team members will work with local/regional facility designers; equipment suppliers; utilities; local permit-approval agencies (e.g., city and county); industry associations; and various state agencies.

Once the facilities have been identified, the project team will utilize an initial mail survey with telephone or site visit follow-up to identify and characterize these facilities in the NCR. The survey mailing will include a questionnaire to characterize each facility. It has been the experience of some of the team members in conducting similar surveys and market research results that responses to mail surveys alone are usually in the 10 percent to 30 percent range. This level is, however, insufficient for this effort, so follow-up telephone calls and/or team visits will be used to increase the response level.

Project team members will develop a database of the emergency and on-site generation installations in the NCR. This database will also incorporate the results of Task 2 – demonstrated capabilities and limitations. It will be used to conduct detailed analyses regarding

the breadth and depth of installations at both government agencies and private firms. The database and the analyses will also provide Emergency Managers and Emergency Operating Center (EOCs) personnel in the NCR jurisdictions a more accurate overall picture and details of this resource in their respective jurisdictions. It will also provide them with a clearer picture of when these installations and the facilities they support may come back on the utility line during any extended outage.

One very important result of this task will be the accurate characterization of the emergency generation facilities for all the EOCs in the NCR. This information will allow emergency managers in every jurisdiction to take any action regarding common performance specifications for these facilities.

> Note: After the events of September 11, 2001, a number of, but not all, government agencies – especially at the federal level – have closed access to information about and to their emergency facilities themselves to personnel without some type of "security clearance" or "specific approval." To enable the team to conduct this project, a request may be made to the DHS and/or COG organizations to assist in gaining access. Project team members are all U. S. citizens and are accustomed to working under Non-Disclosure and Non-Attribution Agreements. However, information is needed for the project, so assistance may be sought.

Task 2: Facility Capability Demonstration

Objective: Document the demonstrated operating capabilities of a "statistically significant" number of on-site and emergency generation facilities- both public and private – in the NCR.

Approach: The project team will work with facility owners, GSA personnel, Federal Emergency Management Administration (FEMA) staff, electric utilities, Corp. of Engineers personnel, and other experts to develop facility Demonstration Plans. Because of the variety of installations and installed hardware that are expected to be identified, more than one plan may be required. The Demonstration Plan will include not only the documentation of a demonstration of the facility/equipment capabilities and documentation of any limitations, but also the documentation of a review of maintenance and testing programs of the facility and equipment. District, utility, and Corp. of Engineer personnel can attest to the fact that many/most of the installed emergency generators in the NCR have not had regularly scheduled, multi-hour, full-load test runs conducted.

Team personnel, working with facility owners, will monitor a demonstration of facility operation and capabilities, following the steps in the Demonstration Plan developed above, at a randomly selected number of installations in the NCR. Included in the demonstration will be a full-load operation run, both grid-connected and grid-independent, when facility hardware allows. It is preferred that the Demonstrations conducted as part of this project be integrated

with a regularly scheduled test of the facilities rather than a stand-alone, unique demonstration. This is because a number of these generation facilities are limited in the number of operating hours allowed per year in their operating permits. Otherwise they might be subject to fines for exceeding their permit limits.

Due to the anticipated large number of facilities that will be identified – in the many 100s and maybe well over 1,000 – it will not be possible to monitor demonstrations at all facilities in the NCR. Demonstrations will be conducted at a statistically significant number of facilities to support accurate projections for the remainder. However, all the remaining facility owners will be requested to conduct Demonstration Plan tests on their own and submit results to the team.

Task 3: Refueling Strategies

Objective: 1) Develop facility refueling strategies and procedures for public and private facility owners and 2) integrate these strategies and procedures into the Emergency Operating Plans of the NCR jurisdictions.

Approach: The team will work with both public and private facility owners, representatives of petroleum industry associations and distribution firms, and members of NCR jurisdictions' emergency planners, to develop refueling strategies and support the integration of these strategies and procedures into the Emergency Operating Plans of NCR jurisdictions. Demonstrated logistic supply principles and operations research analyses will be utilized to support development of the strategies and routing procedures to minimize the exposure of citizens to the refueling transport equipment and vehicles during an emergency.

Primary, secondary, and even tertiary routing plans will be developed and evaluated to help ensure timely and safe delivery of fuels with a minimum of interruption to critical emergency services during and after a disaster event.

Task 4: NCR Emergency Service Networks

Objective: Evaluate the feasibility, costs, and benefits of interconnecting government-owned emergency generating units into NCR Emergency Generation Service Networks – at federal, state, and local levels

Approach: Project team members, along with industry and government agency personnel, will investigate the technical, institutional, and financial requirements for interconnecting government-owned emergency generating units into an NCR Emergency Generation Service Networks – at federal, state, and local levels – to increase the capability, reliability, and security of the emergency systems that support critical government facilities during natural and man-made emergencies. The U. S. Department of Energy's Distributed Energy Program has a number of demonstration projects underway that will/are demonstrating this concept: interconnecting emergency generating units to help meet peak demand, increase reliability of the utility grid, and reduce demand for new utility generating units.

A number of years ago, one (or more) electric distribution network(s) in the Arlington, Virginia area were significantly upgraded to serve various segments of a federal agency and its

supporting contractors. Although the agency and its contractors have moved out to another facility, this electric distribution network still exists today and now supplies electric power to commercial customers in the area at a very high level of service reliability. Project team members will work with Dominion Virginia Power engineering staff to evaluate the network to determine its design specifications, physical characteristics, performance levels, upgrade costs, and O&M costs. These upgraded distribution networks may serve as a starting point for the NCR Emergency Generation Service Networks.

Using the information developed in Task 1, the project team will identify potential opportunities and benefits of upgrading the distribution system(s) that would interconnect emergency generating units owned by a single jurisdiction. The initial approach would be to examine the feasibility of utility-owned interconnection facilities and then examine the feasibility of dedicated interconnection facilities. Preliminary designs, cost estimates, benefits (operating, reliability, and security) and operating strategies will be developed for each approach and for each jurisdiction level.

Task 5: Best Practices, Training, and Outreach

Objective: Develop, train, and disseminate to facility owners/operators the results of the project, facility best practices and lessons learned to increase security, reliability, and performance of emergency generation facilities in the NCR.

Approach: Based upon information obtained in Tasks 1, 2, and 3, the project team will develop a "Best Practices" and "Lessons Learned" manual to document methods and practices that have been shown to increase the reliability and performance of on-site emergency generation systems. Facility hardware vendors will be involved to further identify best practices, both general and hardware-specific.

A total of four workshops and one briefing will be conducted to disseminate the information from the Project and to provide training on the "Best Practices" and "Lessons Learned" identified. It should be noted that the workshops for the government-owned and the privately owned facilities will be separate. The information on government facilities will not be distributed to private facility owners.

Two (2) workshops will be conducted to present the Project results, findings, and recommendations to facility managers and owners of government-owned facilities (federal, state, county, and city).

Two (2) workshops will be conducted to present the Project results, findings, and recommendations to facility managers and owners of privately owned facilities. Private organizations and a number of industry associations will also be invited to participate in these workshops.

A project briefing will be conducted for COG (R-ESF) committee members to ensure wide dissemination of the project's critical findings.

Project Deliverables

The following are the proposed deliverables for this project:

- Task 1 Report: Submitted to NCR/DHS and contract monitors documenting on-site and emergency backup facilities and their characteristics in the National Capitol Region
- Task 2 Report: Submitted to NCR/DHS and contract monitors documenting specific facilities' demonstrated power and energy production capabilities.
- Task 3 Report: Submitted to NCR/DHS, contract monitors, and local jurisdiction's emergency planners documenting refueling strategies, procedures, and options for the refueling of emergency and on-site facilities, both public and private, during an emergency.
- Report to NCR/DHS, contract monitors, and local jurisdiction's emergency planners on the potential of Emergency Generation Network development options and the potential public benefits and costs of these facilities.
- Conduct two (2) workshops for public and two (2) for private NCR on-site and emergency backup facility owners on benefits, costs, capabilities, and limitations found in the survey and demonstrated capability parts of the project. The workshops will include a review of the "best practices" and "lessons learned" relating to the operation, maintenance, and testing of these facilities.
- Conduct one (1) briefing for NCR government agency personnel, coordinated through the relevant COG ESF Committees, on all aspects and findings of the project.

Project Coordination

This development of the proposed project has been closely coordinated with and reviewed by personnel at the George Mason University-led National Capital Region Project (NCR Project) that is now underway. During the development of the refueling strategies (proposed Task III), NCR project personnel (primarily from the School of Public Policy) may be requested to support the development of the refueling strategies (at no cost to this proposed effort) and integration of the strategies and procedures into existing Emergency Operating Plans of the NCR jurisdictions.

