U.S. NUCLEAR REGULATORY COMMISSION
NOTICE OF GRANT/ASSISTANCE AWARD

1. GRANT/AGREEMENT NO.	2. MODIFICATION NO.	3. PERIOD OF PERFORMANCE	4. AUTHORITY
NRC-38-10-974		FROM: 7/1/2010 TO: 6/30/2011	Pursuant to Section 31b and 141b of the Atomic Energy Act of 1954, as amended

5. TYPE OF AWARD	6. ORGANIZATION TYPE	7. RECIPIENT NAME, ADDRESS, and EMAIL ADDRESS
[X] GRANT [ ] COOPERATIVE AGREEMENT	Public State-Controlled Institution of Higher ED DUNS: 790934285	University of Maryland 2309A Chemical and Nuclear Engineering Building 090 College Park, MD 20742

8. PROJECT TITLE:
Course Modules in Risk Based Materials Corrosion Education

9. PROJECT WILL BE CONDUCTED	10. TECHNICAL REPORTS ARE REQUIRED	11. PRINCIPAL INVESTIGATOR(S) NAME, ADDRESS and EMAIL ADDRESS
PER GOVERNMENT'S/RECIPIENT'S PROPOSAL(S) DATED See Program Description AND APPENDIX A-PROJECT GRANT PROVISIONS	[X] PROGRESS AND FINAL [ ] FINAL ONLY [ ] OTHER (Conference Proceedings)	University of Maryland Attn: Aris Christou Email: christou@umd.edu 301-405-5208

12. NRC PROGRAM OFFICE (NAME and ADDRESS)	13. ACCOUNTING and APPROPRIATION DATA	14. METHOD OF PAYMENT
NRC Attn: Randi Neff Office of Human Resources MS: GW5A6 (301) 492-2301 11545 Rockville Pike Rockville, Maryland 20852	APPN. NO: 31X0200 B&R NO: 0-8415-5C1116 JOB CODE: T8453 BOC NO: 4110 OFFICE ID NO: RFPA: HR-10-974	[ ] ADVANCE BY TREASURY CHECK [ ] REIMBURSEMENT BY TREASURY CHECK [ ] LETTER OF CREDIT [X] OTHER (SPECIFY) Electronic ASAP.gov (See Remarks in Item #20 "Payment Information")

15. NRC OBLIGATION FUNDS		16. TOTAL FUNDING AGREEMENT		
THIS ACTION	$100,000	NRC	$100,000	This action provides funds for Fiscal Year in the amount of See Page Two
PREVIOUS OBLIGATION		RECIPIENT		
TOTAL	$100,000	TOTAL	$100,000	

17. NRC ISSUING OFFICE (NAME, ADDRESS and EMAIL ADDRESS)

U.S. Nuclear Regulatory Commission
Div. of Contracts
Attn: Sheila Bumpass
Mail Stop: TWB-01-B10M
Rockville MD 20852

18.	19. NRC CONTRACTING OFFICER
Signature Not Required	Sheila Bumpass 7/1/10 (Signature) (Date) NAME (TYPED) Sheila Bumpass TITLE Contracting Officer TELEPHONE NO. 301-492-3484

20. PAYMENT INFORMATION

Payment will be made through the Automated Standard Application for Payment (ASAP.gov) unless the recipient has failed to comply with the program objectives, award conditions, Federal reporting requirements or other conditions specified in 2 CFR 215 (OMB Circular A110).

21. Attached is a copy of the "NRC General Provisions for Grants and Cooperative Agreements Awarded to Non-Government Recipients. Acceptance of these terms and conditions is acknowledged when Federal funds are used on this project.

22. ORDER OF PRECEDENCE

In the event of a conflict between the recipient's proposal and this award, the terms of the Award shall prevail.

23. By this award, the Recipient certifies that payment of any audit-related debt will not reduce the level of performance of any Federal Program.

TEMPLATE - ADM001

SUNSI REVIEW COMPLETE

ADM002

ATTACHMENT A - SCHEDULE

A.1 PURPOSE OF GRANT

The purpose of this Grant is to provide support to the "Course Modules in Risk Based Materials Corrosion Education" as described in Attachment B entitled "Program Description."

A.2 PERIOD OF GRANT

1. The effective date of this Grant is July 1, 2010. The estimated completion date of this Grant is June 30, 2011.

2. Funds obligated hereunder are available for program expenditures for the estimated period: July 1, 2010 – June 30, 2011.

A. GENERAL

1. Total Estimated NRC Amount:	$100,000
2. Total Obligated Amount:	$100,000
3. Cost-Sharing Amount:	$0
4. Activity Title:	Course Modules in Risk Based Materials Corrosion Education
5. NRC Project Officer:	Randi Neff
6. DUNS No.:	790934285

B. SPECIFIC

RFPA No.:	HR-10-974
FFS:	N/A
Job Code:	T8453
BOC:	4110
B&R Number:	0-8415-5C1116
Appropriation #:	31X0200
Amount Obligated:	$100,000

A.3 BUDGET

Revisions to the budget shall be made in accordance with Revision of Grant Budget in accordance with 2 CFR 215.25.

	Year 1
Direct Participant Cost	$79,366.00
Indirect Cost	$20,635.00
Yearly Total	**$100,000.00**

All travel must be in accordance with the University of Maryland Travel Regulations or the US Government Travel Policy absent Grantee's travel regulation.

A.4 AMOUNT OF AWARD AND PAYMENT PROCEDURES

1. The total estimated amount of this Award is $100,000 for one year period.

2. NRC hereby obligates the amount of $100,000 for program expenditures during the period set forth above and in support of the Budget above. The Grantee will be given written notice by the Contracting Officer when additional funds will be added. NRC is not obligated to reimburse the Grantee for the expenditure of amounts in excess of the total obligated amount.

3. Payment shall be made to the Grantee in accordance with procedures set forth in the Automated Standard Application For Payments (ASAP) Procedures set forth below.

