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

1. GRANT/AGREEMENT NO.	2. MODIFICATION NO.	3. PERIOD OF PERFORMANCE	4. AUTHORITY
NRC-04-10-0150		FROM: 09/30/2010 TO: 09/29/2015	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
☐ GRANT ☒ COOPERATIVE AGREEMENT	DUNS#: 062511126 Nonprofit Organization	ELECTRIC POWER RESEARCH INSTITUTE, INC. 3420 HILLVIEW AVE PALO ALTO CA 943041338 rreid@epri.com

8. PROJECT TITLE:
Zorita Internals Research Project

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 AND APPENDIX A-PROJECT GRANT PROVISIONS	☐ PROGRESS AND FINAL ☐ FINAL ONLY ☒ OTHER (Conference Proceedings)	Richard D. Reid, PhD, 650-855-2237 Senior Project Manager Electric Power Research Institute 3420 Hillview Avenue Palo Alto CA 94304 rreid@epri.com

12. NRC PROGRAM OFFICE (NAME and ADDRESS)	13. ACCOUNTING and APPROPRIATION DATA	14. METHOD OF PAYMENT
US Nuclear Regulatory Commission Attention: Carol Moyer Mailstop: CSB-5A24M 11545 Rockville Pike Rockville MD 20852 301-251-7641	APPN. NO: 31X0200.060 B&R NO: 060-15-111-127 JOB CODE: K6000 BOC NO: 4110 OFFICE ID NO: RES-C10-847	☐ ADVANCE BY TREASURY CHECK ☐ REIMBURSEMENT BY TREASURY CHECK ☐ LETTER OF CREDIT ☒ OTHER (SPECIFY) Electronic ASAP.gov (See Remarks in Item #20 "Payment Information")

15. NRC OBLIGATION FUNDS		16. TOTAL FUNDING AGREEMENT		
THIS ACTION	$573,000.00	NRC	$1,175,000.00	This action provides funds for Fiscal Year in the amount of See Page 2
PREVIOUS OBLIGATION	$0.00	RECIPIENT	$4,784,594.00	
TOTAL	$573,000.00	TOTAL	$5,959,594.00	

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

U.S. Nuclear Regulatory Commission
Div. of Contracts
Attn: Erika Eam, 301-492-3492
Mail Stop: TWB-01-B10M
Washington, DC 20555
Erika.Eam@nrc.gov

18.	19. NRC CONTRACTING OFFICER
SIGNATURE NOT REQUIRED	Sheila Bumpass 9/23/2010 (Signature) (Date) NAME (TYPED) Sheila Bumpass TITLE Agreement 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 COOPERATIVE AGREEMENT

The purpose of this Cooperative Agreement is to provide support to the "Electric Power Research Institute (EPRI) Zorita Internals Research Program" as described in Attachment B entitled "Program Description."

A.2 PERIOD OF COOPERATIVE AGREEMENT

1. The effective date of this Cooperative Agreement is September 30, 2010. The estimated completion date of this Cooperative Agreement is September 29, 2015.

2. Funds obligated hereunder are available for program expenditures for the estimated period: September 30, 2010 – September 29, 2011.

A. GENERAL

1. Total Estimated NRC Amount:	$1,175,000.00
2. Total Obligated Amount:	$573,000.00
3. Cost-Sharing Amount:	$4,782,598.00
4. Activity Title:	To generate data on the effects of irradiation on reactor internal materials.
5. NRC Project Officer:	Carol Moyer
6. DUNS No.:	062511126

B. SPECIFIC

RFPA No.:	RES-10-150
FFS:	RES-C10-847
Job Code:	K6000
BOC:	4110
B&R Number:	060-15-111-127
Appropriation #:	31X0200.060
Amount Obligated:	$573,000

A.3 BUDGET

The following is a Cooperative Agreement Budget. Revisions to the budget shall be made in accordance with Revision of Cooperative Agreement Budget in accordance with 2 CFR 215.25.

Cost Elements	USNRC
Personnel	$12,709
Fringe Benefits	$11,183
Travel	$1,033
Contractual	$1,001,344
Other	$260
Indirect Charges	$148,471
Total	$1,175,000

A.4 AMOUNT OF AWARD AND PAYMENT PROCEDURES

1. The total estimated amount of this Award is $1,175,000 for the five year period. Years two – five are subject to the availability of funding.

2. NRC hereby obligates the amount of $573,000 for program expenditures during the period set forth above and in support of the Budget above. The Recipient will be given written notice by the Contracting Officer when additional funds will be added. NRC is not obligated to reimburse the Recipient for the expenditure of amounts in excess of the total obligated amount.