The development of the proposed project is also being closely coordinated with the ongoing U. S. Army Corps. of Engineers' Prime Power Project. The Prime Power Project involves Corps. personnel working with a number of NCR government agencies to: 1) define critical facilities in their jurisdiction, 2) determine the need for any on-site emergency generator capability at these facilities, and 3) size the generator installation needed to support the critical facility during emergencies. The Prime Power project deals only with new generation facility sites, whereas this proposed project deals with existing government and private generator installations. Discussions with the Prime Power project manager, Mr. Stan Ballard, have also included the feasibility of developing compatible databases and GIS information packages, as

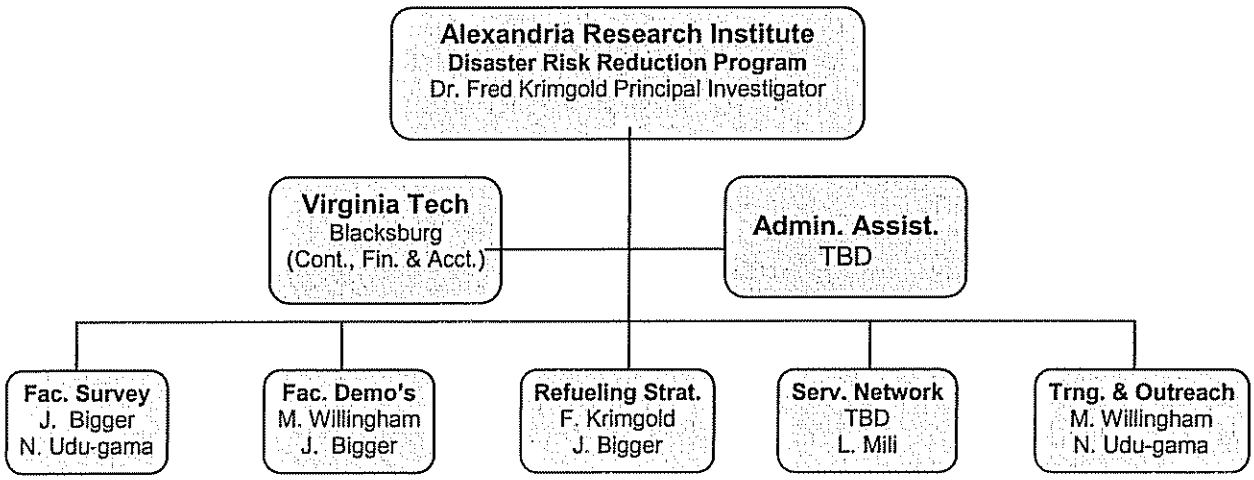
discussed in Appendix J: Geospatial Guidance of the Request for Applications (page 70 of RFA). This will benefit the individual jurisdictions and the DHS Office of the National Capital Region Coordination. This coordination will also simplify updating facility information as new installations are made.

IV. Organization, Experience, & Qualifications (Max 5 Pages)

Team Organization

Shown below is a simplified Project Organization Chart. The Principle Investigator for the proposed project will be Dr. Fred Krimgold, Director of the Disaster Risk Reduction Program (DRR), one of the program areas located at the Alexandria Research Institute. ARI is an arm of Virginia Polytechnic Institute and State University and is located in Alexandria, Virginia.

Figure III-1 Project Organization Chart



Team Experience

Members of the project team have been involved in a number of studies and projects over the past five years that directly relate to critical infrastructures and their interdependencies. These have been mainly for the Commonwealth of Virginia and for the Department of Homeland Security's Office of National Capital Region Coordination (NCR). The following is a brief description of the recent projects and the proposal team personnel involved.

1. **CRIS/DRMM/IIIT/NSF Workshop on the Mitigation of the risk of Catastrophic Failures across Interdependent Critical Infrastructures.** A 2-day workshop was held in Alexandria, Virginia, on September 10-11, 2001, under the joint patronage of the International Institute for Critical National Infrastructures (CRIS), the World Institute for Disaster Risk Management (DRM), the International Institute for Information Technology

(IIIT), and the National Science Foundation (NSF). Drs. Lamine Mili and Fred Krimgold organized the workshop under contract to NSF. This workshop brought together about forty experts in critical infrastructures and disaster risk management from North America and Europe. The main papers were published in *the International Journal of Critical Infrastructures*, Vol. 1, No. 1, 2004, which are available at: https://www.inderscience.com/browse/index.php?journalID=58&year=2004&vol=1&issue=1

2. **Critical Infrastructure to Support Virginia's High Technology Industries.** This one-year study, beginning in August 2000, funded by the Commonwealth of Virginia's Center for Innovative Technology examined the Commonwealth's physical infrastructures (communications, energy, water, and transportation) to support Virginia's rapidly expanding high-technology industries. John Bigger was the manager and investigator for the project; Dr. Michael Willingham was the second investigator. The final report on the study is available at: http://www.cimap.vt.edu/presentations/taskforce_report_ES.pdf .

3. **Impact of Hurricane Isabel on the Critical Infrastructures of the National Capital Region.** This four-month investigation, funded by the U.S. Department of Homeland Security and managed by George Mason University, examined the impacts of Hurricane Isabel on the NCR's critical infrastructures (communications, emergency services, energy, public health, shipping/postal, transportation, and water/wastewater). Extensive interviews with executives, managers, and technicians from every infrastructure sector were conducted and documented. Dr. Fred Krimgold and John Bigger headed the Energy Sector investigation and interviewed personnel from electric and gas utilities and petroleum companies that all serve the NCR. A major element in this effort was the examination and documentation of examples of interdependencies among the infrastructures. The results on the infrastructure interdependency will shortly be publicly accessible through a GMU website.

4. **National Capital Region Project.** This 14-month study, now underway, is funded by the U.S. Department of Homeland Security and managed by George Mason University. The objective of this project is to examine the publicly available Vulnerability Assessment (VA) methodologies used by infrastructure organizations, to interview representative infrastructure organization personnel regarding their VA activities, and to make a status assessment for the NCR infrastructure organizations. Dr. Fred Krimgold is leading the emergency services investigation, John Bigger is leading the energy sector investigation, and Drs. Willingham and Mili are investigators in the energy and the communications sector.

5. **Assessing the Role of Utility and Transportation System Infrastructure Interdependencies in the Response and Recovery from the Recent Florida Hurricanes.** The ARI team has just been awarded a contract by the American Lifelines Alliance to examine the roles of infrastructure interdependencies in the response and recovery from the 2004 hurricane season in Florida. This project is primarily directed at examining electric, communications, and transportation infrastructure interdependencies. Drs. Fred Krimgold and Lamine Mili are the co-principle investigators; Dr. Michael Willingham and Mr. John Bigger are the project investigators.

V. Staffing Plan and Management

Each person on the ARI Proposal Team has been and is presently involved in research and contract projects that deal specifically with local, state and/or regional infrastructures. Three members of the project team (Krimgold, Bigger, and Willingham) have worked together on a number of infrastructure-related projects over the past five (5) years. Ms. Udu-gama, the most recent addition to the team, has been working on the NCR project for over a year. Thus, the team brings a great deal of knowledge and experience to this effort. Two additional persons, a graduate Research Assistant (part time) and an Administrative Assistant (part time) will be added to the Team after the Project has been approved and the contract signed.

Project Staffing

Listed below are the proposed personnel, their project titles, Virginia Tech titles, and the percentage of time they will devote to the project. The full resume for each named person below is included in Appendix A. The resumes contain the information requested in the RFA related to education, experience, training, previous employment. Salary and other financial information is listed in the proposed Project Budget, Section V.

Upon being notified that this proposal has been selected for funding, Dr. Krimgold will initiate action to hire another Project Research Assistant and an Administrative Assistant and obtain support from an existing electric engineering staff, experienced in the specific area of investigation. Unofficial inquiries regarding potential candidates for these positions have already been initiated.

Staff Name	Project Title	Time (%)
Dr. Fred Krimgold	Principal Investigator	12
John Bigger	Project Manager and Project Investigator	15
Dr. Michael Willingham	Project Investigator	16
Dr. Lamine Mili	Project Investigator	10
Ms. Natasha Udu-gama	Project Research Assistant	25
TBD	Graduate Research Assistant (GRA-13)	100
TBD	Project Administrative Assistant	5

Position Descriptions

The position descriptions developed by the Human Resources Department at Virginia Polytechnic Institute and State University are used hiring academic, adjunct, professional, and support staff positions. The titles for the positions used in this project are given below.

- Professor

- Adjunct Professor/Faculty
- Research Assistant
- Graduate Research Assistant
- Administrative Assistant

Team Member Qualifications

The ARI team consists of Drs. Fred Krimgold, Michael Willingham, Lamine Mili, and Mr. John Bigger and Ms. Natasha Udu-gama of the Alexandria Research Institute, an arm of Virginia Polytechnic Institute and State University. A brief summary of their professional experience and qualifications is provided below; full resumes for each of the named team members are included in Appendix A of this proposal.