Attachment B – Program Description

Course Modules in Risk Based Materials Corrosion Education

Proposal Description and Approach

I. Course Modules and Insertions:
1.1 Probabilistic Risk Assessment Course Series

The UMD's graduate NE program has offered a PRA course since the mid-1980's. The content of this course has evolved as PRA and techniques have matured and now represent one of the most popular graduate courses in this area and in the US. A second course was also developed in 2004 under the Reliability Engineering curriculum with the focus on Risk Management. This course reviews methods used for risk ranking, treatment of uncertainties, establishment of risk acceptance criteria and formal decision theoretic methods and techniques. As part of this grant we can develop an NE-focused version of these courses. Further, the new concepts of Dynamic-PRA and uses of systems codes such as RELAP and TRACE in dynamic PRAs will be discussed. The Risk Management course will be substantially modified to discuss issues pertaining regulatory decision making under uncertainty, as the NRC moves to a full implementation of risk-informed regulatory paradigm. For example, in risk ranking methods, specific formal and informal risk ranking techniques used in risk-informed regulations and the application context and meaning of each method will be discussed. Under the risk acceptance criteria, the issue of reasonable assurance, safety goals, and other acceptance criteria will be covered. Finally experiences and implications of using formal probabilistic-based decision making techniques along with the traditional deterministic decision making techniques used in safety regulation will be covered. Examples of the topics that the course will cover are:

Uncertainty Analysis: Types of Uncertainty, Measures of Uncertainty, Uncertainty Propagation Methods, Comparison of Uncertainty Propagation Methods, Quantitative and Graphical Representation of Uncertainty

Identifying, Ranking and Predicting Contributors to Risk: Importance Ranking in PRAs, Comprehensive Examples of Importance Measure Application, Consideration of Uncertainties in Importance Measures Used for Risk Ranking, Uncertainty Associated with the Importance Measures, Relative and Absolute Ranking Based on Uncertain Importance Measures, Uncertainty Importance Measure, Precursor Analysis. Differences between Precursor Analysis and PRA

Precursor Type Analyses: The use and implication of the traditional precursor type analysis in risk management. Uses of risk significant events and differences between the precursor type studies and PRAs especially as they relate to critical corrosion events.

Risk Acceptance Criteria: System Health and Safety Risk Acceptance Criteria, Individual Risk Acceptance Criteria, Economic Risk and Performance Acceptance Criteria, NRC Safety Goals, Other Risk Acceptance Criteria in Form of Figures of Merit

Decision Making Techniques: Economic Methods in Risk Analysis: Benefit-Cost Analysis, Cost-Effectiveness Analysis, Risk-Effectiveness Analysis; Non-Economic Techniques: Probability of "Exceedance" Method, Structured Value Analysis, Analytical Hierarchy Process, Decision Tree Analysis.

1.2 **Corrosion Modules Within the Severe Accidents Course**

The proposed course modules involves developing knowledge on the associated risks and consequences linked with severe accident situations for different types of nuclear reactors, particularly in LWRs. The course assures that students learn about important degradation mechanisms of the different safety barriers in case of a *severe* accidents and evaluation of the possible recovery actions. Examples of corrosion events will be emphasized. An existing graduate course on sever accidents will be updated and offered on a academic year frequency. The revived course will assemble, organize, and develop instructional materials in: core melt progression, fission products release from the core, various deposition and retention processes, with subsequent release to the containment, including interactions with containment structure, and fission products released from (or, possibly, bypass) the containment, uptake by the public, deposited on ground or water areas. Specific scenarios and events to be taken into account depends on the categories with regard to the integrity of the containment and the corresponding radioactive releases. For example discussion of scenarios involving core meltdown with bypassing of the containment, meltdown at high pressure, deflagration or detonation of hydrogen inside the containment, and core melt down with slow rise of the pressure and temperature in the containment.

Specific plant design features such as the design of containment will be discussed. For example effects of containments with metallic liner fixed on a concrete wall, double ended wall in concrete and a depression system, internal wall covered with a metallic liner, external wall and a depression system, and effect of ice condensers will be examined. Issues and phenomena covered include: source term assessment, core degradation, core melting, induced primary breaks, direct containment heating, containment bypass, debris coolability, structure penetration, steam explosion, hydrogen generation and combustion, release of fission products, BWR liner melt through, and fission products retention. Finally, uncertainty characterization of data, models of phenomena and key input parameters and severe accident codes will be discussed.

1.3 Corrosion Modules within the Materials Degradation Course

The main objective of the course is to understand the basic degradation mechanisms of materials and reactor components through the understanding of the physics, chemistry, mechanics of such mechanisms. Mechanical failures will be introduced through understanding fatigue, creep and yielding in materials. Physical or chemical related failures are introduced through a basic understanding of physical mechanisms such as diffusion, corrosion, oxidation, radiation induces defects and defect migration. Failure mechanisms observed in reactor vessel materials will also be presented. This course will be developed by Professor Aris Christou who has developed basic courses in understanding the failure mechanisms of materials.

The course will be based on the initial overview of material failure mechanisms at the component and system level. The mathematics of reliability and quality as well as the design of experiments is reviewed. The physics of failure approach to reactor materials will also be covered. Reliability Prediction and modeling and statistical approaches will be incorporated from the point of view of material safety and material survivability. The physics of failure approach to

corrosion failure will now be included as one of the main modules of the course.
Analysis of Failure: Mechanical and physical failure analysis techniques. We will emphasize microscopy techniques including acoustic microscopy inspection. The analysis of material failure will include the development of virtual testing approaches. Through web based developed approaches the student will be able to carry out a material failure analysis remotely.
Material failures: Radiation induced defects in materials, changes in properties of materials, and the mechanics of materials at the reactor component level will be presented. Load-Strength interference methods will be taught as methods to analyze material failures.

