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

1. GRANT/AGREEMENT NO.	2. MODIFICATION NO.	3. PERIOD OF PERFORMANCE	4. AUTHORITY
NRC-HQ-11-G-38-0045		FROM: 8/22/2011 TO: 8/31/2012	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: 555456995 NAICS: 611310	Board of Regents, University of Nebraska - Lincoln 312 North 14th Street Lincoln, NE 68588-0430

8. PROJECT TITLE:
Collaborative Distance Education Course on Radiation and Dosimetry in Nuclear Health Physics

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 Nebraska - Lincoln Attn: Prof. Brian W. Robertson Mechanical Engineering and NCMN Email: brobertson@unl.edu 402-472-8308

12. NRC PROGRAM OFFICE (NAME and ADDRESS)	13. ACCOUNTING and APPROPRIATION DATA	14. METHOD OF PAYMENT
NRC Attn: Tanya Parwani-Jaimes Office of Human Resources MS: GW5A06 (301) 492-2308 11545 Rockville Pike Rockville, Maryland 20852 Email: Tanya.Parwani-Jaimes@NRC.GOV	APPN. NO: 31X0200 B&R NO: 2011-84-51-K-134 JOB CODE: T8453 BOC NO: 4110 OFFICE ID NO: RFPA: HR-11-252 FAIMIS: GR0035	[ ] 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	$143,125.00	NRC	$143,125.00	This action provides funds for Fiscal Year In the amount of See Page Two
PREVIOUS OBLIGATION		RECIPIENT		
TOTAL	$143,125.00	TOTAL	$143,125.00	

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

U.S. Nuclear Regulatory Commission
Div. of Contracts
Attn: Shashi Malhotra Email: Shashi.Malhotra@NRC.GOV
Mail Stop: TWB-01-B10M
Rockville MD 20852

18.	19. NRC CONTRACTING OFFICER
Signature Not Required	Sheila Bumpass (Signature) 8/19/11 (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 "Collaborative Distance Education Course on Radiation and Dosimetry in Nuclear Health Physics : Board of Regents, University of Nebraska - Lincoln" as described in Attachment B entitled "Program Description."

A.2 PERIOD OF GRANT

1. The effective date of this Grant is August 22, 2011. The estimated completion date of this Grant is August 31, 2012.

2. Funds obligated hereunder are available for program expenditures for the estimated period: August 22, 2011 – August 31, 2012.

A. GENERAL

1. Total Estimated NRC Amount:	$143.125.00
2. Total Obligated Amount:	$143.125.00
3. Cost-Sharing Amount:	$0
4. Activity Title:	Collaborative Distance Education Course on Radiation and Dosimetry in Nuclear Health Physics
5. NRC Project Officer:	Tanya Parwani-Jaimes
6. DUNS No.:	555456995

B. SPECIFIC

RFPA No.:	HR-11-252
FAIMIS:	GR0035
Job Code:	T8453
BOC:	4110
B&R Number:	2011-84-51-K-134
Appropriation #:	31X0200
Amount Obligated:	$143.125.00

A.3 BUDGET

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

	UNL (Prime)	Baylor(sub)	KSU(sub)	**Year 1 Total**
Personnel	$20,438.00	$13,000.00	$20,824.00	$54,262.00
Fringe Benefits	$ 4,463.00	$ 2,800.00	$ 6,872.00	$14,135.00
Travel	$ 600.00	$ 4,000.00	$ 0.00	$ 4,600.00
Equipment	$ 0.00	$ 3,000.00	$ 0.00	$ 3,000.00
Supplies and Services	$12,000.00	$ 2,000.00	$ 1,500.00	$15,700.00
Total Direct Cost	$37,701.00	$24,800.00	$29,196.00	$91,697.00
Indirect Cost	$32,449.00	$ 9,052.00	$ 9,927.00	$51,428.00
Yearly Total	**$70,150.00**	**$33,852.00**	**$39,123.00**	**$143,125.00**