Dr. Frederick Krimgold is Co-Director of the World Institute for Disaster Risk Management, a joint initiative of the Board of the Swiss Federal Institutes of Technology, Swiss Re and Virginia Tech. He received his undergraduate training at Yale University and his doctorate in Building Science from the Royal Institute of Technology in Stockholm. From 1977 to 1983, he was Program Director in the Engineering Directorate of NSF. He has served as President of the Architectural Research Centers Consortium, as a member of the Building Research Board of the National Research Council of the National Academy of Sciences, and as a member of the Advisory Board of the Federal Emergency Management Agency. He is currently a member of the Consultative Council of the National Institute of Building Sciences and the Endowment Committee of the Earthquake Engineering Research institute. He has worked as a consultant on disaster management for the World Bank, the Asian Development Bank, USAID, the Swedish International Development Agency, the Swiss Agency for Development Cooperation, the Government of Maharashtra, India, the US Federal Emergency Management Agency, and the Virginia Department of Emergency Management.

Dr. Michael Willingham is an energy and environmental analyst, with experience in policy, technology, educational program design, and professional training. His work experience includes efforts with the Navajo Indian Tribe, Peace Corps, US Congress, United Nations, World Bank and a number of companies in the private sector. He has an undergraduate degree in Mathematics from MIT and a PhD in Energy Management from the University of Pennsylvania. Since April 2000, Dr. Willingham has coordinated Virginia Tech's Critical Infrastructure and Modeling Program, which was established to provide Virginia state policymakers and legislators - along with citizens, state and federal agencies as well as industry partners - with long-term perspectives and guidance on the various issues that affect the planning, commissioning and operation of critical infrastructures. He serves at the Alexandria Research Institute as an Adjunct Professor. Current projects include identifying the problems and opportunities confronting the Commonwealth in relation to the growth of high-tech industry and the move toward deregulation of energy services.

Dr. Lamine Mili is a Professor of Electrical Engineering at the Alexandria Research Institute of Virginia Tech. He received an Electrical Engineering Diploma from the Swiss Federal Institute of Technology, Lausanne, in 1976, and the Ph. D. degree from the University of

Liege, Belgium, in 1987. Dr. Mili is a senior member of the Power Engineering Society of IEEE, the recipient of a 1990 NSF Research Initiation Award and of a 1992 NSF Young Investigator Award. He has 5 years of industrial experience with an electric utility. His research interests include risk assessment and management of catastrophic failures, risk-based decision theory, multi-criteria decision under uncertainty, robust statistics, power system stability analysis and control, robust signal processing, robust state estimation, nonlinear optimization, and multifunction radar systems. Dr. Mili is the co-founder and co-editor of the International Journal of Critical Infrastructures.

Mr. John Bigger has over 30 years of project and program management experience in the electric utility and energy fields. This consists of 10 years of engineering experience, at increasing levels of responsibility, at the Los Angeles Department of Water and Power and 21 years managing energy technology research, development, demonstration, and integration projects at the Electric Power Research Institute in Palo Alto, California. Mr. Bigger was part of a small group that created and then served as Technical Director of the Utility Photovoltaic Group, a not-for-profit organization to support the commercial use of photovoltaic systems by electric utilities in the U.S. Since 1998, Mr. Bigger has served as president of the small consulting firm, Sol y Mer, Ltd; the firm develops projects and programs for utilities and other organizations in the renewable energy field. In September 2000, Mr. Bigger was appointed Adjunct Professor at the Alexandria Research Institute; since that time, he has been managing and conducting research studies of infrastructures, their security, and their organizations. The Commonwealth of Virginia and federal government agencies have funded these projects.

Ms. Natasha Udu-gama is a disaster risk management specialist. Her research interests include appropriate technologies for community-based disaster risk information systems in poor urban areas and information technologies for risk communication. Ms. Udu-gama has extensive research and training experience in disaster management. In her capacity as research associate at the Virginia Tech Center for Disaster Risk Management (VT-DRM), she participated in the "Microzonation for Earthquake Risk Mitigation in Turkey" project with DRM. Currently, Ms. Udu-gama is carrying out research and constructing surveys of emergency services for the emergency services component of the "National Capital Region – Critical Infrastructure Vulnerability Assessments" project in conjunction with the Department of Homeland Security and George Mason University.

Project Advisory Committee

A Project Advisory Committee will be formed to regularly review project activities and help support project needs throughout the Period of Performance. The Advisory Committee will be made up of personnel experienced in the specific areas covered by the Project. It is planned to have Project staff meet with the Committee ahead of the completion of each Task in order to obtain input on progress, directions being taken, and recommendations for action. Committee members will also provide feedback on draft publications and workshop materials. This approach has been used very successfully in the past by Project staff and results in better and more usable products from a project.

Discussions have been initiated regarding possible participation on the Committee. All Committee personnel will be from the local NCR area and will serve at no cost (e.g., time and travel) to the project. Personnel with the following backgrounds will be sought for membership on the Committee:

- Electric utility (from NCR area)
- NCR-area emergency facility manager
- Emergency facility designer/developer
- U. S. Corp. of Engineers (from the Prime Power Project)
- Emergency manager/planner (from one NCR jurisdiction)

Project Monitoring

To help keep the sponsoring organization's contracting and monitoring personnel informed about the progress of the project, the following will be part of the management of the Project:

- **Project Kick-Off Meeting:** The ARI Project staff will conduct a Project Kick-Off meeting within the first two weeks after contract signing. Contract monitors and Advisory Committee members will be invited. The project activities, approaches, and deliverables will be discussed to ensure personnel from both the sponsoring organizations and Project staff understands the requirements and expectations of the project. (Proposed Site: ARI headquarters)
- **Monthly Progress Report:** These reports will document: a) the activities worked on each month; b) activities anticipated for the next month; c) goals, objectives, and milestones achieved; d) issues and problems that have arisen; and e) monthly project financial tracking.
- **RSF #12 Committee Bi-Monthly Briefings:** Progress briefings will be presented at the regular bi-monthly meetings of the R-ESF Energy Committee. Briefing length and content will be reviewed with the Committee Chair and COG Committee staff person, Mr. George L. Nichols. (Proposed Site: COG Headquarters)
- **Project Task Briefings:** Near the end of each task, Project Advisory Committee members and Monitors will be briefed on the progress of each task and the format and content of documents being produced from the task. (Sites: ARI and COG Headquarters)
- **Project Final Review:** The ARI staff will conduct a final briefing for the monitoring personnel and Advisory Committee members on the findings, conclusions, and recommendations made by ARI staff. The project final report draft will be submitted for review and comments at this meeting. (Proposed Site: COG headquarters)

Personnel from DHS, COG, and the local contracting agency will act as contract monitors/administrators for the project. These personnel will participate in the Project Advisory Committee meetings, the R-ESF #12 Bi-Monthly briefings, and will be sent the Monthly Progress Reports.

VI. Project Budget & Budget Narrative

The estimated Total Budget for the proposed project is $245,000. The breakdown of the project budget is shown in Table VI-1 below. The budget breakdown shows the details for: a) project labor, b) materials, c) travel, and d) project overhead and indirect charges.

Travel: It is expected that all the travel in the proposed project will be limited to the National Capital Region area; there may be some travel to Annapolis and Baltimore, Maryland and Richmond, Virginia to meet with state-level agencies and personnel. It is not anticipated at this time that there will be any overnight travel associated with the proposed project.

Materials: The primary materials expenditures will be related to the survey (Task 1), including documents and postage; development of testing documents (Task 2); Emergency Electric System Design (Task 3), and materials and publications required for the four workshops and one briefing.

In addition to the Total Budget of $245,000 shown in this proposal, it is expected that MWCOG will add an additional 2.5 percent ($6,125) for project administration and monitoring performed by their personnel.