Failure Mechanisms: The understanding of mechanical failure mechanisms of metals, and metal alloys are taught through hands on experiments and through problem solving.
Life Prediction- A Mechanistically Based Probability Approach: Material aging is a principle cause for the aging of nuclear systems. We will teach methodologies capable of the following: (i) extrapolation beyond possible data, (ii) analysis of critical variable response, (iii) investigation into the reliability of components and (iv) life cycle management. Mechanistically based probability modeling provides the structure to meet this requirement. This course will emphasize the extension of this understanding at the materials level to the analysis of reliability and safety at the system level.

II. Development of New Courses:
2.1 Course on Stress Corrosion: Basics and Applications

Stress corrosion is an important phenomenon which can affect the nuclear power industry in various forms; including high-level waste storage and reactor vessel internal components [1,2]. The loads can be static in nature leading to stress corrosion cracking or irradiation-assisted stress corrosion cracking (IASCC). The loads may also be dynamic in nature, leading to corrosion fatigue. A variation of static stress corrosion cracking is known as sustained-load cracking [4-6], where the presence of a corrosive environment can cause the diffusion of hydrogen towards crack tips, leading to crack propagation. Another important variation of static stress corrosion cracking is related to the combination of low temperature creep [3] enhanced by the environment.

The main aspects of this module include identification of various types of stress corrosion including stress corrosion cracking, corrosion fatigue, and fundamentals of corrosion. The aim of this module is to systematically describe various forms of stress corrosion cracking and corrosion fatigue.

In addition, the factors to be discussed will include: the effect of chemical composition of the alloys, the alloy microstructure, processing conditions (such as cold-work, welding, etc.), temperature, irradiation effects, and the effect of different types of environments. These same factors will be discussed under dynamic loading conditions, Le. fatigue, including fatigue crack initiation and propagation. Being able to identify the effect of chemistry and microstructure of thE alloys on susceptibility to stress corrosion is of great importance in selection of the alloys and processing conditions for optimal microstructures.

In addition to studying the effect of various environments and testing the effect of various parameters, the testing methods for detecting various types of corrosion will be discussed. An important aspect to this module will be to distinguish between real stress corrosion phenomenor and those phenomena which will look like stress corrosion but indeed the corrosion has no effect, for example, failure due to low temperature creep sustained load cracking. The testing methods will include the determination of failure origins through fractography including optical, SEM, and TEM examinations. Finally, this module will include the ways to remedy or mitigate the failure of materials because of stress corrosion. This will include a discussion as related to the selection of alloys, the selection of designs which limit the presence of sharp contours or

internal stresses, the selection of processing conditions, and other modifications such as coatings/inhibitors.

In summary, in this module, the prospective students will learn the classification of various types of failure due to stress corrosion, as well as the effects of such parameters as alloy chemistry, alloy microstructure, processing conditions, temperature, and irradiation on stress corrosion will be discussed. Further, they will learn how to identify various types of corrosion and select materials to mitigate this type of failure in various nuclear reactor applications.

2.2 Course Module on Risk Management and Probabilistic Prediction of Corrosion

Nuclear plants are designed for decades of operation. One of the challenges in their maintenance is how to predict two types of phenomena related to corrosion: stress corrosion cracking and activity build-up, Le. deposition of activated corrosion products onto the surfaces of the reactor cooling system. In March 2002, the most serious safety issue confronting commercial nuclear power since the TMI accident in 1979 was identified at the Davis-Besse plant in Ohio. After shutting down to inspect its reactor vessel for cracked tubing, the plant found that leakage from these tubes had caused extensive corrosion on the reactor vessel head. Therefore it is critical that the next generation of nuclear engineers appreciate corrosion risks.

Advances as a result of international collaboration and research on corrosion risks carried out by the NRC allow the knowledge be transferred to classrooms. In the proposed course the students will learn how to prevent the corrosion, what risk factors should be used to assess safety and decide when a reactor shutdown is warranted. They learn methods to prevent actual corrosion events. The class will study slow accumulation of activated corrosion products into the oxide films. It will review methods for monitoring by measurements carried out during the annual refueling outages. This course will cover fundamentals, applications, and hands-on demonstrations of emerging monitoring and detection techniques, including applications for generator rotors, turbine disks, header ligaments, girth welds, tube welds, and welds. These include, advanced nondestructive examination techniques such as the linear phased array and ultrasonic techniques. Finally, the role of Probabilistic Risk Assessment techniques in identifying risk-significant structures, systems and components susceptible to the two main corrosion mechanisms discussed above will be discussed.

III. Schedule and Milestones
Milestone 1. Development (4 week duration) of module for course insertion in Risk and Risk Management.

1 (a). Complete module development in risk and risk management. (Month 4) (b). Transform milestone 1 (a) to electronic form. (Month 6) (c). Distribute and test success of first beta version of module 1 (a). (Month 8) (d). Complete revisions of module 1 (a) and distribute to students. (Month 10) (e). Complete implementation of on-line version of module 1(a). (Month 18)

Milestone 2. Module development for Course Insertion in Severe Accidents.

2(a). Complete development of 4 week module for Severe Accident course. (Month 6) (b). Transform module 2(a) into electronic form. (Month 8) (c). Distribute and test first beta version of module 2(a). (Month 9) (d). Complete necessary revisions to 2(a) and distribute to students. (Month 10)
(e). Complete the on-line version and insert into the on-line masters program. (Month 18)

Milestone 3. Complete the development of failure analysis module for corrosion as part of the Materials Degradation course.

3(a). Test success of failure analysis module on specific test cases. (Month 12)
(b). Revise failure analysis module as necessary and distribute changes to students. (Month 12)
(c). Develop and implement the on-line version of the module. (Month 18)

Milestone 4. Complete development of the new Risk and Corrosion semester course.

4(a). Develop and offer first version of course to on campus and on-line students. (Month 12)
(b). Revise beta version of course as necessary. (Month 14) (c). Develop the on-line version of the new course and distribute to first on-line student group. (Month 24).

Milestone 5. Complete development of the "Basic Concepts and Applications of Stress Corrosion semester course.