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

4. Additional funds up to the total amount of the Cooperative Agreement shown above may be obligated by NRC subject to the availability of funds and satisfactory progress of the project.

A.5 PROGRAM INCOME

Program income is defined as gross income earned by the recipient that is directly generated by a support activity or earned as a result of the award. Recipients earning program income are required to report that income to the Grants Officer. In accordance with 2 CFR 215.44, the recipient is required to either deduct proportionally from the NRC's share of the project or returned the proportionate amount to the NRC. This obligation affects program income earned after the end of the project period and to program income earned from license fees and royalties for copyrighted material, patents, and inventions produced under the award or as a result of the award.

Attachment B – Program Description

Zorita Intemals Research Project

1. Background and Objectives:

1.1 Program Objective

The overall objective of the Zorita Internals Research project is to generate data on the effects of irradiation on reactor internal materials. Testing will be performed to investigate Irradiation Assisted Stress Corrosion Cracking (IASCC) initiation and crack growth rates, mechanical properties (tensile and fracture toughness) and micro-structural properties (including swelling/void formation and gas content) of material harvested from the Zorita reactor vessel internals. The testing of such highly irradiated materials will provide crucial information needed to support on-going plant operating, aging management and scheduled maintenance programs, and plant life extension.

1.2 Jose Cabrera Nuclear Power Plant (ItZorita")

Construction on Spain's first nuclear power plant began in July 1965. The plant known as Jose Cabrera (more commonly referred to as Zorita), was a 160 MWe pressurized water reactor (PWR). The nuclear stream supply system (NSSS) was designed by the Westinghouse Electric Corporation for Union Electrica (Union FENOSA). Initial criticality of the plant occurred in June 1968, with commercial startup in February 1969. The plant was permanently disconnected from the national power grid on April 30, 2006 after approximately 38 years of operation. During this period, 26.4 Effective Full Power Years (EFPY) of reactor operation were accumulated. After 26.4 EFPY, the highest fluence on the reactor vessel internals was estimated to be 58 dpa (displacement per atom).

1.3 Zorita Material Description

Material from the Zorita plants offers several unique characteristics with respect to evaluation of irradiation effects on plant materials. This includes use of:

- structural materials after a much greater life/fluence combination than has been previously investigated (26.4 EFPY /up to 58 dpa);
- *in situ* PWR irradiation exposure (as opposed to test reactor or BWR exposures);
- thick section material to properly assess plant structural materials behavior (thick section material allows for the evaluation of gamma heating effects); and
- sufficient volume of material to develop a detailed, systematic material property database which includes tensile, fracture toughness, crack initiation and crack growth rate (CGR) data.

The Zorita reactor vessel internals contain baffle plates and former plates fabricated from annealed hot rolled 304SS. The core barrel was also fabricated using 304 SS. The material will be harvested from the Zorita plant during plant decommissioning. Extraction is currently scheduled to occur in early 2012.

1.4 Program Elements

The Zorita Internals Research Project as described herein contains the elements listed below.

1. Material identification and characterization, including cutting plan, and radiation and temperature analysis;
2. extraction of materials from the Zorita plant;
3. shipping of material from Zorita to the machining/testing facility.;

4. machining of test specimens and transfer to test facilities;
5. tensile strength measurements;
6. irradiation assisted stress corrosion cracking (IASCC) initiation testing;
7. IASCC crack growth rate (CGR) testing;
8. fracture toughness measurements;
9. data analysis and reporting;
10. final waste disposal
11. micro-structural investigation of grain boundary chemistry and grain size;
12. microscopic analysis for detection of voids and bubbles; and
13. analysis of hydrogen and helium content.

1.5 Zorita Internals Neutron Fluence and Temperature Characterization

Under contract to the Spanish Nuclear Safety Authority (CSN), an independent contractor (SOCCOIN) has estimated that peak fluence at the inner baffle plate surface in the Zorita reactor vessel internals was 58 dpa after 26.4 EFPY. SOC COIN estimated that the fluence in the baffle plates dropped from the peak value of 58 dpa to 1 dpa. In addition to the drop off along the baffle plate perimeter, there is a drop off of the fluence through the baffle plate thickness due to attenuation.

The temperature history of the material is not well characterized. Key temperature effects include g"ammaheating, heat transfer from the coolant and conduction from the fuel.

1.6 Testing Overview

Hot cell testing will include tensile, fracture toughness, IASCC crack growth and initiation rate tests. The results from these tests will be evaluated using methodologies similar to the data analysis performed as part of previous internals material research projects.