Table VI-1: Total Project Budget

DATE: 02/22/05 REVISED: 2/28/2005 15:43

FILE NAME: lm Krimgold Government of DC.xls

PRINCIPAL INVESTIGATOR: Fred Krimgold

START DATE OCT 1 2005

END DATE JAN 31 2007

NAME/POSITION			1 YEAR 10/1/05-9/30/2006		4 MONTHS 10/1/06-1/31/2007	TOTAL
Fred Krimgold	CY	12%	$12,814	12%	$4,456	$17,270
John Bigger	CY	15%	$19,766	20%	$9,163	$28,929
Michael Willingham	CY	15%	$15,813	15%	$5,498	$21,311
Lamine Mili	AY	10%	$9,003	10%	$4,188	$13,191
Lamine Mili	SMR	0%	$0	0%	$0	$0
Research Assistant	CY	25%	$10,963	25%	$3,812	$14,775
Admin Assistant	STAFF	5%	$1,709	5%	$582	$2,291
GRA- Step 13	GRA	100%	$19,813	100%	$6,777	$26,590
TOTAL PERSONNEL SALARIES			$89,881		$34,476	$124,357
FRINGE BENEFITS						
Reg Fac 33.25% / 32.75% & Res Fac 34.25% / 35%			$10,863		$4,079	$14,942
SMR/WAGES 9.5% / 9.75%			$3,402		$1,429	$4,831
GRA @ 6.25% / 7.5%			$1,300		$508	$1,808
CLASSIFIED 40.75% / 44.5%			$712		$259	$971
TOTAL FRINGE BENEFITS			$16,277		$6,275	$22,552
TOTAL SALARIES & BENEFITS			$106,158		$40,751	$146,909
EQUIPMENT			$0		$0	$0
TUITION - AY (NoVA rate)			$7,977		$3,807	$11,784
TRAVEL (International)			$0		$0	$0
TRAVEL (Domestic)			$1,838		$612	$2,450
MATERIALS & SUPPLIES			$3,675		$1,400	$5,075
TOTAL DIRECT COSTS			$119,648		$46,570	$166,218
INDIRECT COSTS @ 51.0% 7/1/05-fut			$56,952		$21,809	$78,761
TOTAL COSTS			$176,600		$68,379	$244,980
INDIRECT BASE	51.0%		*$111,671*		*$42,763*	

APPENDIX E: CERTIFICATIONS

GOVERNMENT OF THE DISTRICT OF COLUMBIA
OFFICE OF THE DEPUTY MAYOR FOR PUBLIC SAFETY AND JUSTICE

Certifications Regarding Lobbying; Debarment, Suspension and Other Responsibility Matters; and Drug-Free Workplace Requirements

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Applicants should also review the instructions for certification included in the regulations before completing this form. Signature of this form provides for compliance with certification requirements under 28 CFR Part 69, "New Restrictions on Lobbying" and 28 CFR Part 67, "Government-wide Debarment and Suspension (Non-procurement) and Government-wide Requirements for Drug-Free Workplace (Grants)." The certifications shall be treated as a material representation of fact.

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 28 CFR Part 69, for persons entering into a grant or cooperative agreement over $100,000, as defined at 28 CFR Part 69, The applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal grant or cooperative agreement;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form - lll, "Disclosure of Lobbying Activities," in accordance with its instructions;

(c) The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers including sub grants, contracts under grants and cooperative agreements, and subcontracts) and that all sub-recipients shall certify and disclose accordingly.

2. DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS (DIRECT RECIPIENT)

As required by Executive Order 12549, Debarment and Suspension, and implemented at 28 CFR Part 67, for prospective participants in primary covered transactions, as defined at 28 CFR Part 67, Section 67.510—

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, sentenced to a denial of Federal benefits by a State or Federal court, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c.) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application had one or more public transactions (Federal, State, or local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

3. DRUG-FREE WORKPLACE (GRANTEES OTHER THAN INDIVIDUALS)

As required by the Drug Free Workplace Act of 1988, and implemented at 28 CFR Part 67, Subpart F. for grantees, as defined at 28 CFR Part 67 Sections 67.615 and 67.620—

A. The applicant certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in The applicant's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an on-going drug-free awareness program to inform employees about—

(1) The dangers of drug abuse in the workplace;
(2) The applicant's policy of maintaining a drug-free workplace;
(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will—

(1) Abide by the terms of the statement; and

(2) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction;

(e) Notifying the agency, in writing, within 10 calendar days after receiving notice under subparagraph (d)(2) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title to: Office of Grants Management and Development, 717 14th St., NW, Suite 1200, Washington, DC 20005. Notice shall include the identification number(s) of each affected grant;

(f) Taking one of the following actions, within 30 calendar days of receiving notice under subparagraph (d)(2), with respect to any employee who is so convicted—

(1) Taking appropriate personnel action against such an employee, up to and incising termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or

(2) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency;

(3) Making a good faith effort to continue to maintain a drug free workplace through implementation of paragraphs (a), (1), (c), (d), and (e). and (f)

B. The applicant may insert in the space provided below the sites for the performance of work done in connection with the specific grant:

Place of Performance (Street address, city. county, state, zip code)

Alexandria Research Institute

206 N. Washington Street

Alexandria, VA 22314

As the duly authorized representative of the applications, I hereby certify that the applicant will comply with the above certifications.

1. Grantee Name and Address:

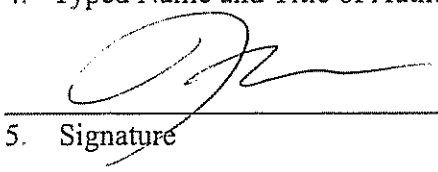
Virginia Polytechnic Institute and State University
460 Turner St, Suite 306
Blacksburg, Va 24060

2. Application Number and/or Project Name: FY 05 Urban Areas Security Initiative Program

3. Grantee IRS/Vendor Number: TIN: 54-6001805

David W. Richardson, Director, Office of Sponsored Programs

4. Typed Name and Title of Authorized Representative



5. Signature

2-28-05

6. Date

APPENDIX F: STANDARD ASSURANCES

GOVERNMENT OF THE DISTRICT OF COLUMBIA
OFFICE OF THE DEPUTY MAYOR FOR PUBLIC SAFETY AND JUSTICE

STANDARD ASSURANCES

The applicant hereby assures and certifies compliance with all Federal statutes, regulations, policies, guidelines and requirements, including OMB Circulars No. A-21, A-110, A-122, A-128, A-87; E.O. 12372 and Uniform Administrative Requirements for Grants and Cooperative Agreements - 28 CFR, Part 66, Common Rule, that govern the application, acceptance and use of Federal funds for this federally-assisted project.

Also, the Application assures and certifies that:

1. It possesses legal authority to apply for the grant; that a resolution, motion or similar action has been duly adopted or passed as an official act of The applicant's governing body, authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of The applicant to act in connection with the application and to provide such additional information as may be required.

2. It will comply with requirements of the provisions of the Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 P.L. 91-646 which provides for fair and equitable treatment of persons displaced as a result of Federal and federally-assisted programs.

3. It will comply with provisions of Federal law which limit certain political activities of employees of a State or local unit of government whose principal employment is in connection with an activity financed in whole or in part by Federal grants. (5 USC 1501, et. seq.).

4. It will comply with the minimum wage and maximum hour's provisions of the Federal Fair Labor Standards Act if applicable.

5. It will establish safeguards to prohibit employees from using their positions for a purpose that is or gives the appearance of being motivated by a desire for private gain for themselves or others, particularly those with whom they have family, business, or other ties.

6. It will give the sponsoring agency of the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the grant.

7. It will comply with all requirements imposed by the Federal-sponsoring agency concerning special requirements of Law, program requirements, and other administrative requirements.

8. It will insure that the facilities under its ownership, lease or supervision which shall be utilized in the accomplishment of the project are not listed on the Environmental Protection Agency's (EPA), list of Violating Facilities and that it will notify the Federal grantor agency of the receipt of any communication from the Director of the EPA Office of Federal Activities indicating that a facility to be used in the project is under consideration for listing by the EPA.

9. It will comply with the flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973, Public Law 93-234-, 87 Stat. 975, approved December 31, 1976. Section 102(a) requires, on and after March 2, 1975, the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any Federal financial assistance for construction or acquisition purposes for use in any area that has been identified by the Secretary of the Department of Housing and Urban Development as an area having special flood hazards. The phrase "Federal Financial Assistance" includes any form of loan, grant, guaranty, insurance payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect Federal assistance.

10. It will assist the Federal grantor agency in its compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (16 USC 470), Executive Order 11593, and the Archeological and Historical Preservation Act of 1966 (16 USC 569a-1 et. seq.) By (a) consulting with the State Historic Preservation Officer on the conduct of investigations, as necessary, to identify properties listed in or eligible for inclusion in the National Register of Historic Places that are subject to adverse effects (see 36 CFR Part 800.8) by the activity, and notifying the Federal grantor agency of the existence of any such properties, and by (b) complying with all requirements established by the Federal grantor agency to avoid or mitigate adverse effects upon such properties.

11. It will comply, and assure the compliance of all its sub grantees and contractors, with the applicable provisions of Title I of the Omnibus Crime Control and Safe Streets Act of 1968, as amended, the Juvenile Justice and Delinquency Prevention Act, or the Victims of Crime Act, as appropriate; the provisions of the current edition of the Office of Justice Programs Financial and Administrative Guide for Grants; and all other applicable Federal laws, orders, circulars, or regulations.

12. It will comply with the provisions of 28 CFR applicable to grants and cooperative agreements including Part 18. Administrative Review Procedure; Part 20, Criminal Justice Information Systems; Part 22, Confidentiality of Identifiable Research and Statistical Information; Part 23, Criminal Intelligence Systems Operating Policies; Part 30, Intergovernmental Review of Department of Justice Programs and Activities; Part 42, Nondiscrimination/Equal Employment Opportunity Policies and Procedures; Part 61, Procedures for Implementing the National Environmental Policy Act; Part 63, Flood Plain Management and Wetland Protection Procedures; and Federal laws or regulations applicable to Federal Assistance Programs.