5(a). Offer beta version of the course to on-campus and on-line students. (Month 18) (b). Revise beta version as necessary from student and peer group assessments. (Month 20) (c). Develop the on-line version and distribute to on-line student group. (Month 22) (d). Complete development of the two course sequence in corrosion (risk based and basic mechanism based). (Month 24)

IV. Implementation and Assessment Tools

UMD's well-established web-based delivery system will be streamlined to offer the proposed courses to a broad audience of nuclear industry professionals, including web-based access for the interested NRC and DOE staff. As part of this proposal, the new on-line MS degree program will be modified to include the new courses and will be fully on line during academic year 2010-2011. The courses developed on-line will also be modified for inclusion in the new on-line MS degree program in Sustainable Energy. The online Master of Engineering programs in Nuclear Engineering and Sustainable Energy Engineering offered through the Clark School of Engineering are equivalent to the campus-based programs. They are delivered synchronously and asynchronously via web-casts, live chat sessions, video chat sessions, bulletin board discussions, and at remote learning sites throughout the state of Maryland. The online programs are designed to assist engineers and technical professionals in the development of their careers and to provide the expertise needed in the rapidly changing business, government, and industrial environments. Students in these programs have the opportunity to enhance their knowledge in their discipline and, in some cases, launch a new career path. In operation since 1994, the Office of Advanced Engineering Education offers 6 completely online programs as well as 18 campus-based academic options under the Master of Engineering program covering a broad spectrum of engineering technology that reflects faculty expertise and changing needs within the professional engineering community. A rich array of graduate-level courses, focusing on both traditional and emerging technologies, is the result of great cooperation from the administrators and faculty in the A. James Clark School of Engineering.

Student Learning Resources:
We will establish a web site for the students with several important instructional elements for the student which will complement each semester course. These include:

1. VCSE: The virtual corrosion science and engineering. This will consist of interactive simulations and animations that enhance the learning of key concepts in corrosion of materials, in addition to a corrosion oriented data base.
2. Answers to Corrosion and Probablistic Risk Check questions. The students can visit the site to find the correct answers to concept check questions.
3. Direct access to self assessment exercises. We will establish a web based assessment program for each module in corrosion and risk.
4. Extended list of Learning Objectives. An extensive list of learning objectives will direct

the student to study corrosion to a greater depth.

5. Links to Other Web Resources. These links will be categorized according to internet, software and specific course content and course activities, as well as corrosion databases.

Instructor Teaching Resources

We will establish an instructor web site and will be made available to other Nuclear Engineering programs who adopt the modules and courses developed via this project. The instructor resources will include the following:

1. A set of power point lecture slides. These slides will follow the flow of topics developed for each module and course. It will include material from other sources as well as illustrations and animations. Instructors may use these slides or edit them for their own use.
2. A list of classroom demonstrations and laboratory experiments. These will portray the corrosion phenomena and illustrate principles. References will be provided which give a more detailed account of the demonstrations.
3. Instructor Solution Manuals. Detailed solutions will be provided for all problems developed for the students.
4. Suggested course syllabi for the various Nuclear Engineering Programs. Instructors at other Universities may consult these syllabi for guidance in course organization and lecture planning. Comments, suggestions and criticisms may be submitted to the Pis via email for rapid implementation of changes in order to ensure a continuous improvement of the course content.

V. Principle Investigators:

Two of the faculty of the Graduate Nuclear Engineering Program will be the Principle Investigators. One faculty member from the Materials Department will also participate as a Principle Investigator. The faculties as principle investigators are:
Prof. Aris Christou, who is an expert in material failure mechanisms as well in the physics of failure of materials, will develop the corrosion failure analysis methodologies. **Professor M. Modarres** will provide expertise in risk and probability model development. Professor Modarres will also be responsible for probabilistic corrosion modeling, and will be responsible for criticality analysis of reactor systems. **Professor S. Ankem** will provide material testing expertise as well as to provide course development in the area of stress corrosion, corrosion induced by fatigue. The three faculties have had an established history of collaboration which will ensure to successful implementation of the developed courses.

Attachment C – Standard Terms and Conditions

The Nuclear Regulatory Commission's
Standard Terms and Conditions for U.S. Nongovernmental Grantees

Preface

This award is based on the application submitted to, and as approved by, the Nuclear Regulatory Commission (NRC) under the authorization 42 USC 2051(b) pursuant to section 31b and 141b of the Atomic Energy Act of 1954, as amended, and is subject to the terms and conditions incorporated either directly or by reference in the following:

- Grant program legislation and program regulation cited in this Notice of Grant Award.
- Restrictions on the expenditure of Federal funds in appropriation acts, to the extent those restrictions are pertinent to the award.

- Code of Federal Regulations/Regulatory Requirements - 2 CFR 215 Uniform Administrative Requirements For Grants And Agreements With Institutions Of Higher Education, Hospitals, And Other Non-Profit Organizations (OMB Circulars), as applicable.

To assist with finding additional guidance for selected items of cost as required in 2 CRF 220, 2 CFR 225, and 2 CFR 230 these URLs to the Office of Management and Budget Cost Circulars are included for reference:

A-21 (now 2CFR 220): http://www.whitehouse.gov/omb/circulars/a021/print/a021.html
A-87 (now 2CFR 225): http://www.whitehouse.gov/omb/circulars/a087/print/a087-all.html
A-122 (now 2CFR 230): http://www.whitehouse.gov/omb/circulars/a122/print/a122.html
A-102, SF 424: http://www.whitehouse.gov/omb/circulars/a102/print/a102.html
Form 990: http://www.irs.gov/pub/irs-pdf/i990-ez.pdf

Any inconsistency or conflict in terms and conditions specified in the award will be resolved according to the following order of precedence: public laws, regulations, applicable notices published in the Federal Register, Executive Orders (EOs), Office of Management and Budget (OMB) Circulars, the Nuclear Regulatory Commission's (NRC) Mandatory Standard Provisions, special award conditions, and standard award conditions.

By drawing funds from the Automated Standard Application for Payment system (ASAP), the recipient agrees to the terms and conditions of an award.