In parallel with this work, thin specimens of 304SS baffle plate material will be examined using optical microscopy, and transition electron microscopy/energy dispersive spectroscopy (TEM/EDS). Hardness measurements will also be performed on" the material, as well as the determination of hydrogen and helium content via gas chromatography.

2. Tasks:

2.1 Radiation and Temperature Analysis

Computational analyses will be performed to determine the irradiation (fluence) profile, temperature profile and critical operational history of the material to be used in the test program. To fully characterize the test materials, detailed analyses of a 1/8 section of a baffle former barrel assembly will be performed to determine thermal and fast fluence, dpa and temperature in the material to be tested. The thermal analysis will use the gamma heating input from radiation
analysis and will consider only those significant changes in operation that would affect the temperature profile.

2.2 Material Extraction

Material will be extracted from up to six (6) specified locations. The locations will include material with high (>50 dpa), intermediate (-30 dpa) and low (-10 dpa) degrees of irradiation. Material from three locations - designated B1, B2 and B3 - will be used in the program covered under this Statement of Work. Remaining pieces will be retained for use in future test programs.

2.3 Shipment and Receipt of Zorita Reactor Vessel Internals Materials

Material extracted from the Zorita site in Spain will be shipped to a facility licensed and capable of handling radioactive material. This includes responsibility for obtaining all required licenses, cask rental and shipping logistics. Table 2-1 provides the characterization of the materials to be removed from the Zorita plant reactor internals (approximate). Material extraction is scheduled to occur during a window of February to May 2012. Note that pieces designated BI, B2 and B3 will be used in the test program covered under this Statement of Work. Pieces AI, A2 and "Weld" will be retained for later use in separate testing programs.

Piece	W (cm)	L (cm)	T (cm)	Volume (cm^3)	Mass (kg)	2011 β/γ Activity (Ci)	2014 β/γ Activity (Ci)	2011 β/γ Activity (TBq)	2014 β/γ Activity (TBq)
A1	10.15	45.81	2.86	1328	10.6	701	442	26	16
A2	7.51	23.81	2.86	511	4.1	269	170	10	6
B1 (high fluence)	7.63	88.07	2.86	1921	15.4	2893	1827	107	68
B2 (intermediate fluence)	6.46	54.80	2.86	1012	8.1	1339	846	50	31
B3 (low fluence)	7.00	54.80	2.86	1096	8.8	578	365	21	14
Weld	13.14	64.96	2.86	2440	19.5	632	399	23	15
Total				8307	66.5	6413	4050	237	150

Table 2-1 provides the characterization of the materials to be removed from the Zorita plant reactor internals

2.4 Material Receipt

This task covers receipt of the Zarita Reactor Internals material. This includes all material handling, including unloading, inspection, material inventory, material storage (for up to five years) and record keeping (e.g. photography).

2.5 Test Specimen Machining

This task covers machining of test specimens from the bulk material removed from Zorita. This task also includes shipment of small test specimens to MHI in Japan (see fourth bullet below).

- A minimum of ten (10) 0.5 T- CT specimens for crack growth rate testing; this total includes specimens from high, intermediate and low fluence baffle plate material.
- A minimum of eight (8) 0.5 T- CT specimens or specimen blanks for fracture toughness testing; this total includes specimens from high, intermediate and low fluence baffle plate material.
- A minimum of ten (I0) tensile specimens; this total includes four (4) specimens from high fluence baffle plate material, three (3) specimens from moderate fluence baffle plate material, and three (3) specimens from low fluence baffle plate material.
- A minimum of twenty-two (24) O-ring specimens for crack initiation testing, all cut from high fluence baffle plate material.
- A minimum of six (6) specimens for micro-structural analysis; this total includes thin slices (30mmX30mmX5mm) from available high and intermediate fluence 304 SS baffle plate material (three (3) at each fluence level). These specimens will be shipped to the Narita airport for receipt by MHI.

2.6 Tensile Strength Testing

Tensile strength testing will be performed on baffle plate material using agreed upon standard test methods. Testing will be performed on a minimum of four (4) tensile specimens of high

fluence (>50 dpa), three (3) at intermediate fluence (~30 dpa) and three (3) tensile specimens of lower fluence (~l a dpa). Testing will be conducted in air at room temperature (-25°C) and at 320°C.

2.7 Crack Initiation Testing

Crack initiation testing will be performed on baffle plate material using agreed upon standard test methods. This testing will include pre-loading and testing a minimum of 24 O-ring specimens at high fluence (i.e., >50 dpa) in simulated PWR primary coolant water chemistry at 320°C (see below) for a maximum of 9000 hours or failure before reaching 9000 hours.