A.4 AMOUNT OF AWARD AND PAYMENT PROCEDURES

1. The total estimated amount of this Award is $143.125.00for the one-year period.

2. NRC hereby obligates the amount of $143.125.00 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

Project Title: Collaborative Distance Education Course on Radiation and Dosimetry in Nuclear Health Physics

OVERVIEW

Project Aims:
In this project, we will create, and deliver for the first time, a new 3-credit university course, "Radiation and Dosimetry in Nuclear Health Physics", highly innovative in attributes, collaborative strategies and delivery. The project is enabled by collaboration amongst faculty in engineering at three of the Big 12 universities in the Big 12 Engineering Consortium – University of Nebraska-Lincoln (UNL) as lead institution, along with Baylor University (Baylor) and Kansas State University (KSU). They, and an experienced educational evaluator, will apply their skills and resources, including those related to nuclear radiation detection, nuclear engineering, health physics and distance education, to design, test and evaluate a closely, collaborative, modular course. This course will be offered as a technical elective to all Big 12 Nuclear Engineering students and, in part or as a whole, to Big 12 students in related disciplines who are attracted by the topics and whom we can then encourage to consider further education and a career related to nuclear power, nuclear engineering, and / or uses of nuclear radiation in health or other fields. While UNL will join the Big 10 schools in 2011, this athletic realignment has no influence on UNL participation in the Big 12 Engineering Consortium, which will soon also include additional partner and associate schools beyond the Big 12 who have expressed and demonstrated a desire to join this engineering education consortium. A key aim is to target students who are unaware of nuclear engineering and its applications.

Innovative Instructional Nature of Project to Enhance Student Learning:

This project has a good number of innovative aspects, including these six:

1) The development and offering of the course benefits from close collaboration by faculty at three Big 12 schools who share relevant expertise and strong interests.
2) The delivery of the course benefits from, and strongly contributes to, the Big 12 Engineering Consortium program in Nuclear Engineering (described in necessary detail below).
3) Students in undergraduate degree programs at Big 12 schools can enroll in the course in connection with their degrees as readily as if the course was offered and delivered entirely on their own campus.

4) Most unusually for distance education, the course includes a carefully-designed, safetytested, experimental component that will give each enrolled student hands-on experience, with only minimal need for laboratory equipment at the student's own university.
5) To promote best learning outcomes and enthusiasm amongst all students who take the course, the proposing universities are collaborating to contribute, and then teach, three complementary parts of the course in successive modules that are highly coordinated and well-integrated.
6) The modular structure of the course is deliberately chosen to enable the course as a whole, and the individual modules as well, to be most flexibly valuable as a tool for attracting students from other majors to nuclear engineering and to careers that relate to nuclear power and use of radiation, particularly in nuclear and health fields.

Several aspects could readily be extended once the course is established, as discussed later.

Big 12 Engineering Consortium

Since the project we propose is for a course that will be offered to any qualified student enrolled at any Big 12 school who registers for the course by the course number adopted by their own school – that is, as transparently and simply as if the student were registering for an on-campus course – it is necessary to describe the Big 12 Engineering Consortium nuclear engineering curriculum briefly here in the project overview and then in more detail later.

The Big 12 Engineering Consortium was formed in May 2008 primarily to address the escalating need for engineers who have a basic knowledge of nuclear engineering (NE). The Big 12 schools started offering fully online NE courses in Spring 2007 with only a few enrollments. By Fall 2009, more than 90 students had enrolled to take the Big 12 NE courses. Drawing on Big 12 offerings, Iowa State University and Texas Tech University are newly offering NE minors, and Kansas State University is revising institutional policy to allow for delivery of a fully online minor for post-baccalaureate working professionals. The Consortium currently offers nine online courses in NE (listed in Table 1 below). The Big 12 faculty agree that there is still a need to develop and offer more fully online courses, as well as modularized lessons that can be incorporated into non-nuclear courses to reach students outside the NE major. This project will help towards a critical set of technical elective courses and a broadly useful set of lessons.