Certifications and representations. These terms incorporate the certifications and representations required by statute, executive order, or regulation that were submitted with the SF424B application through Grants.gov.

I. Mandatory General Requirements
The order of these requirements does not make one requirement more important than any other requirement.

1. Applicability of 2 CFR Part 215

a. All provisions of 2 CFR Part 215 and all Standard Provisions attached to this grant/cooperative agreement are applicable to the Grantee and to sub-recipients which meet the definition of "Grantee" in Part 215, unless a section specifically excludes a sub-recipient from coverage. The Grantee and any sub-recipients must, in addition to the assurances made as part of the application, comply and require each of its sub-awardees employed in the completion of the project to comply with Subpart C of 2 CFR 215 Part 180 and include this term in lower-tier (subaward) covered transactions.

b. Grantees must comply with monitoring procedures and audit requirements in accordance with OMB Circular A-133. < http://www.whitehouse.gov/omb/circulars/a133_compliance/08/08toc.aspx >

2. Award Package

Grant Performance Metrics:

The Office of Management and Budget requires all Federal Agencies providing funding for educational related funding to report on specific metrics. These metrics are part of the Academic Competitiveness Council's (ACC) 2007 report and specifically relates to Science, Technology, Engineering, and Mathematics (STEM) curricula.

As part of the FY 2010 HR curriculum development grant awards, in addition to the customary performance progress report requested on the SF-PPR, SF-PPR-B, and SF-PPR-E forms, HR requires the following metrics to be reported on by the awardees as follows:

1. Overall number of new courses developed in NRC designated STEM areas;
2. Number of students enrolled in new STEM courses;
3. Number of these enrolled students retained in STEM major.

§ 215.41 Grantee responsibilities.
The Grantee is obligated to conduct such project oversight as may be appropriate, to manage the funds with prudence, and to comply with the provisions outlined in 2 CFR 215.41 Within this framework, the Principal Investigator (PI) named on the award face page, Block 11, is responsible for the scientific or technical direction of the project and for preparation of the project performance reports. This award is funded on a cost reimbursement basis not to exceed the amount awarded as indicated on the face page, Block 16., and is subject to a refund of unexpended funds to NRC.

The standards contained in this section do not relieve the Grantee of the contractual responsibilities arising under its contract(s). The Grantee is the responsible authority, without recourse to the NRC, regarding the settlement and satisfaction of all contractual and administrative issues arising out of procurements entered into in support of an award or other agreement. This includes disputes, claims, protests of award, source evaluation or other matters of a contractual nature. Matters concerning violation of statute are to be referred to such Federal, State or local authority as may have proper jurisdiction.

Subgrants
Appendix A to Part 215—Contract Provisions

Sub-recipients, sub-awardees, and contractors have no relationship with NRC under the terms of this grant/cooperative agreement. All required NRC approvals must be directed through the Grantee to NRC. See 2 CFR 215.180 and 215.41.

Nondiscrimination
(This provision is applicable when work under the grant/cooperative agreement is performed in the U.S. or when employees are recruited in the U.S.)

No U.S. citizen or legal resident shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity funded by this award on the basis of race, color, national origin, age, religion, handicap, or sex. The Grantee agrees to comply with the non-discrimination requirements below:

Title VI of the Civil Rights Act of 1964 (42 USC §§ 2000d et seq)
Title IX of the Education Amendments of 1972 (20 USC §§ 1681 et seq)
Section 504 of the Rehabilitation Act of 1973,as amended (29 USC § 794)
The Age Discrimination Act of 1975, as amended (42 USC §§ 6101 et seq)
The Americans with Disabilities Act of 1990 (42 USC §§ 12101 et seq)

Parts II and III of EO 11246 as amended by EO 11375 and 12086.
EO 13166, "Improving Access to Services for Persons with Limited English Proficiency."
Any other applicable non-discrimination law(s).

Generally, Title VII of the Civil Rights Act of 1964, 42 USC § 2000e et seq, provides that it shall be an unlawful employment practice for an employer to discharge any individual or otherwise to discriminate against an individual with respect to compensation, terms, conditions, or privileges of employment because of such individual's race, color, religion, sex, or national origin. However, Title VII, 42 USC § 2000e-1(a), expressly exempts from the prohibition against discrimination on the basis of religion, a religious corporation, association, educational institution, or society with respect to the employment of individuals of a particular religion to perform work connected with the carrying on by such corporation, association, educational institution, or society of its activities.

Modifications/Prior Approval

NRC prior written approval may be required before a Grantee makes certain budget modifications or undertakes particular activities. If NRC approval is required for changes in the grant or cooperative agreement, it must be requested of, and obtained from, the NRC Grants Officer in advance of the change or obligation of funds. All requests for NRC prior approval must be made, in writing (which includes submission by e-mail), to the designated Grants Specialist and Program Office no later than 30 days before the proposed change. The request must be signed by both the PI and the authorized organizational official. Failure to obtain prior approval, when required, from the NRC Grants Officer may result in the disallowance of costs, termination of the award, or other enforcement action within NRC's authority.

Lobbying Restrictions

The Grantee will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

The Grantee shall comply with provisions of 31 USC § 1352. This provision generally prohibits the use of Federal funds for lobbying in the Executive or Legislative Branches of the Federal Government in connection with the award, and requires disclosure of the use of non-Federal funds for lobbying.

The Grantee receiving in excess of $100,000 in Federal funding shall submit a completed Standard Form (SF) LLL, "Disclosure of Lobbying Activities," regarding the use of non-Federal funds for lobbying within 30 days following the end of the calendar quarter in which there occurs any event that requires disclosure or that materially affects the accuracy of the information contained in any disclosure form previously filed. The Grantee must submit the SF-LLL, including those received from sub-recipients, contractors, and subcontractors, to the Grants Officer.

§ 215.13 Debarment And Suspension.