Simulated PWR primary coolant water chemistry shall meet the specifications provided below.

- H3B03 - 1000 ppm as B
- LiOH ~ 2 ppm as Li

The following conditions will be controlled:

- Dissolved oxygen < 5 ppb
- Dissolved hydrogen ~ 30 cm3/kg H20
- Chlorine <30 ppb
- Fluorine <30 ppb
- pH ~ 6.9 at room temperature
- Conductivity of the de-ionized water <0.3 Ils/cm
- Total dissolved solids <0.2 ppm
- Dissolved silica < 0.1ppm

2.8 Crack Growth Rate (CGR) Testing

Crack growth rate testing will be performed on baffle plate material using agreed upon standard test methods. During the tests, *in situ* measurement of crack length shall be performed using properly referenced electrical potential difference. Test specimens will include six (6) high fluence specimens (>50 dpa), two (2) intermediate fluence specimens (-30 dpa) and two (2) low fluence specimens (-10 dpa). Six tests will be performed at 320°C (two at each fluence level), two at 290°C (high fluence) and two at 340°C (high fluence). All tests will be performed using 0.5T -CT specimens in simulated PWR primary coolant water chemistry (see Task 2.7 above). It is intended that fracture testing be performed using the same test specimens if sufficient ligament remains after straightening the crack front following COR testing.

2.9 Fracture Toughness Testing

Fracture toughness (J-R) testing will be performed on baffle plate material using agreed upon standard test methods at 320°C. It is intended that this testing be performed on specimens used in Task 2.8 COR testing if sufficient ligament remains in these specimens. Testing will be performed on a minimum of two (2) specimens of high fluence (>50 dpa)), two (2) specimens at intermediate fluence (-30 dpa) and two (2) specimens of lower fluence (-10 dpa). All specimens shall be 0.5 T-CT specimens. For each fluence level, two specimens will be tested in air. For the lowest fluence, two specimens shall also be tested in under simulated primary coolant conditions.

2.10 Waste Disposal

This task covers disposal of all waste materials generated during the program. This includes all used and unused test materials, remnants from specimen preparation, tools, consumables and miscellaneous wastes generated during testing.

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:

- Cooperative Agreement program legislation and program regulation cited in this Notice of Cooperative Agreement 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 Cooperative 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 (now2 CFR 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 cooperative agreement are applicable to the Recipient and to sub-recipients which meet the definition of "Recipient" in Part 215, unless a section specifically excludes a sub-recipient from coverage.

The Recipient 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. Recipients 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

This award is composed of an award face page, Program Description, and the NRC Standard Provisions for U.S. Nongovernmental Recipients. This award constitutes acceptance by the NRC of the Recipient's program description and budget as incorporated into this award document.

Substantial Involvement

This award is issued as a Cooperative Agreement, a financial assistance mechanism in which substantial NRC programmatic involvement is anticipated in the performance of the activity. Under the cooperative agreement, the NRC purpose is to support and stimulate the recipients' activities by involvement in and otherwise working jointly with the award recipients in a partnership role; it is not to assume direction, prime responsibility, or a dominant role in the activities. Consistent with this concept, the dominant role and prime responsibility resides with the awardees for the project as a whole, although specific tasks and activities may be shared among the awardees and the NRC as defined below.

1. Recipient Responsibility.

a. The Recipient will bear primary responsibility for the conduct of the research and will exercise judgment towards attaining the stated research objectives within the limits of the Cooperative Agreement's terms and conditions.

b. The principal investigator(s) specified in the Cooperative Agreement will be continuously responsible for the conduct of the research project and will be closely involved with the research effort. The principal investigator, operating within the policies of the Recipient, is in the best position to determine the means by which the research may be conducted most effectively.

c. The principal investigator has primary authorities and responsibilities to define objectives and approaches, and to plan, conduct, analyze, and publish results, interpretations, and conclusions of their research and other activities. The Principal Investigator should be prepared to work collaboratively with the NRC to achieve the goals of this cooperative agreement and agree to accept the participatory and cooperative nature of the group process. The Principal Investigator is required to submit annual progress reports to NRC, as appropriate, and to provide site performance information as stipulated by NRC

2. NRC Responsibilities

a. The NRC Project Officer (PO) will have substantial involvement above and beyond the normal program stewardship of the award. The NRC PO partners with the recipient's research team representing the government's interest in the substantive work of the research team. The primary role of the NRC PO is to facilitate the work of the recipient. The NRC PO will have

overall responsibility for monitoring the conduct and progress of Recipient Sites, including conducting site visits. The PO will provide substantial input, in collaboration with the recipients, both in the planning and implementation of the program and in evaluation activities, and will make recommendations regarding program continuance. Likewise, Federal Project Officers will participate in the publication of results and packaging and dissemination of products and materials in order to make the findings available to the field, where appropriate. The Nuclear Regulatory Commission staff will receive authorship/co-authorship credit on all publications to which they have made substantial contribution

b. Additionally, The NRC Project Officer (PO) will have substantial involvement above and beyond the normal program stewardship of the award.

