Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Office of Sponsored Programs

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March 1, 2005

Leann Turner
Government of District of Columbia
Director for Homeland Security Grants Administrator
Office of Deputy Mayor for Public Safety & Justice
1350 Pennsylvania Avenue, NW, Suite 327
Washington, DC 20004

Dear Ms. Turner:

Enclosed please find an original copy of a research proposal entitled, "Enhancing Infrastructure System Data Availability at National Capital Region Emergency Operating Centers". This proposal is being submitted by Dr. Frederick Krimgold in our Alexandria Research Institute.

Please refer to our Proposal Number 05-1634-03 all correspondence regarding this proposal.

The enclosed information relating to an application for funding of a research 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 and is in full support of this proposal. If questions of a budgetary or fiscal nature should arise, please contact Ms. Lauren Magruder at (540) 231-8054. Technical questions should be directed to the Principal Investigator.

Sincerely,

David W. Richardson
Director, Sponsored Programs

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

APPENDIX B: APPLICANT PROFILE

GOVERNMENT OF THE DISTRICT OF COLUMBIA

APPLICANT PROFILE

FY 2005 Homeland Security Grant Program: Urban Areas Security Initiative	
PROJECT TITLE:	Enhancing Infrastructure System Data Availability at
EMERGENCY SUPPORT FUNCTION:	NCR EOCs ESF 5
PROJECT PERIOD:	10/1/05-1/31/07
PROJECT SYNOPSIS:	This project addresses the need for improved information sharing between utilities and jurisdictional emergency operations centers (EOCs). Collaborative models developed by PEPCO & Montgomery County will be expanded and applied throughout the National Capital Region.
IMPLEMENTING JURISDICTION:	Montgomery County, City of Alexandria and MWCOG

AGENCY: Alexandria Research Institute/Virginia Tech
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Signature of Authorized Official _____ **Date** 3-1-05

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- Fiscal Management (5)
- Project Evaluation (30)

Background

Each of the 19 Federal, state, and local political jurisdictions in the NCR has an emergency plan and a related Emergency Operating Center (EOC) to coordinate public responses of fire, police, EMT, hospitals, and other resources during natural and man-made disasters. In addition, each infrastructure organization has its own EOC – communications (e.g., telephone, cable, wireless), energy (e.g., electric, natural gas, and petroleum liquids), water (water supply and wastewater), and transportation (e.g., highways, ports, airports).

With a few exceptions, the communications and energy infrastructures in the NCR are privately owned and they operate under various local/state franchise arrangements and state/federal regulations. The water, wastewater, and some of the transportation infrastructures are public organizations and are operated by federal, state, regional, county, or municipal organizations.

Problem

The sharing of private-sector infrastructure design and location information has become very problematic because of a) the increasingly competitive nature of the electric and natural gas industries and b) the proprietary, trade secret, and competitive advantage nature of the information. Private sector organizations fully recognize the critical nature of their information for public agency decision-making, during emergency periods; however, they are increasingly wary of making the data available to public agencies in any form for fear that it will become available to competitors.

Since the events of September 2001, access to the detailed design and location information of all infrastructure facilities has been severely curtailed because of security concerns. Presently, the discussions between public agencies and private infrastructure organizations regarding access to infrastructure data are at a low level. After the experience with Hurricane Isabel, one bright spot has emerged with an effort underway in the Montgomery County Fire Department, under Chief XXXX, where Pepco shares certain "wires down" electric system information in a spread-sheet format with the Fire Department. In general, however, emergency managers and other EOC personal may encounter slower response times when coordinating emergency operations among the many public agencies and private infrastructure companies during disasters because of the many layers the information must travel from request to approval to coordination to action. In addition, private infrastructure companies do not have the experienced electric, natural gas, and water infrastructure personnel to assign to every EOC for disaster operations and recovery.

The Proposed Project

The proposed project has three principal parts and these are briefly described below.

Part I: Shared Infrastructure Data Demonstration

Certain communications hardware and software firms claim the capacity to display information in a secure manner at remote sites is commercially available. However, in discussions with personnel on the "intelligence" side of the IT industry, a single approach is not considered adequate. Part I will, working with infrastructure firms and emergency agencies: a) develop security and operational specifications for the display system, b) develop, install, and demonstrate a pilot system to display infrastructure data at one or two EOCs, and c) determine resources necessary to develop, integrate, and support the system at any EOC in the NCR. This determination will include an investigation of the organizational, administrative, legal, and financial aspects, and will include an examination of the types of data needed by EOC personnel and associated display formats and content.