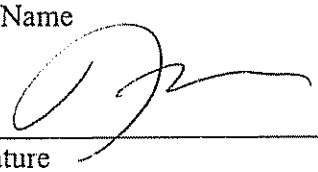
13. It will comply, and all its contractors will comply, with the non-discrimination requirements of the Omnibus Crime Control and Safe Streets Act of 1968, as amended, 42 USC 3789(d),

or Victims of Crime Act (as appropriate); Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973, as amended; Subtitle A, Title II of the Americans with Disabilities Act (ADA) (1990); Title IX of the Education Amendments of 1972; the Age Discrimination Act of 1975; Department of Justice Non-Discrimination Regulations, 28 CFR Part 42, Subparts C, D, E and G; and Department of Justice regulations on disability discrimination, 28 CFR Part 35 and Part 39.

14. In the event a Federal or State court or Federal or State administrative agency makes a finding of discrimination after a due process hearing on the grounds of race, color, religion, national origin, sex, or disability against a recipient of funds, the recipient will forward a copy of the finding to the Office for Civil Rights, Office of Justice Programs.

15. It will provide an Equal Employment Opportunity Program if required to maintain one, where the application is for $500,000 or more.

16. It will comply with the provisions of the Coastal Barrier Resources Act (P.L 97-348), dated October 19, 1982, (16 USC 3501 et. seq.) which prohibits the expenditure of most new Federal funds within the units of the Coastal Barrier Resources System.

David W. Richardson	Director, Office of Sponsored Programs
Print Name	Print Title
	2-28-05
Signature	Date

VII. Certifications & Assurances

A. Lobbying

B. Debarment, Suspension, and Other Responsibility Matters

C. Drug-Free Workplace

D. Standard Assurances

VIII. Appendices

A. Project Team Résumés

1. Dr. Fred Krimgold
2. Dr. Michael Willingham
3. John E. Bigger
4. Dr. Lamine Mili
5. Ms. Natasha Udu-gama

FREDERICK KRIMGOLD
Director

Education:	D.Tech, Architecture and Planning, Royal Institute of Technology, Stockholm BA, Architecture, Yale University
Years of Experience:	29 years
Languages:	English, French, Swedish
Countries of Experience:	India, Turkey, Mexico, Russia, Armenia, the Philippines, Ethiopia

Dr. Frederick Krimgold is an architect specializing in disaster risk management including hazard and vulnerability assessment, mitigation design and implementation and mechanisms for financing of mitigation investment. He has worked in disaster management in developing countries over the past 30 years. He has been a researcher and research manager for the National Earthquake Hazard Reduction Program at the National Science Foundation and has served as a member of the Federal Emergency Management Agency Advisory Board. Dr. Krimgold has worked with the founding of the National Urban Search and Rescue System in the United States and the creation of the Disaster Management Facility at the World Bank.

RECENT PROFESSIONAL EXPERIENCE

Director: Virginia Tech Center for Disaster Risk Management. 2003-present. Dr. Krimgold is the director of the multi-disciplinary university research and implementation center for disaster risk management. The Center is affiliated with the World Institute for Disaster Risk Management that is a joint initiative of Virginia Tech and the Swiss Federal Institutes of Technology. The Center is currently completing a major research and publishing program on the topic of Integrated, Incremental Seismic Rehabilitation for the reduction of earthquake risk in existing buildings.

Project Director, Federal Emergency Management Agency, Incremental Seismic Rehabilitation Series 2000-2003. Dr. Krimgold has directed a major research and publishing program to introduce earthquake risk management to owners and managers of existing vulnerable buildings. Research has been carried out on the organizational, financial and functional characteristics of critical high risk occupancies including schools, hospitals, office and retail buildings and multi-family housing to develop strategies for the integration of physical risk reduction measures at minimum cost and functional disruption. This work opens new prospect for the management and reduction of risk in existing buildings
FEMA, 2003, *FEMA 395, Incremental Seismic Rehabilitation of School Buildings*

Project Director, Federal Emergency Management Agency, Insurance, Finance and Regulation for the Management of Terrorism Risk in Buildings 2003 Frederick Krimgold was the research team leader and principal author for the FEMA primer on the role of the "change levers" of insurance, building finance and regulation in the process of physical modification of existing buildings for risk reduction. The work is developed for the US domestic case, however, the development and mobilization of financial and regulatory mechanisms for risk management is critical particularly in emerging economies. FEMA 2003, *FEMA 429 Insurance, Finance and Regulation for the Management of Terrorism Risk in Buildings.*

Author: US Office of Foreign Disaster Assistance 2002. Frederick Krimgold and Randolph Lentz prepared a comprehensive evaluation of the USAID response to the 2001 Gujarat earthquake. The evaluation was based on extensive fieldwork in the earthquake-affected region, New Delhi and Washington. The evaluation included the emergency response of US Government and non-government agencies, the assistance to permanent reconstruction and plans for long-term assistance to disaster management in India. *Independent Evaluation of USAID Gujarat Humanitarian Response and Rehabilitation Program, 2003*

Task Manager, Swiss Development and Cooperation Agency, Sustainable Implementation Task of Seismic Microzonation for Earthquake Safety in Turkey 2000-2003. Dr. Krimgold has served as coordinator of research and the principal author of the sustainable implementation section of the seismic microzonation manual developed for the General Directorate for Disaster Affairs of the Turkish Ministry of Public Works. This project has developed the procedures for the application of microzone risk maps to the management of land-use and urban development at the municipal level in Turkey. *Microzonation in Turkey Manual, August2003*

Principal Consultant, World Bank, for mitigation component of Emergency Reconstruction Loan (MEER) for Turkey following the earthquakes of 1999. Dr. Krimgold was the principal consultant on building standards and land-use management for the World Bank team that prepared project documents for the emergency reconstruction loan. He carried out field investigations and prepared the project component on strengthening of land-se and building regulation in high hazard areas in Turkey

Mitigation Investment Consultant, Disaster Management Facility, World Bank, Disaster Management in Mexico (1998) Dr. Krimgold was a primary author of the ""Market Incentives for Mitigation Investment project. A pilot study was carried out in Mexico to assess the feasibility of restructuring the national disaster fund to provide incentives for expansion of access to insurance and public and private investment in natural disaster risk reduction. Krimgold was a co-author of the study report published by the World Bank, 1999, *Managing Disaster Risk in Mexico.*

Disaster Management Consultant, World Bank, Maharashtra Emergency Earthquake Rehabilitation Project (MEERP) (1995-1998) Frederick Krimgold assisted in the monitoring of the reconstruction program and in the development of the state-wide program of disaster management planning. He worked with the Government of Maharashtra to establish a permanent Disaster Management Unit in the Office of the Chief Minister. He assisted in the development of GIS based hazard and vulnerability studies at the state and district levels. Krimgold is a co-author of a report on this program published by the Earthquake Engineering Research Institute, *1999 Lessons Learned Over Time: Innovative Earthquake Recovery in India*

Disaster Management Consultant, World Bank, Andhra Pradesh Emergency Recovery Project (1997) Dr. Krimgold participated in the project feasibility study and worked with the development of the concept of the AP Disaster Mitigation Fund to provide incentive for private investment in wind and flood mitigation.

SELECTED RECENT PUBLICATIONS

Reconnaissance Report on Bam Earthquake Social and Public Policy Issues, An EERI Special Report, Earthquake Engineering Research Institute, Oakland, CA, 2004.

Lessons Learned Over Time: Innovative Earthquake Recovery in India, Learning From Earthquakes

Series, Earthquake Engineering Research Institute, Oakland,CA, 1999

Incentives and Impediments to Improving the Seismic Performance of Buildings, An EERI Special Report, Earthquake Engineering Research Institute, Oakland, CA, June 1998

"Search and Rescue", chapter in Special Supplement to Earthquake Spectra, "Armenia Earthquake Reconnaissance Report", Loring A. Wyllie, Jr., and John R. Filson, Eds., August, 1989
NCARB Conference Report, "Armenian Earthquake, Relevance for the U.S. Architectural Profession", Sept., 1989

With K. Shiono, "Model for Earthquake Casualty Estimation", Proceedings of the International Workshop on Earthquake Injury Epidemiology for Mitigation and Response, The Johns Hopkins University, Baltimore, MD, July 10-12, 1989

"Earthquake-Induced Building Collapse", Proceedings of the International Workshop on Earthquake Injury Epidemiology for Mitigation and Response, The Johns Hopkins University, Baltimore, MD, July 10-12, 1989

"The Armenian Earthquake: Its Impact in America", NCARB Annual Report
June 26-28, 1989, Boston, MA

"The Soviet Armenian Earthquake Disaster: Could a Similar Disaster Happen in the United States?" testimony at a hearing before the Subcommittee on Science, Space and Technology, U.S. House of Representatives, March 15, 1989, U.S. Government Printing Office, 1989

"Search and Rescue in Collapsed Reinforced Concrete Buildings", Proceedings of the Ninth World Conference on Earthquake Engineering Tokyo and Kyoto, Japan, August 2 - 9, 1988