This Project in Context of Other Big 12 Projects Proposed to NRC:

The project proposed here, and the other three interrelated Big 12 projects simultaneously proposed to NRC under the same call for proposals, will enable collaborative development and delivery of fully online 3-credit courses for the benefit of students who are degree-seeking at Big 12 schools and for working professionals who are seeking to re-tool. The other Big 12 proposals are titled: "Online Nuclear Engineering Laboratory (1LAB): Virtual Reactor Experiments", "Innovative Nuclear Engineering Materials and Corrosion Modules for Enhancement and Expansion of the US-NE Educational Infrastructure", and "Development and Implementation of a Distance Education Course Sequence that Addresses the Need for Engineers Trained in Probabilistic Risk Assessment and Fire Protection". The four projects, and their proposed courses, are coordinated and synergistic. Each course is individually tailored to be highly beneficial to the education, and motivation, of students in nuclear engineering and affiliated fields. Separately, and together, the proposed projects are expected to:

- Enhance and expand the collaboration among faculty at the Big 12 universities and encourage interactions to develop user-friendly educational offerings.
- Support development of new and innovative educational lessons, modules, and courses, including virtual laboratory experiments for both distance and on-campus education.
- Increase interest of students from other disciplines in nuclear engineering.
- Promote proactive recruitment and training of students interested in the nuclear area.
- Advance long-term collaborative efforts among Big 12 schools to ensure sustainability in
- addressing critical workforce issues.
- Engage nuclear industry to continually enhance education and training of their current and future employees.

We emphasize that we propose our project because we believe that its own merits and objectives provide an important, needed, advance in nuclear education that is consistent with NRC goals. We expect this proposal to stand, and to be reviewed, on its own. However, we are convinced that the greatest positive impact on student education, recruitment and retention in respect of nuclear engineering careers will be gained by our project team, along with the other Big 12 NE faculty, being able to offer the full set of courses to students.

The impact of our project, and the others proposed by Big 12 schools in response to the present RFP, is greatly enhanced by, and will help promote, the success of the Big 12 Nuclear Engineering education program. The following sections therefore present the necessary outline of the present development of the Big 12 NE program in respect of existing curriculum, enrolment, delivery, efficiency, evaluation and synergy.

INTRODUCTION

In 2006, the U.S. Departments of Energy and Education provided seed grants that supported the development of the Big 12 Consortium and nuclear engineering course-sharing program. At that time, the four Big 12 schools with nuclear programs—Kansas State University (KSU), Texas A&M University (TAMU), University of Missouri (MU), and The University of Texas at Austin (UT) — joined forces to offer fully online nuclear courses to students at the other interested Big 12 institutions. The original focus was to reach students who are degree-seeking at any of the Big 12 institutions, but working professionals have also been attracted to the flexible program. Students can enroll through one home school to take the nuclear engineering courses taught by KSU, MU, TAMU, and UT. The courses currently being offered are listed in Table 1 below. Additionally, UT started offering a summer institute that engages students in on-site training at a research reactor in Austin, TX.

TABLE 1. CURRENT OFFERINGS AVAILABLE THROUGH THE CONSORTIUM

COURSE TITLE	TEACHING	SCHOOL
NE 300	Introduction to Nuclear and Radiation Engineering Concepts	UT
NE 301	Principles of Nuclear Engineering	TAMU
NE 302	Fulfilling Madame Curie's Dream	MU
NE 500	Elements of Nuclear Engineering	KSU
NE 600	Energy Systems and Resources	MU
NE 601	Radiation Protection and Shielding	KSU
NE 602	Nuclear Reactor Engineering	UT
NE 603	Nuclear Reactor Theory	TAMU
NE 604	Nuclear Reactor Analysis	TAMU

New programs in NE are expensive to initiate and so leveraging existing programs by way of collaborative online education is a rational solution. The Big 12 Higher Education Strategy Council, consisting of leading education experts, has strongly recommended that existing nuclear courses be re-designed for online delivery and offered to a broad audience so more students will have access to the at-a-distance nuclear education opportunities. In line with their advice, the Big 12 schools intend to develop shared online offerings, reduce duplication by establishing a course teaching rotation that includes the new courses, and increase access points for students who are not currently admitted at a Big 12 school with a nuclear program.