Part II: Coordinated Infrastructure Display

Each NCR physical infrastructure was developed independently over decades; interaction with other infrastructure organizations during emergencies was usually assigned a lower priority. In Part II, project staff will work with the two electric and one natural gas utilities that serve the NCR to identify options in system operations and information display that would allow closer coordination with enhanced security and reliability of infrastructure operations during disasters. A computer-based, multi-level display system will be developed to demonstrate coordinated infrastructure display(s) for a specific NCR area. This demonstration will utilize the secure system developed in Part I.

Part III: Centralized & Decentralized EOC Information Sources

The nineteen larger EOCs, plus a number of smaller, similar municipal facilities, make the dissemination of up-to-date critical infrastructure information to all these entities during a regional emergency a large undertaking. In Part III, an examination of the advantages and disadvantages, costs and benefits, and the institutional problems associated with centralized and decentralized approaches to EOC information and communications will be made. This effort will also include an examination of the resources needed for each of the two – centralized and decentralized – approaches.

II. Project Goals and Objectives (5 Pages)

Even before the events of September 11, 2001, governments at all levels and private infrastructure organizations have been 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 and timely actions of Emergency Operating Centers at all levels of government and infrastructure service organizations in the National Capital Region to respond to emergencies, both natural and man-made." The proposed project will directly result in an increased capability and coordination and reduced reaction time for EOC staffs and infrastructure personnel to respond to events and coordinate resources before, during, and in restoring critical infrastructure services to citizens.

The specific, individual goals of the proposed project will not only support the **Overall Goal** but also 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. The proposed project's Specific Goals are listed below along with first-level objective information. A more in-depth discussion of each goal and objective is given in Section III Project Description. The proposed Project Schedule is shown below in Figure II-1.

1. **Goal 1** - Develop, install, and demonstrate a pilot "utility infrastructure display system" at one or two NCR area EOCs.

   1.1 **Objective 1** – Develop security and operational specifications for a "utility infrastructure display system" in consort with NCR utilities, emergency managers, and IT industry firms.

   1.2 **Objective 2** - Develop, install, and demonstrate a pilot system to display infrastructure data in a secure manner at one or two EOCs in the NCR area.

   1.3 **Objective 3** – Develop the design and determine resources necessary to develop, integrate, and support the system at EOCs in the NCR, including organizational, administrative, legal, and financial aspects.

2. **Goal 2** - Develop, install, and demonstrate a pilot "coordinated infrastructure display" for electric and gas utilities serving the NCR area.

   2.1 Objective 1 – Develop design and operational specifications for a "coordinated infrastructure display system" that is compatible with the secure system developed under Goal 1.

   2.2 Objective 2.2 – Develop, install, and demonstrate a pilot "coordinated infrastructure display system" at two EOCs in the NCR area.

2.3 **Objective 2.3** – Develop the design and determine resources necessary to develop, integrate, and support the system at EOCs in the NCR, including organizational, administrative, legal, and financial aspects.

3. **Goal 3** – Examine the advantages and disadvantages, costs and benefits, and the capabilities and limitations of centralized-decentralized infrastructure information and communications systems for use in NCR area EOCs.