The Grantee agrees to notify the Grants Officer immediately upon learning that it or any of its principals:

(1) Are presently excluded or disqualified from covered transactions by any Federal department or agency;

(2) Have been convicted within the preceding three-year period preceding this proposal 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, tax evasion, receiving stolen property, making false claims, or obstruction of justice; commission of any other offense indicating a lack of business integrity or business honesty that seriously and directly affects your present responsibility;

(3) Are 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); and

(4) Have had one or more public transactions (Federal, State, or local) terminated for cause or default within the preceding three years.

b. The Grantee agrees that, unless authorized by the Grants Officer, it will not knowingly enter into any subgrant or contracts under this grant/cooperative agreement with a person or entity that is included on the Excluded Parties List System (http://epls.arnet.gov).

The Grantee further agrees to include the following provision in any subgrant or contracts entered into under this award:

'Debarment, Suspension, Ineligibility, and Voluntary Exclusion

The Grantee certifies that neither it nor its principals is presently excluded or disqualified from participation in this transaction by any Federal department or agency. The policies and procedures applicable to debarment, suspension, and ineligibility under NRC-financed transactions are set forth in 2 CFR Part 180.'

Drug-Free Workplace

The Grantee must be in compliance with The Federal Drug Free Workplace Act of 1988. The policies and procedures applicable to violations of these requirements are set forth in 41 USC 702.

Implementation of E.O. 13224 -- Executive Order On Terrorist Financing

The Grantee is reminded that U.S. Executive Orders and U.S. law prohibits transactions with, and the provision of resources and support to, individuals and organizations associated with terrorism. It is the legal responsibility of the Grantee to ensure compliance with these Executive Orders and laws. This provision must be included in all contracts/sub-awards issued under this grant/cooperative agreement.

Award Grantees must comply with Executive Order 13224, Blocking Property and Prohibiting Transactions with Persons who Commit, Threaten to Commit, or Support Terrorism. Information about this Executive Order can be found at: www.fas.org/irp/offdocs/eo/eo-13224.htm.

Procurement Standards. § 215.40

Sections 215.41 through 215.48 set forth standards for use by Grantees in establishing procedures for the procurement of supplies and other expendable property, equipment, real property and other services with Federal funds. These standards are furnished to ensure that such materials and services are obtained in an effective manner and in compliance with the

provisions of applicable Federal statutes and executive orders. No additional procurement standards or requirements shall be imposed by the Federal awarding agencies upon Grantees, unless specifically required by Federal statute or executive order or approved by OMB.

Travel
Travel is an appropriate charge to this award and prior authorization for specific trips are not required, as long as the trip is identified in the Grantee's original program description and original budget. All other travel, domestic or international, must not increase the total estimated award amount. Trips that have not been identified in the approved budget require the written prior approval of the Grants Officer.

Travel will be in accordance with the US Government Travel Regulations at: www.gsa.gov/federaltravelregulation and the per diem rates set forth at: www.gsa.gov/perdiem.

Travel costs to the grant must be consistent with provisions as established in Appendix A to 2 CFR 220 (J.53)

Property Management Standards
Property standards of this award shall follow provisions as established in 2 CFR 215.30.

Equipment procedures shall follow provision established in 2 CFR 215.34.

Procurement Standards
Procurement standards of this award shall follow provisions as established in 2 CFR 215.40.

Intangible and Intellectual Property
Intangible and intellectual property of this award shall generally follow provisions established in 2 CFR 215.36.

Inventions Report - The Bayh-Dole Act (P.L. 96-517) affords Grantees the right to elect title and retain ownership to inventions they develop with funding under an NRC grant award ("subject inventions"). In accepting an award, the Grantee agrees to comply with applicable NRC policies, the Bayh-Dole Act, and its Government-wide implementing regulations found at Title 37, Code of Federal Regulations (CFR) Part 401. A significant part of the regulations require that the Grantee report all subject inventions to the awarding agency (NRC) as well as include an acknowledgement of federal support in any patents. NRC participates in the trans-government Interagency Edison system (http://www.iedison.gov) and expects NRC funding Grantees to use this system to comply with Bayh-Dole and related intellectual property reporting requirements. The system allows for Grantees to submit reports electronically via the Internet. In addition, the invention must be reported in continuation applications (competing or non-competing).

Patent Notification Procedures- Pursuant to EO 12889, NRC is required to notify the owner of any valid patent covering technology whenever the NRC or its financial assistance Grantees, without making a patent search, knows (or has demonstrable reasonable grounds to know) that technology covered by a valid United States patent has been or will be used without a license from the owner. To ensure proper notification, if the Grantee uses or has used patented technology under this award without license or permission from the owner, the Grantee must notify the Grants Officer. This notice does not necessarily mean that the Government authorizes and consents to any copyright or patent infringement occurring under the financial assistance.

Data, Databases, and Software - The rights to any work produced or purchased under a NRC federal financial assistance award are determined by 2 CFR 215.36. Such works may include data, databases or software. The Grantee owns any work produced or purchased under a NRC federal financial assistance award subject to NRC's right to obtain, reproduce, publish or otherwise use the work or authorize others to receive, reproduce, publish or otherwise use the data for Government purposes.

Copyright - The Grantee may copyright any work produced under a NRC federal financial assistance award subject to NRC's royalty-free nonexclusive and irrevocable right to reproduce, publish or otherwise use the work or authorize others to do so for Government purposes. Works jointly authored by NRC and Grantee employees may be copyrighted but only the part authored by the Grantee is protected because, under 17 USC § 105, works produced by Government employees are not copyrightable in the United States. On occasion, NRC may ask the Grantee to transfer to NRC its copyright in a particular work when NRC is undertaking the primary dissemination of the work. Ownership of copyright by the Government through assignment is permitted under 17 USC § 105.

Records retention and access requirements for records of the Grantee shall follow established provisions in 2 CFR 215.53.

Organizational Prior Approval System
In order to carry out its responsibilities for monitoring project performance and for adhering to award terms and conditions, each Grantee organization shall have a system to ensure that appropriate authorized officials provide necessary organizational reviews and approvals in advance of any action that would result in either the performance or modification of an NRC supported activity where prior approvals are required, including the obligation or expenditure of funds where the governing cost principles either prescribe conditions or require approvals.