"Search and Rescue in Collapsed Buildings", Proceedings: U.S. Mexico Workshop in 1985 Mexico Earthquake Research, Earthquake Engineering Research Institute, Publication No. 87 - B, April 1987

Editor, Proceedings of the International Conference on Disaster Mitigation Program Implementation, Ocho Rios, Jamaica, November 1984, Center for International Development Planning and Building, College of Architecture and Urban Studies, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1986

With Whitman, Robert V., Heger, Frank J., and Luft, Rene W., Evaluation of Seismic Resistance of Existing Buildings American Society of Civil Engineers, ASCE Proceedings, 1978

Seismic Design Decisions for the Commonwealth of Massachusetts State Building Code, Report #32, Department of Civil Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, June, 1977

Curriculum Vitae

Michael Willingham

ADDRESS: Alexandria Research Institute
Virginia Polytechnic Inst. & State University
206 N. Washington St., Suite 400
Alexandria, VA 22314, USA
Phone (703) 535-3464 Fax (703) 518-8085
E-mail: mwilling@vt.edu

Dr. Willingham is an energy and environmental analyst, with experience in policy, technology, educational program design, and professional training. His work experience includes the United Nations, USAID, the US Congress, the World Bank, the Peace Corps, the Navajo Tribe, and the private sector. Since April 2000, Dr. Willingham has been attached to Virginia Tech Institute as an Adjunct Professor. Current projects include identifying the problems and opportunities confronting the Commonwealth in relation to the growth of high-tech industry and the move toward deregulation of energy services. During this period he undertook an assignment with USAID Ukraine in a six-week exercise to evaluate the success of USAID energy programs in Ukraine over the past eight years. He served as Chief of Mission for three-week in-country mission, and as head of the mission report preparation team. In another consultative capacity, he participated in a USAID-sponsored mission to India as part of a mission team to assist the Government of India with policy aspects of sustainable energy development and greenhouse gas mitigation.

In 1970, Dr. Willingham was disaster relief volunteer in Peru, assigned to the Peruvian agency (Cooperacion Popular) following a major earthquake. He worked in the disaster area for six months, conducting environmental evaluations of towns, distributing supplies and preparing topographic maps for relocated population centers, and working with architect/planner to develop template for village reconstruction. Additional relevant activities include a mission to the Solomon Islands (1994) to explore the possibility of developing an environmental trust fund designed to protect the nation's timber resources, and also to determine disposal practices for imported waste oil, including the possibility of its use as an energy primary fuel. More recently, he has worked to analyze post-disaster impacts of Hurricane Isabel (September 2003) in the electric power sector.

EDUCATION:

Ph.D., Energy Management and Policy, University of Pennsylvania, Philadelphia PA, 1993.
M.S., Energy Management and Policy, University of Pennsylvania, Philadelphia PA, 1987.
B.Sc., Mathematics, Massachusetts Institute of Technology, Cambridge, MA, 1961.

EXPERIENCE:

Industry/Government

1. Technical Advisor for Energy and Environment, Department of Economic & Social Affairs
   United Nations, New York, NY, January 1991 to July 1999

2. Director, Professional Training Programs, Institute of International Education, Washington, D.C., September 1987 to January 1991.
3. Policy Analyst, TechLaw, Inc., Reston, Virginia, March 1984 to October 1985
4. Senior Analyst, Policy Analysis Division, National Commission on Air Quality, Washington, D.C., July 1979 to May 1981
5. Policy Analyst, President's Commission on Coal, Washington, D.C., November 1978 to July 1979
6. Senior Policy Analyst, Navajo Tribe Environmental Protection Commission, Window Rock, Arizona, May 1975 to October 1978
7. Environmental Specialist, HNTB Engineering, Alexandria, Virginia, February 1972 to February 1974

Academic

1. Director, Experimental Environmental Studies Curriculum, Boston University, Boston, 1969 to 1971 (Co-funded by National Endowment for Humanities)
2. Designed, taught experimental humanities studies curriculum, George Washington University, Washington, D.C., 1971 to 1972
3. Peace Corps Volunteer Teacher (Uganda); devised experimental mathematics curriculum

SELECTED REPORTS AND PUBLICATIONS

1. ... To Breathe Clean Air: Report of the National Commission on Air Quality to Congress, March 1981. Contributor, 346 pages.

2. ... Energy Processes Analysis: Alternative Technologies, President's Coal Commission, 44 pages, 29 June 1979.

3. ... The Navajo Tribe Sulfur Emission Fee Resolution: A Discussion of Health, Technological and Economic Considerations, prepared for Navajo Tribal Council, 12 October 1977, 17 pages.

4. ... An Evaluation of Navajo Nation Uranium Reserves and the Residuals Impacts Associated with Resource Development, prepared for Navajo Tribal Council, 1 May 1978, 25 pages.

5. ... Report to Peruvian Government concerning Reconstruction of Five Villages in La Libertad District, Peru, prepared for Cooperacion Popular, Government of Peru, December 1970, 73 pages (English-Spanish).

6. ... Sawyer, J. and Willingham, M. Final Report - Pressurized Fluidized Bed Market Assessment, Summit Technologies, Inc. for U.S. DOE, No. 010-763, DE-AT21-86MC23193, June 1987.

7. ... Raufer, R.K., Bodmer, E.C., Willingham, M.G., and Goldstein, R.S. Tax and Financial Implications of ERC Leasing by Electric Utilities, prepared for Regulatory Reform Staff, U.S. E.P.A., November 1985.

8.... Willingham, M.G. Analysis of Select Gas Use, Emission Reduction Credits and Limestone Injection Controls in Acid Deposition Control Programs, prepared for Regulatory Reform Staff, U.S. E.P.A., February 1986.

9.... Willingham, M.G. "Reflections on Development", Development Anthropology Network, Vol.5, No.1, published by the Institute for Development Anthropology, Binghamton, New York, Spring 1987.

10.. Willingham, Michael G. and Kunreuther, Howard. Insurance and Hazardous Waste Management: A Regulatory Perspective, for U.S. Environmental Protection Agency, Contract No. 68-01-7288, September 1989.

11.. The Impact Assessment of Environment and Energy Resources: UNDTCD's Methodologies and Applications, prepared for 1991 Conference of International Association for Impact Assessment, Minneapolis, Minnesota, June 1991.

12.. Coal and the Environment: An Overview, presented at 1991 United Nations Interregional Symposium "Management of the Economic and Environmental Aspects in the Coal Mining Industry" held in Prague, Czechoslovakia from 21-24 October 1991.

13.. Economic Mechanisms in the Resource Conservation and Recovery Act for Hazardous Waste Management, Doctoral Dissertation, University of Pennsylvania, Spring 1993. Committee Chairman: Howard C. Kunreuther

14.. Michael G. Willingham "Strategies for Implementing Power Sector Efficiency: A United Nations Perspective", Indian Journal of Power and River Valley Development, November-December 1993

15.. T. J. Hammons, M. Willingham, K. N. Mak, Malhães da Silva, M. Morozowski, and B. K. Blyden Generation and Transmission Improvements in Developing Countries, [p. 760-65], IEEE TRANSACTIONS ON ENERGY CONVERSION, September 1999, Volume 14, Number 03

16.. Sustainable Development: Asian and Pacific Perspectives, published by Asian Development Bank, 1999 (ISBN 971-561-214-6), (Supervising Editor)

Book Reviews:

1. .. *The Human Impact on the Natural Environment (Third Edition),* by Andrew Goudie, MIT Press, 1990, 388 pp.
------Natural Resources Forum, Volume 15 Number 3, August 1991

2. .. *Divided We Stand: Redefining Politics, Technology and Social Choice*, by Michiel Schwarz and Michael Thompson, University of Pennsylvania Press, 1990, 176 pp.
------Natural Resources Forum, Volume 16 Number 1, February 1992

3. .. *Responding to Global Warming: The Technology, Economics and Politics of Sustainable Energy*, by Peter Read, Zed Books, 1994, 304 pp+xii.
------Natural Resources Forum, Volume 19 Number 2, May 1995

CURRICULUM VITEA

John E. Bigger

ADDRESS: 8326 Lilac Lane
Alexandria, VA 22308
Phone: 703.360.6369 (H)
703.535.3457 (O)
E-mail: jobigger@vt.edu

Citizenship: USA **Passport:** USA-Current

EDUCATION:

M.S., Electrical Engineering, University of Southern California, Los Angeles, California 1970
B.Sc., Electrical Engineering, Iowa State University, Ames, Iowa 1965

EXPERIENCE:

Academic

1. Adjunct Professor, Alexandria Research Institute, Virginia Polytechnic Institute and State University, September 2000 to the present.