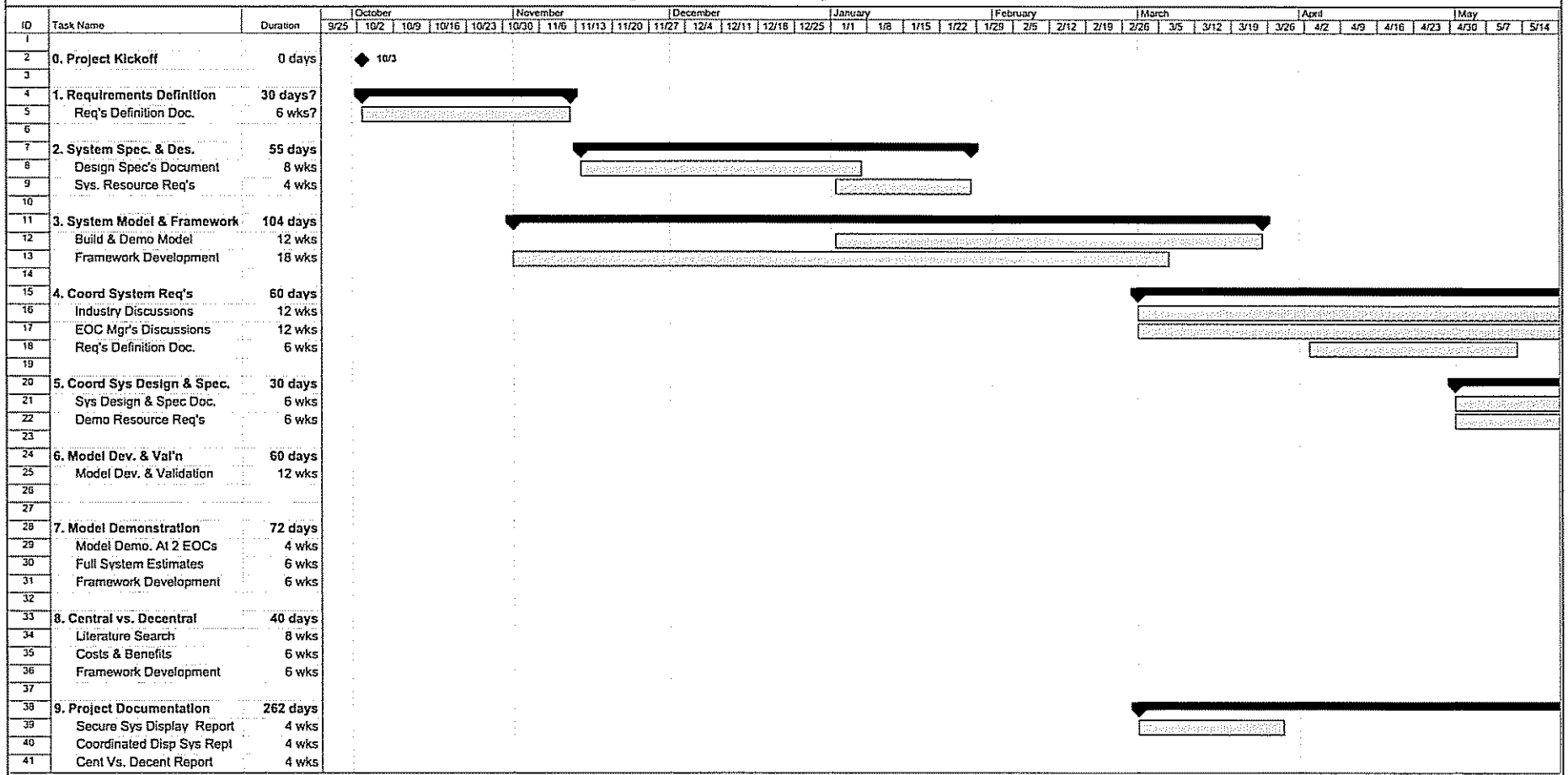
   3.1 **Objective 3.1** – Document information and display requirements for infrastructure data at EOCs, information transfer requirements (communications, data, and video), and source and end-use data conversion requirements for centralized-decentralized systems.

   3.2 **Objective 3.2** – Examine the technical and operational capabilities and limitations of centralized-decentralized systems and the resources (financial, labor, etc.) necessary for each approach.

   3.3 **Objective 3.3** – Examine the institutional, organizational, administrative, legal, and financial aspects of centralized-decentralized approaches to utility infrastructure information and communications systems.

Fig. III-1 Project Schedule

UASI FY05 Grant Program
"Enhancing Infrastructure System Data In EOCs"