The Grantee shall designate an appropriate official or officials to review and approve the actions requiring NRC prior approval. Preferably, the authorized official(s) should be the same official(s) who sign(s) or countersign(s) those types of requests that require prior approval by NRC. The authorized organization official(s) shall not be the principal investigator or any official having direct responsibility for the actual conduct of the project, or a subordinate of such individual.

Conflict Of Interest Standards of this award shall follow provisions as established in 2 CFR 215.42 Codes of Conduct.

Dispute Review Procedures
a. Any request for review of a notice of termination or other adverse decision should be addressed to the Grants Officer. It must be postmarked or transmitted electronically no later than 30 days after the postmarked date of such termination or adverse decision from the Grants Officer.

b. The request for review must contain a full statement of the Grantee's position and the pertinent facts and reasons in support of such position.

c. The Grants Officer will promptly acknowledge receipt of the request for review and shall forward it to the Director, Office of Administration, who shall appoint a review committee consisting of a minimum of three persons.

d. Pending resolution of the request for review, the NRC may withhold or defer payments under the award during the review proceedings.

e. The review committee will request the Grants Officer who issued the notice of termination or adverse action to provide copies of all relevant background materials and documents. The committee may, at its discretion, invite representatives of the Grantee and the NRC program office to discuss pertinent issues and to submit such additional information as it deems appropriate. The chairman of the review committee will insure that all review activities or proceedings are adequately documented.

f. Based on its review, the committee will prepare its recommendation to the Director, Office of Administration, who will advise the parties concerned of his/her decision.

Termination and Enforcement. Termination of this award by default or by mutual consent shall follow provisions as established in 2 CFR 215.60,

Monitoring and Reporting § 215.51

a. Grantee Financial Management systems must comply with the established provisions in 2 CFR 215.21

- Payment – 2 CFR 215.22
- Cost Share – 2 CFR 215.23
- Program Income – 2 CFR 215.24
  - Earned program income, if any, shall be added to funds committed to the project by the NRC and Grantee and used to further eligible project or program objectives.
- Budget Revision – 2 CFR 215.25
  - In accordance with 2 CFR 215.25(e), the NRC waives the prior approval requirement for items identified in sub-part (e)(1-4).
  - The Grantee is not authorized to rebudget between direct costs and indirect costs without written approval of the Grants Officer.
  - Allowable Costs – 2 CFR 215.27

b. **Federal Financial Reports**

Effective October 1, 2008, NRC transitioned from the SF–269, SF–269A, SF–272, and SF–272A to the Federal Financial Report (SF-425) as required by OMB:
http://www.whitehouse.gov/omb/fedreg/2008/081308_ffr.pdf
http://www.whitehouse.gov/omb/grants/standard_forms/ffr.pdf
http://www.whitehouse.gov/omb/grants/standard_forms/ffr_instructions.pdf

The Grantee shall submit a "Federal Financial Report" (SF-425) on a quarterly basis, for the periods ending 3/31, 6/30, 9/30 and 12/31, or any portion thereof, unless otherwise specified in a special award condition. Reports are due no later than 30 days following the end of each reporting period. A final SF-425 shall be submitted within 90 days after expiration of the award.

Period of Availability of Funds 2 CFR § 215.28

a. Where a funding period is specified, a Grantee may charge to the grant only allowable costs resulting from obligations incurred during the funding period and any pre-award costs authorized by the NRC.

b. Unless otherwise authorized in 2 CFR 215.25(e)(2) or a special award condition, any extension of the award period can only be authorized by the Grants Officer in writing. Verbal or written assurances of funding from other than the Grants Officer shall not constitute authority to obligate funds for programmatic activities beyond the expiration date.

c. The NRC has no obligation to provide any additional prospective or incremental funding. Any modification of the award to increase funding and to extend the period of performance is at the sole discretion of the NRC.

d. Requests for extensions to the period of performance shall be sent to the Grants Officer at least 30 days prior to the grant/cooperative agreement expiration date. Any request for extension after the expiration date shall not be honored.

Automated Standard Application For Payments (ASAP) Procedures

Unless otherwise provided for in the award document, payments under this award will be made using the Department of Treasury's Automated Standard Application for Payment (ASAP) system < http://www.fms.treas.gov/asap/ >. Under the ASAP system, payments are made through preauthorized electronic funds transfers, in accordance with the requirements of the Debt Collection Improvement Act of 1996. In order to receive payments under ASAP, Grantees are required to enroll with the Department of Treasury, Financial Management Service, and Regional Financial Centers, which allows them to use the on-line method of withdrawing funds from their ASAP established accounts. The following information will be required to make withdrawals under ASAP: (1) ASAP account number – the award number found on the cover sheet of the award; (2) Agency Location Code (ALC) – 31000001; and Region Code. Grantees enrolled in the ASAP system do not need to submit a "Request for Advance or Reimbursement" (SF-270), for payments relating to their award.

Audit Requirements

Organization-wide or program-specific audits shall be performed in accordance with the Single Audit Act Amendments of 1996, as implemented by OMB Circular A-133, "Audits of States, Local Governments, and Non-Profit Organizations." http://www.whitehouse.gov/omb/circulars/a133/a133.html Grantees are subject to the provisions of OMB Circular A-133 if they expend $500,000 or more in a year in Federal awards.

The Form SF-SAC and the Single Audit Reporting packages for fiscal periods ending on or after January 1, 2008 must be submitted online.

1. Create your online report ID at http://harvester.census.gov/fac/collect/ddeindex.html
2. Complete the Form SF-SAC
3. Upload the Single Audit
4. Certify the Submission
5. Click "Submit."

Organizations expending less than $500,000 a year are not required to have an annual audit for that year but must make their grant-related records available to NRC or other designated officials for review or audit.