Industry

1. President, Sol y Mer, Ltd., Alexandria, VA. January 1998 to the present.
2. Technical Director, Utility PhotoVoltaic Group, Washington, DC. June 1994 to January 1998.
3. Manager, Electric Power Research Institute, Solar and Hydro Programs. June 1984 to January 1998.
4. Senior Project Manager, Electric Power Research Institute, Solar and Geothermal Programs. May 1976 to June 1984.
5. Electrical Engineer, Los Angeles Department of Water and Power, Los Angeles, California. May 1966 to April 1976.
6. Missile Systems Engineer, U.S. Navy, Missile Systems Engineering Station, Port Hueneme, California, May 1965 to April 1966.

RELEVANT EXPERIENCE:

1. **President, Sol y Mer, Ltd. 1998 to Present.** In this capacity, Mr. Bigger conducts research, develops and manages programs, and provides consulting services for government, industry, and utility organizations in the areas critical infrastructures (communications, energy, transportation, and water/wastewater) and renewable energy.

   Mr. Bigger conducted a portion of a study (June 2002 – October 2002) of Washington D.C. Metropolitan Region's Critical Infrastructure Security Assessment; the Metropolitan Region's Council of Governments funded the study. This portion covered the energy utilities (electric and natural gas) and energy industries (coal and liquid petroleum) that serve the Northern Virginia, Maryland, and District of Columbia areas.

   Individual solar (photovoltaic) programs have been developed for specific utilities. These programs normally lead to an array of projects that develop internal experience and knowledge of the technology and support technical and business decisions by utility management. Mr. Bigger conducted a photovoltaic-industry status assessment in 1999; the assessment was documented in an overall renewable power industry report (see below). A "lessons learned" study was conducted (1998-1999) to evaluate and document technical, institutional, and business progress made by individual utilities participating in the Utility PhotoVoltaic Group's *TEAM-UP* program.

2. **Adjunct Professor, Alexandria Research Institute, Alexandria, VA. September 2000 to the Present.** In the 2000-2001 period, Mr. Bigger conducted research in the area of critical energy (electricity and natural gas), communications, and water system infrastructures in Virginia. He managed the study on Electric Power for Virginia's High-Technology Industry that was funded by Virginia's Center for Innovative Technology. This study identified critical issues related to Virginia's infrastructure capability to continue to support high-technology firms in the Commonwealth and to meet their growing energy and communications needs with a minimum of environmental impact. Since 2002, Mr. Bigger has been conducting research in the area of energy infrastructure security in the Northern Virginia, Maryland, and District of Columbia areas as part of projects funded by the U.S. Department of Homeland Security and other federal agencies.

3. **Technical Director of the Utility PhotoVoltaic Group (UPVG), 1994-1998.** In this capacity, Mr. Bigger was responsible for developing and implementing the technical aspects of the UPVG's 6-year, $16 million photovoltaic commercialization program for the U.S. electric utility industry. Mr. Bigger and three consultants developed the national program and proposal that led to the formation of the UPVG in 1992 and served on its Board of Directors until taking the position of Technical Director in 1994. The UPVG's *TEAM-UP* program awarded $11 million in contracts to private industry and this has resulted in the installation of 100s of PV installations, totaling over 7 MW of capacity, throughout the U.S.

4. **Manager in the Electric Power Research Institute's (EPRI) Solar Program, 1988 to 1994.** In this capacity, Mr. Bigger was responsible for 1) developing the test programs for EPRI-developed, high-concentration photovoltaic materials, equipment, and systems in both laboratory and field settings and 2) developing and implementing EPRI's "Early

Applications of Photovoltaics for Electric Utilities" Program for over 100 utilities in the U.S. The latter was a national education and technical support program for utilities involved in installing PV systems for their own and their customer's use.

5. **Senior Project Manager in the Electric Power Research Institute's Geothermal Program, 1984-1988.** In this capacity, Mr. Bigger was responsible for development and implementation of the two-year test program for the $144 million Heber 56 MW Binary-Cycle Geothermal Power Plant installed at Heber, California. Mr. Bigger served as the EPRI Project Manager for the project during its late design, two-year construction, and two-year test and operation phases.
6. **Senior Project Manager in the Electric Power Research Institute's Solar Program, 1976-1984.** In this capacity, Mr. Bigger was responsible for development and management of EPRI's Solar Thermal Program. This multi-year, multi million-dollar program's major thrust was on technology development and testing of Brayton-cycle, solar central receiver equipment and systems. Mr. Bigger also developed and conducted research studies on the impacts of integrating solar-thermal generating plants into existing electric utility systems in the Western U.S. and on the processes and costs to manufacture major components of these solar plants.
7. **Electrical Engineer at the Los Angeles Department of Water and Power, 1966-1976.** In this capacity, Mr. Bigger held positions of increasing responsibility in transmission design and construction, resource planning and load forecasting, and resource development areas. In the resource planning area, Mr. Bigger also conducted studies in developing renewable and advanced resources: geothermal, fuel cells, solar thermal, municipal waste, and landfill gas recovery. In the resource development area, Mr. Bigger initiated and managed installation of the first power generation system (300 kW) in the world that was fueled by Methane recovered from a sanitary landfill in 1973. In 1975-1976, Mr. Bigger created the utility-state team that successfully won the Department of Energy's contract to design, build, and operate the Solar One project, a 10 MW water-steam central receiver project that cost $122 million.
8. **City and State Energy Policy Committees, 1974-1976.** At the beginning of the first oil crisis in late-1973, Mr. Bigger was appointed to serve on the Energy Policy Committee created by Mayor Thomas Bradley to advise the Los Angeles city administration and city council on directions and policies that would allow the city to better cope with the energy crisis. In 1974, Mr. Bigger was also appointed to the California Attorney General's Task Force on energy policy. He served on both until 1976 when he joined EPRI.
9. **Military Service, 1955-1961.** U.S. Navy. Active Duty: September 1956-August 1960. U.S. Navy Reserves: 1955 and 1961

PUBLICATIONS

Technical Reports

Rahman, S. and J. Bigger, *Improving Virginia's Attractiveness for High-Technology Industries,* Alexandria Research Institute, Alexandria, VA: October 31, 2001. Available at: http://www.cimap.vt.edu/reports/Final%20Report%20103101.pdf

Photovoltaic-Based Projects and Ventures: Development Guidelines. Electric Power Research Institute, Palo Alto, CA: March 1999. Report TR-111892.

Renewable Power Industry Status Overview, Electric Power Research Institute, Palo Alto, CA: March 1999. Report TR-111893. (Mr. Bigger authored the chapter on the Photovoltaics industry).

Professional Papers

Mr. Bigger is the author or co-author of over 25 professional papers on technology development and system integration in a wide range of renewable energy areas; these include peer-reviewed and invited papers on photovoltaics, solar thermal, and geothermal systems. Most recently, he is a coauthor of a peer-reviewed paper in the infrastructure security assessment area:

L. Mili, F. Krimgold, J. Alwang, J. Bigger, *Integrating Engineering, Economic, and Social Modeling in Risks of Cascading Failures Across Interdependent Complex Networks*, Proceedings of the International Conference on Probability Methods Applied to Power Systems, Ames, Iowa, September 12-16, 2004.

RÉSUMÉ

Name: Lamine Mili

Citizenship: U.S.A.

Current Position: **Professor of Electrical and Computer Engineering**
Virginia Tech, Alexandria Research Institute
206 N. Washington Street, Suite 400
Alexandria, VA 22314
Tel: (703) 535 3453; Fax: (703) 518 8085
E-mail: lmili@vt.edu

College Education

- Electrical Engineering Diploma, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland, January 1976.
- Diplôme d' Études Approfondies, Major in Automatic Control, University of Tunis, Tunisia, June 1981.
- Thèse de Doctorat de 3ème Cycle, Major in Automatic Control, University of Tunis, Tunisia, March 1983
- Ph. D., Major in Electric Power Systems, University of Liège, Belgium, December 1987.

Professional Experience

1988-1989	Visiting Professor, ECE Department, Virginia Tech, Blacksburg, VA.
1989-1993	Assistant Professor, ECE Department, Virginia Tech, Blacksburg, VA.
1993-1999	Associate Professor, ECE Department, Virginia Tech, Blacksburg, VA.
1999-Present	Professor, ECE Department, Virginia Tech, ARI, VA.
1986 (Spring)	Brown Boveri & Company, Turgi, Switzerland. Acted as a consulting engineer on power system state estimation software program.
1976-1981	Société Tunisienne d' Électricité et du Gaz (STEG), Tunisia. Worked on the specifications of the new control center.

Current Research Interests

Robust statistics, robust estimation and detection, nonlinear signal processing, image processing, speech processing multifunction radar systems, power system analysis and control, fuzzy and robust control, bifurcation theory and chaos, risk assessment and management, nonlinear optimization, multi-criteria decision under uncertainty.

Recent Sponsors

NSF, EPRI, NRL, Dominion Center, USAD, DoD, and AEP.

Honor and Awards:

- Senior member of the IEEE Power Engineering Society
- Recipient of a 1990 NSF Research Initiation Award
- Recipient of a 1992 NSF Young Investigation Award.