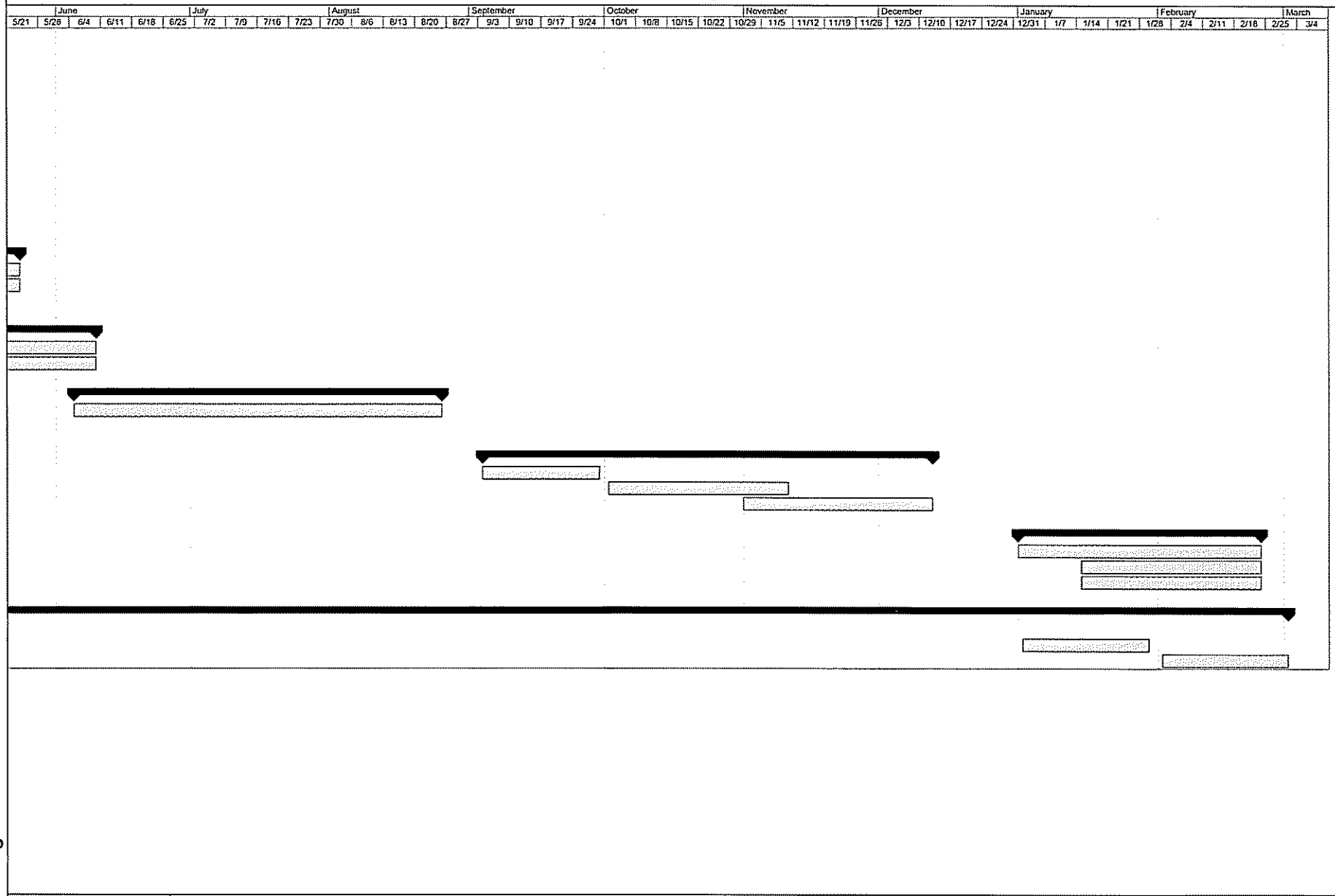
ID	Task Name	Duration
2	0. Project Kickoff	0 days
4	1. Requirements Definition	30 days?
5	Req's Definition Doc.	6 wks?
7	2. System Spec. & Des.	55 days
8	Design Spec's Document	8 wks
9	Sys. Resource Req's	4 wks
11	3. System Model & Framework	104 days
12	Build & Demo Model	12 wks
13	Framework Development	18 wks
15	4. Coord System Req's	60 days
16	Industry Discussions	12 wks
17	EOC Mgr's Discussions	12 wks
18	Req's Definition Doc.	6 wks
20	5. Coord Sys Design & Spec.	30 days
21	Sys Design & Spec Doc.	6 wks
22	Demo Resource Req's	6 wks
24	6. Model Dev. & Val'n	60 days
25	Model Dev. & Validation	12 wks
28	7. Model Demonstration	72 days
29	Model Demo. At 2 EOCs	4 wks
30	Full System Estimates	6 wks
31	Framework Development	6 wks
33	8. Central vs. Decentral	40 days
34	Literature Search	8 wks
35	Costs & Benefits	6 wks
36	Framework Development	6 wks
38	9. Project Documentation	262 days
39	Secure Sys Display Report	4 wks
40	Coordinated Disp Sys Rept	4 wks
41	Cent Vs. Decent Report	4 wks