III. Programmatic Requirements

Performance (Technical) Reports

a. The Grantee shall submit performance (technical) reports electronically to the NRC Project Officer and Grants Officer as specified in the special award conditions in the same frequency as the Federal Financial Report unless otherwise authorized by the Grants Officer.

b. Unless otherwise specified in the award provisions, performance (technical) reports shall contain brief information as prescribed in the applicable uniform administrative requirements 2 CFR §215.51 which are incorporated in the award.

Unsatisfactory Performance

Failure to perform the work in accordance with the terms of the award and maintain at least a satisfactory performance rating or equivalent evaluation may result in designation of the Grantee as high risk and assignment of special award conditions or other further action as specified in the standard term and condition entitled "Termination".

Failure to comply with any or all of the provisions of the award may have a negative impact on future funding by NRC and may be considered grounds for any or all of the following actions: establishment of an accounts receivable, withholding of payments under any NRC award, changing the method of payment from advance to reimbursement only, or the imposition of other special award conditions, suspension of any NRC active awards, and termination of any NRC award.

Other Federal Awards With Similar Programmatic Activities

The Grantee shall immediately provide written notification to the NRC Project Officer and the Grants Officer in the event that, subsequent to receipt of the NRC award, other financial assistance is received to support or fund any portion of the program description incorporated into the NRC award. NRC will not pay for costs that are funded by other sources.

Prohibition Against Assignment By The Grantee

The Grantee shall not transfer, pledge, mortgage, or otherwise assign the award, or any interest therein, or any claim arising thereunder, to any party or parties, banks, trust companies, or other financing or financial institutions without the express written approval of the Grants Officer.

Site Visits

The NRC, through authorized representatives, has the right, at all reasonable times, to make site visits to review project accomplishments and management control systems and to provide such technical assistance as may be required. If any site visit is made by the NRC on the premises of the Grantee or contractor under an award, the Grantee shall provide and shall require his/her contractors to provide all reasonable facilities and assistance for the safety and convenience of the Government representative in the performance of their duties. All site visits and evaluations shall be performed in such a manner as will not unduly delay the work.

IV. Miscellaneous Requirements

Criminal and Prohibited Activities

a. The Program Fraud Civil Remedies Act (31 USC §§ 3801-3812), provides for the imposition of civil penalties against persons who make false, fictitious, or fraudulent claims to the

Federal government for money (including money representing grant/cooperative agreements, loans, or other benefits.)

b. False statements (18 USC § 287), provides that whoever makes or presents any false, fictitious, or fraudulent statements, representations, or claims against the United States shall be subject to imprisonment of not more than five years and shall be subject to a fine in the amount provided by 18 USC § 287.

c. False Claims Act (31 USC 3729 et seq), provides that suits under this Act can be brought by the government, or a person on behalf of the government, for false claims under federal assistance programs.

d. Copeland "Anti-Kickback" Act (18 USC § 874), prohibits a person or organization engaged in a federally supported project from enticing an employee working on the project from giving up a part of his compensation under an employment contract.

American-Made Equipment And Products
Grantees are herby notified that they are encouraged, to the greatest extent practicable, to purchase American-made equipment and products with funding provided under this award.

Increasing Seat Belt Use in the United States
Pursuant to EO 13043, Grantees should encourage employees and contractors to enforce on-the-job seat belt policies and programs when operating company-owned, rented or personally-owned vehicle.

Federal Employee Expenses
Federal agencies are generally barred from accepting funds from a Grantee to pay transportation, travel, or other expenses for any Federal employee unless specifically approved in the terms of the award. Use of award funds (Federal or non-Federal) or the Grantee's provision of in-kind goods or services, for the purposes of transportation, travel, or any other expenses for any Federal employee may raise appropriation augmentation issues. In addition, NRC policy prohibits the acceptance of gifts, including travel payments for Federal employees, from Grantees or applicants regardless of the source.

Minority Serving Institutions (MSIs) Initiative
Pursuant to EOs 13256, 13230, and 13270, NRC is strongly committed to broadening the participation of MSIs in its financial assistance program. NRC's goals include achieving full participation of MSIs in order to advance the development of human potential, strengthen the Nation's capacity to provide high-quality education, and increase opportunities for MSIs to participate in and benefit form Federal financial assistance programs. NRC encourages all applicants and Grantees to include meaningful participations of MSIs. Institutions eligible to be considered MSIs are listed on the Department of Education website:
http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html

Research Misconduct
Scientific or research misconduct refers to the fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. It does not include honest errors or differences of opinions. The Grantee organization has the primary responsibility to investigate allegations and provide reports to the Federal Government. Funds expended on an activity that is determined to be invalid or unreliable because of scientific misconduct may result in a disallowance of costs for which the institution may be liable for

repayment to the awarding agency. The Office of Science and Technology Policy at the White House published in the Federal Register on December 6, 2000, a final policy that addressed research misconduct. The policy was developed by the National Science and Technology Council (65 FR 76260). The NRC requires that any allegation be submitted to the Grants Officer, who will also notify the OIG of such allegation. Generally, the Grantee organization shall investigate the allegation and submit its findings to the Grants Officer. The NRC may accept the Grantee's findings or proceed with its own investigation. The Grants Officer shall inform the Grantee of the NRC's final determination.

Publications, Videos, and Acknowledgment of Sponsorship

Publication of the results or findings of a research project in appropriate professional journals and production of video or other media is encouraged as an important method of recording and reporting scientific information. It is also a constructive means to expand access to federally funded research. The Grantee is required to submit a copy to the NRC and when releasing information related to a funded project include a statement that the project or effort undertaken was or is sponsored by the NRC. The Grantee is also responsible for assuring that every publication of material (including Internet sites and videos) based on or developed under an award, except scientific articles or papers appearing in scientific, technical or professional journals, contains the following disclaimer:

> "This [report/video] was prepared by [Grantee name] under award [number] from [name of operating unit], Nuclear Regulatory Commission. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the view of the [name of operating unit] or the US Nuclear Regulatory Commission."