Programmatic: NRC program staff will serve on project steering committees as voting members.

Scientific: NRC program staff will monitor the Recipient's research protocols, approve sub recipients, provide technical monitoring of research work, and review and comment on publications from the project.

c. Role of the NRC Grants Officer:

The NRC Grants Officer (GO) is responsible for all business management aspects of negotiation, award, financial and administrative aspects of the cooperative agreement. The GO utilizes information from site visits, reviews of expenditure and audit reports and other appropriate means to assure that the project is operated in compliance with all applicable Federal laws, regulations, guidelines and the terms and conditions of award. Questions concerning the applicability of regulations and policies to this cooperative agreement and all requests for required prior approvals such as requests for permission to expend funds for certain items should be directed to the GO. Required approvals must be provided in writing and the GO is the only person who may grant such required approvals. Written approvals granted by other officials are not binding on the government. All changes in the terms of the cooperative agreement award must be issued in writing by the GO.

§ 215.41 Recipient responsibilities.

The Recipient 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 recipient of the contractual responsibilities arising under its contract(s). The recipient 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 Recipient 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 Recipient 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 recipient makes certain budget modifications or undertakes particular activities. If NRC approval is required for changes in the 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 Recipient 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 Recipient 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 Recipient 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 Recipient must submit the SF-LLL, including those received from sub-recipients, contractors, and subcontractors, to the Grants Officer.

§ 215.13 Debarment And Suspension.

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

The Recipient further agrees to include the following provision in any sub-agreement or contracts entered into under this award:

'Debarment, Suspension, Ineligibility, and Voluntary Exclusion

The Recipient 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 Recipient 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 Recipient 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 Recipient to ensure compliance with these Executive Orders and laws. This provision must be included in all contracts/sub-agreements issued under this cooperative agreement. Award Recipients 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 recipients 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 Recipients, 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 Recipient'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 cooperative agreement 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 recipients the right to elect title and retain ownership to inventions they develop with funding under an NRC cooperative agreement award ("subject inventions"). In accepting an award, the recipient 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 recipient 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 recipients to use this system to comply with Bayh-Dole and related intellectual property reporting requirements. The system allows for recipients 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 Recipients, 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 Recipient uses or has used patented technology under this award without license or permission from the owner, the Recipient 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 Recipient 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 Recipient 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 Recipient employees may be copyrighted but only the part authored by the Recipient 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 Recipient 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 Recipient 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 recipient 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 recipient 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 recipient'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 recipient 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. Recipient 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 Recipient and used to further eligible project or program objectives, or returned to the NRC.
- 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 Recipient 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 Recipient 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 recipient 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 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, Recipients 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. Recipients 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 Recipients 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 cooperative agreement-related records available to NRC or other designated officials for review or audit.

II. Programmatic Requirements

Performance (Technical) Reports

a. The Recipient 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.

c. The submission for the six month period ending March 31st is due by April 30th. The submission for the six month period ending September 30th is due by October 31st. A formal report will be prepared documenting the results of the radiation and temperature analysis (Task 2.2). A single formal report will be prepared after completion of tensile strength testing (Task 2.6), crack growth rate testing (Task 2.8) and fracture toughness testing (Task 2.9). A final comprehensive report will be prepared documenting the results of crack initiation testing (Task 2.7), as well as the previously reported results for Tasks 2.2, 2.6, 2.8 and 2.9. These reports will be in standard EPRI format. In addition, informal summary program reports will be provided electronically (e.g., via e-mail). These reports shall contain a summary of tasks completed, including key results, as well as a forecast of planned work for the next six months.

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 Recipient 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 Recipient 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 Recipient
The Recipient 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 Recipient or contractor under an award, the Recipient 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.

III. 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 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
Recipients are hereby 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, Recipients 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 Recipient 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 Recipient'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 Recipients 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 from Federal financial assistance programs. NRC encourages all applicants and Recipients 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 Recipient 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 Recipient organization shall investigate the allegation and submit its findings to the Grants Officer. The NRC may accept the Recipient's findings or proceed with its own investigation. The Grants Officer shall inform the Recipient 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 Recipient 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 Recipient 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 [Recipient 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."