Project: UASI EOC Data Access
Date: Tue 3/1/05

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

J. Bigger - ARI

UASI FY05 Grant Program
"Enhancing Infrastructure System Data In EOCs"



Project: UASI EOC Data Access
Date: Tue 3/1/05

Task | Split | Progress | Milestone | Summary | Project Summary | External Tasks | External Milestone | Deadline

J. Bigger - ARI

III. Project Description

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

Part I: Secure Infrastructure Display System Demonstration

Task 1: Display System Requirements Definition

Objective: Develop infrastructure information requirements, range and criteria for decisions made, technical capabilities and limitations of present facilities, and background and training of EOC coordinators.

Approach: This task will develop infrastructure information requirements, range and criteria for decisions made, technical capabilities and limitations of present facilities, and background and training of EOC coordinators.

There are a number of approaches to the solution of this problem that can be utilized either with technologies available today or with moderate development efforts One step along this path is in use today: when the District's EOC is activated and information from Virginia Gas is needed, a knowledgeable person from the gas company goes to the EOC with a laptop computer and connects to the gas company's information system (via telephone access); this allows the gas company employee to respond to inquiries and provide information for the coordinators in the EOC. However, this approach is not widely adaptable. Virginia alone has about 190 separate political jurisdictions that implement some kind of EOC during an emergency. Add to that number those in Maryland and the District and the requirements for knowledgeable and experienced infrastructure personnel alone are unsupportable.

In discussions with IT and security industry personnel, a single approach is not considered adequate for the security of this system; the proposed display system will utilize physical protection and isolation, data encryption, and chain-of-custody control software to ensure utility data is not compromised.

Meetings and interviews with infrastructure organization personnel, government emergency planners, and technical equipment and software suppliers will be utilized to help in developing the system security, design, specification, and operating requirements: a) develop the technical and operational requirements for such a system (or systems); b) examine alternative approaches to the solution; and c) develop administrative, legal, and financial framework(s) needed for such a system.

Deliverables:

a) Documentation of the infrastructure-related decisions, infrastructure information requirements, and infrastructure communication requirements in the EOCs during emergency operations

b) Secure Infrastructure Display System Requirements document

Task II: Display System Specification & Design

Objective: Develop specifications and design (hardware, software, security provisions, and network requirements) of a Secure EOC Infrastructure Display System(s).

Approach:
An important part of this approach is the communication aspects among EOCs and the infrastructure organizations. This will entail an examination of present NCR energy infrastructure organizations' Operating Centers and the design for a human-communication interface at both the EOC and the utility Operating Center locations. An estimate of the resources – financial, operational, labor, and training – necessary to support the proposed EOC Infrastructure Display System will be developed.

A specification and design document will be prepared that will identify and specify interfaces (e.g., electrical, computer, communications), operating ranges, and security requirements and will document the Secure EOC Infrastructure Display System design. The document will be the basis for the procurement of hardware, software, and display equipment for the system.

Deliverables:

a) Design and specifications document of the Secure EOC Infrastructure Display System

b) Resource estimates to develop, implement, and support the System at an EOC

Task III: Display System Model & Framework Development

Objectives: The objectives of this task are to: a) Develop and demonstrate the Secure EOC Infrastructure Display System model at selected EOC(s) and b) develop the framework for organizational, administrative, legal, and financial aspects of the Secure EOC Infrastructure Display System

Approach:

The Secure EOC Infrastructure Display System – demonstration model – will be developed, operating ranges confirmed, and performance validated in the ARI computer laboratory prior to installing and demonstrating the system at two NCR Emergency Operating Centers (e.g., Arlington EOC and Dominion data and Montgomery County and Pepco data).

Deliverables:

a) Computer-based demonstration model of the EOC Infrastructure Display System installed and demonstrated at two EOCs.

b) Resource estimates to install, operate, and maintain a complete system at an EOC

c) Framework for organizational, administrative, legal, and financial aspects

Part II: Coordinated Infrastructure Displays in EOCs During Emergencies

Task IV: Coordinated Infrastructure Display Requirements Definition

Objective: Evaluate design and data needs for a representative network model of two infrastructure segments to demonstrate feasibility of closely coordinated infrastructure display system.