Number of graduate Students Advised: 20
Number of Post Doctoral Scholars advised: 7

Seminars and Short Courses given to Power Industries

1991 (Dec.)	Tennessee Valley Authority, Chattanooga, TN. Gave a two-day short course on power system state estimation.
1991 (May)	AEP, Columbus, OH. Gave a seminar on state estimation and control of electric power systems.
1994 (June)	STEG, Tunisia. Gave a 5-day short course on transient stability.
1994 (Dec.)	PG&E, San Francisco, CA. Conducted a seminar on power system state estimation.
1995 (June, Oct.)	Siemens Empros, Minneapolis, MN. Gave short courses and consulted on power system state estimation and measurement calibration.
1996 (Sept.)	EEF, Switzerland. Gave a seminar on power system state estimation.
1996 (Dec.)	Électricité de France. Gave a seminar on power system state estimation.
1997 (Nov., May)	Virginia Power, Richmond, VA. Gave two seminars on load estimation and reliability in distribution systems.
1998 (March)	Duke Power, Charlotte, NC. Gave a one-day seminar on load forecasting in a deregulated environment and ATC assessment.
1999 (Sept.)	ERCOT-ISO, Taylor, TX. Gave a two-day short course on power system state estimation.
1999, 2000 (Oct.)	Siemens, Minneapolis, USA. Gave a two-day short course on power system state estimation.
2001 (March)	Hydro-Quebec, Montreal, Canada. Gave a four-day short course on power system state estimation.
2003 (June)	Hydro-Quebec, Montreal, Canada. Gave a four-day short course on power system state estimation

Recent Publications Closely Related to the Proposed Project

[1] L. Mili. *Mitigating the Vulnerabilities of Critical Infrastructures in Developing Countries*. World Bank Report. December 2002.

[2] A. V. Gheorghe and L. Mili, "Editorial: In Risk Management, Integrating the Social, Economic and Technical Aspects of Cascading Failures across Interdependent Critical Infrastructures," *International Journal of Critical Infrastructures*, Vol. 1, No. 1, pp. 1-7, 2004.

[3] L. Mili, Q. Qiu, and A. G. Phadke, "Risk Assessment of Catastrophic Failures in Electric Power Systems," *International Journal of Critical Infrastructures*, Vol. 1, No. 1, pp. 38-63, 2004.

[4] L. Mili, F. Krimgold, J. Alwang, J. Bigger, "Integrating Engineering, Economic, and Social Modeling in Risks of Cascading Failures across Interdependent Complex Networks," *Proceedings of the International Conference on Probability Methods Applied to Power Systems,* Ames, Iowa, September 12-16, 2004.

[5] S. Lefebvre, J. Prevost, H. Horisberger, B. Lambert, L. Mili, "Coping with Multiple Q-V Solutions of the WLS State Estimator induced by Shunt-parameter Errors," *Proceedings of the International Conference on Probability Methods Applied to Power Systems,* Ames, Iowa, September 12-16, 2004.

[6] J.B.A. London Jr., L. Mili, N.G. Bretas, "An Observability Analysis Method for a Combined Parameter and State Estimation of a Power System," *Proceedings of the International Conference on Probability Methods Applied to Power Systems,* Ames, Iowa, September 12-16, 2004.

[7] A. Mishra, L. Mili, A.G. Phadke, "Algorithm Based Fault Tolerant State Estimation of Power Systems," *Proceedings of the International Conference on Probability Methods Applied to Power Systems,* Ames, Iowa, September 12-16, 2004.

[8] M. Adibi, R. A. Polyak, I. Griva, and L. Mili, "Optimal Transformer Tap Selection using Modified Barrier-Augmented Lagrangian Method," *IEEE Transactions on Power Systems*, Vol. 18, No. 1, pp. 251-257, Feb. 2003.

[9] L. Mili, Y. Liu, A. Mishra, A.G. Phadke, K. Dooley, K.E. Holbert, "Fault-Tolerant Risk-Based Security Algorithms for Unified Power and Communication Infrastructures," *Proceeding of the NSF-ONR EPNES II workshop*, Orlando, Florida, October 23-24, 2003.

[10] M. Adibi, I. Griva, R. Polyak, S. Ammari, and L. Mili, "Remote Blackstart of Steam Electric Station Using Modified Barrier-Augmented Lagrangian Method," *Proceedings of the 14th Power Systems Computation Conference*, Sevilla, Spain, June 24-28, 2002.

[11] H. Ni, G. T. Heydt, and L. Mili, "Power System Stability Agents using Robust Wide Area Control," *IEEE Trans. on Power Systems*, Vol. 17, No. 4, pp. 1123-1131, Nov. 2002.

[12] A. M. Harb, A. H. Nayfeh, and L. Mili, "Bifurcation Control for Mitigating Subsynchronous Oscillations in Power Systems," *Proceedings of the 14th Power Systems Computation Conference*, Sevilla, Spain, June 24-28, 2002.

[13] L. Mili, G. Steeno, F. Dobraca, and D. French, "A Robust Estimation Method for Topology Error Identification," *IEEE Transactions on Power Systems*, Vol. 14, No. 4, pp. 1469-1476, November 1999.

[14] R. C. Pires, A. S. Costa, L. Mili, "Iteratively Reweighted Least-Squares State Estimation Through Givens Rotations," *IEEE Transactions on Power Systems*, Vol. 14, No. 4, pp. 1499-1505, November 1999.

[15] A. H. Nayfeh, A. A. M. Harb, C.-M. Chin, A. M. A. Hamdan, and L. Mili, "Application of Bifurcation Theory to Subsynchronous Resonance in Power Systems," *International Journal of Bifurcation and Chaos*, Vol. 8, No. 1, pp. 157-172, 1998.

[16] A. H. Nayfeh, A. Harb, C.-M. Chin, A. M. A. Hamdan, and L. Mili, "A Bifurcation Analysis of Subsynchronous Oscillations in Power Systems," *Electric Power Systems Research*, Vol. 4, pp. 21-28, 1998.

[17] L.Mili, M.G. Cheniae, N.S. Vichare, and P. J. Rousseeuw, " Robust State Estimation Based on Projection Statistics," *IEEE Transactions on Power Systems*, Vol. 11, No. 2, pp. 1118-1127, May 1996.

[18] L. Mili and C.W. Coakley, " Robust Estimation in Structured Linear Regression," *The Annals of Statistics*, Vol. 24 , No. 6, pp. 2593-2607, 1996.

Name	**NATASHA M. UDU-GAMA**
Nationality	American
Languages	English, French, Spanish (basic), Sinhala (basic), Hindi (basic)
Education	2003 MSc. Disaster Management Cranfield University – Royal Military College of Science Shrivenham, United Kingdom 2001 BA International Affairs and International Development Studies The George Washington University Washington, DC USA
Countries of Work Experience	U.S.A., India, Nicaragua
Employment Record	July 2004 – Present Research Associate Center for Disaster Risk Management, Virginia Tech (DRM-VT) Alexandria, VA USA October 2003 – June 2004 Project Assistant World Institute for Disaster Risk Management (DRM) Alexandria, VA, USA May – June 2003 Research Consultant Disaster Mitigation Institute (DMI) Ahmedabad, India Conducted DMI-sponsored research on the role of information technologies for disaster mitigation in an urban information center for slum communities in Bhuj, Gujarat. [MSc dissertation research] January – February 2003

Field Consultant
Disaster Mitigation Institute
Ahmedabad, India
Researched community-based information strategies for disaster risk reduction.

February – March 2002
Volunteer
Cross Cultural Solutions (CCS)
New Delhi, India
Taught Macromedia Dreamweaver and Microsoft PowerPoint and Excel to students at Katha Khazana school in Govindpuri slum.

March – April 2002
Volunteer
Cross Cultural Solutions (CCS)
Rajgarh, Himachal Pradesh, India
Conducted water surveys for ARTI (Action Research and Training Institute). Created and conducted health surveys for a CCS project.

May – Aug. 2000
Intern
Human Rights Watch
Washington, DC, USA
Asia Division research

Natasha Udu-gama is a disaster risk management specialist. Her research interests include appropriate technologies for community-based disaster risk information systems in poor urban areas and information technologies for risk communication. Ms. Udu-gama has extensive research and training experience in disaster management. In her capacity as research associate at the Virginia Tech Center for Disaster Risk Management (VT-DRM), she participated in the "Microzonation for Earthquake Risk Mitigation in Turkey" project with DRM. Currently, Ms. Udu-gama is carrying out research and constructing surveys of emergency services for the emergency services component of the "National Capital Region – Critical Infrastructure Vulnerability Assessments" project in conjunction with the Department of Homeland Security and George Mason University.

Publications

World Institute for Disaster Risk Management, Inc. and General Directorate of Disaster Affairs, 2004: Seismic Microzonation for Municipalities. Executive Summary, Pilot Studies, Manual, State-of-the-Art Report.