Deliverables:

a) Conceptual design for the demonstration Coordinated Emergency Infrastructure Response Display System. Note, this demonstration will utilize the secure system developed in Part I, above.

b) Estimate of resources necessary to create, implement and support the demonstration system

Task V: Coordination System Specification & Design

Objective: Develop design and performance specifications for the Coordinated Emergency Infrastructure Operating System

Deliverables:

a) Design and specifications of the Coordinated Emergency Infrastructure Operating System

b) Resource estimate to develop, implement, and support the System at an EOC

Task VI: System Model Demonstration and Analyses

Objective: Develop and demonstrate the Coordinated Emergency Infrastructure Operating System first in the ARI Computer Laboratory and then at two EOCs.

Deliverables

a) Operating computer network model that demonstrates coordinated operation of at least two (2) energy infrastructures for a selected area

Task VII: System Demonstration & Framework

Objectives: Demonstration of the Coordinated Infrastructure Display System model at two (2) EOCs in the NCR

Deliverables:

a) Demonstration of the Coordinated Infrastructure Display System model at two (2) EOCs in the NCR
b) Estimated resources to build, install, operate, and maintain a complete system at an EOC
c) Framework for organizational, administrative, legal, and financial aspects

Part III: Centralized and Decentralized EOC Information Sources

Task VIII: Centralized vs. Decentralized Information Sources

Objectives: Evaluate the costs and benefits of centralized and decentralized information sources for the NCR Emergency Operating Centers.

Approach:

An examination of the advantages and disadvantages, costs and benefits, and the institutional problems associated with centralized and decentralized approaches to EOC information and communications will be made. This effort will also include an examination of the resources needed for each of the two approaches.

There is a considerable data base regarding this question produced by both government agencies and academic researchers. This resource will be examined, reviewed, and summarized to obtain

Deliverables:

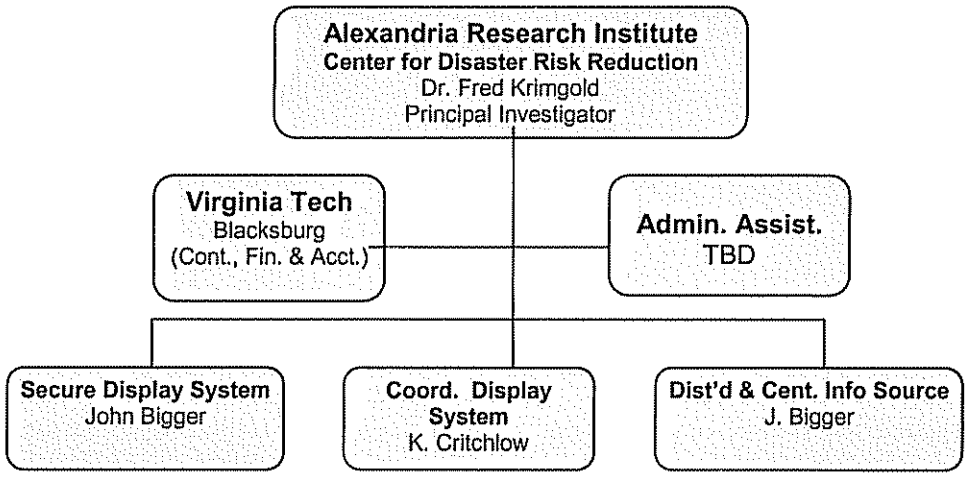
a) Document the advantages and disadvantages, costs and benefits, and the institutional problems associated with centralized and decentralized approaches to EOC information and communications

IV. Organization, Experience, & Qualifications

Organization

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

Figure IV-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 address critical infrastructures and their interdependencies, emergency services planning, and EOC requirements and operations . These have been for the Commonwealth of Virginia, the Metropolitan Washington Council of Governments, 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 specific proposal team members involved in each.

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. Fred Krimgold and Lamine Mili 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 infrastructure (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.

6. **"Assessing the Role of Utility and Transportation System Infrastructure Interdependencies."** 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. It is primarily directed at examining the electric, communications, and transportation infrastructure sectors but will also look at the water and wastewater sector. Drs. Fred Krimgold and Lamine Mili are the co-principle investigators; Dr. Michael Willingham and Mr. John Bigger are the major investigators.

IV. Staffing Plan

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

Project Staffing

Listed below are the proposed personnel, their project 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 data are 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 the Graduate Research Assistants and the Administrative Assistant. Unofficial inquiries regarding potential candidates for these positions have already been initiated.

Staff Name	Project Title	Time (%)
Dr. Fred Krimgold	Principal Investigator	15
John Bigger	Project Manager	20
Dr. Michael Willingham	Project Investigator	10
Keith Critchlow	Adjunct Faculty	25
Dr. Lamine Mili	Project Investigator	5
Ms. Natasha Udu-gama	Project Research Assistant	30
TBD	Research Assistant (GRA-13)	100

Job Descriptions

Listed below are the job descriptions used by the Human Resources Department at Virginia Polytechnic Institute and State University used for academic, adjunct, professional, and support staff positions.

- Professor

- Adjunct Professor/Faculty
- Research Assistant
- Graduate Research Assistant (GRA-Step 13)

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 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.

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; he has been managing and conducting research studies of energy infrastructures, their security, and their organization. These projects have been funded by the Commonwealth of Virginia and various federal government agencies.

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.

Keith Critchlow

V. Project Budget and Budget Narrative

The estimated Total Budget for the proposed project is $382,998. 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) 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 emergency services 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: a) computer and display equipment (hardware and software) for the Secure EOC Infrastructure Display System (Part 1); b) hardware and software for infrastructure coordination display systems (Part 2); and materials for report documents and briefings. Procurement of computer and display equipment and software will be done in accordance with the guidance supplied in the RFA and communications hardware and software will be in accordance with Appendix I in the RFA.

Table VI-1: Total Project Budget

DATE: 02/28/05 REVISED: 2/28/2005 17:54

FILE NAME: lm Krimgold UASI EOC Utilities.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	15%	$16,018	15%	$5,570	$21,588
John Bigger	CY	20%	$26,354	20%	$9,163	$35,517
Michael Willingham	CY	10%	$10,542	10%	$3,665	$14,207
Lamine Mili	AY	5%	$4,502	5%	$2,094	$6,596
Lamine Mili	SMR	0%	$0	0%	$0	$0
Natasha Udu-gama	CY	30%	$18,070	30%	$6,283	$24,353
Keith Critchlow	CY	25%	$27,107	25%	$9,425	$36,532
GRA- Step 13	GRA	200%	$39,626	200%	$13,554	$53,180
TOTAL PERSONNEL SALARIES			$142,219		$49,754	$191,973
FRINGE BENEFITS						
Reg Fac 33.25% / 32.75% & Res Fac 34.25% / 35%			$6,799		$2,510	$9,309
SMR/WAGES 9.5% / 9.75%			$7,849		$2,782	$10,631
GRA @ 6.25% / 7.5%			$2,601		$1,017	$3,618
CLASSIFIED 40.75% / 44.5%			$0		$0	$0
TOTAL FRINGE BENEFITS			$17,248		$6,309	$23,557
TOTAL SALARIES & BENEFITS			$159,467		$56,063	$215,530
EQUIPMENT			$12,510		$3,500	$16,010
TUITION - AY (NoVA rate)			$15,954		$7,614	$23,568
TRAVEL (International)			$0		$0	$0
TRAVEL (Domestic)			$2,500		$1,900	$4,400
MATERIALS & SUPPLIES			$4,000		$3,500	$7,500
TOTAL DIRECT COSTS			$194,431		$72,577	$267,008
INDIRECT COSTS @ 51.0% 7/1/05-fut			$84,643		$31,346	$115,990
TOTAL COSTS			$279,074		$103,924	$382,998
INDIRECT BASE	51.0%		*$165,967*		*$61,463*	

VI. Certifications & Assurances

1. Lobbying
2. Debarment, Suspension, and Other Responsibility Matters
3. Drug-Free Workplace
4. Standard Assurances

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

3-1-05

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
[signature]	3-1-05
Signature	Date

VII. Appendices

A. Project Staff Resumes

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

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

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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
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Alexandria, VA 22314
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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.