The Consortium places the Big 12 schools in a prime position to graduate engineers who are ready to enter the nuclear energy industry and other related professions. However, due to the industry's low profile over the last 20 years, many students are not aware of the attractive job opportunities in the field. The four interrelated projects being proposed by the Big 12 partners will shine a light on the nuclear field. For that reason, many nuclear companies have expressed their enthusiastic support for this Big 12 initiative. Building on conversations started during the 2008 and 2009 Big 12 Summits, institutional leadership and industry representatives have been strengthening networks for ongoing dialogue and planning. One step in the process is development of a formal industry advisory board that will advise the Big 12 faculty on an ongoing basis.

Through concentrated efforts to reach new students, the Big 12 can encourage more students to consider a career in NE. Over the past three years, the Big 12 has incentivized students to study NE by offering online courses at an affordable price and by making scholarships available to students. The Big 12 strives to provide students with the best education possible, which requires continual updating of curriculum and creation of new virtual and hands-on experiences. To better enable the Consortium to step up efforts, we seek NRC's support for this project and the others also proposed by the Big 12 schools. This course and its individual elements can serve a key role in reaching new students, as well as serving NE students.

INNOVATIVE INSTRUCTIONAL APPROACHES AND TECHNIQUES

To promote best learning outcomes and enthusiasm amongst all students who take the course, the proposing universities are collaborating to contribute, and then teach, three complementary parts of the course in successive modules that are highly coordinated and well-integrated. The modular structure of the course is deliberately chosen to enable the course as a whole, and the individual modules as well, to be most flexibly valuable as a tool for attracting students from other majors to nuclear engineering and to careers that relate to nuclear power and use of radiation, particularly in nuclear and health fields.

Rather than omit a lab component which could help students and rather than attempt to arrange for enrolled students to visit one Big 12 school to gain the lab experience, at considerable cost to the student, we plan that the course will include a carefully-designed, safety-tested, experimental component that will give each enrolled student hands-on experience in radiation absorption, secondary radiation emission, detection, and measurements with only minimal need for laboratory equipment at the student's own university and without the supervision, resources and training that would be mandatory if radiological sources were used.

The general intent of the proposed project and the rest of the Big 12 NE curriculum is to make expert-developed content available as fully online 3-credit courses and as modularized lessons that can be injected into many different courses and curricula. The bridging goal is to produce more graduates who are aware of nuclear science and engineering so that they can make

informed, intelligent decisions as well as tackle jobs that require some knowledge of the discipline. Experiential learning supported by the latest and most relevant research, techniques, and practices will enable more students to graduate primed to enter the workforce.

This project is designed, with the above intent in mind, to help us create a model that can aid in development and delivery of other courses, and provide a structure that allows for easy incorporation of future additional modules into this course, designed to enhance student learning. For example, additional or alternating or alternative modules might be desirable to provide students with choices that could interest or serve them still better, depending on their degree programs and career ideas. Before making the course materials readily accessible via web server, the course and individual classes or modules might be tailored further in order to make their use by other schools or instructors more effective.

The four interrelated projects proposed in February and November 2010 by the Big 12 Consortium will involve participation of faculty from multiple partner schools, who will work collaboratively to develop the courses and modularized lessons. To ensure high quality offerings, the faculty will be supported by instructional designers, who will provide training workshops as well as ongoing support. Additionally, the curriculum will be developed with adherence to the Quality Matters course quality standards (http://www.qualitymatters.org/) and the *Distance Learning Course Assessment Guidelines* developed by the Big 12 Consortium's Assessment Committee. Amongst other things, the curriculum will include assessment tools for evaluating Student Learning Outcomes (SLO), e.g., a list of relevant Educational Outcomes (a thru k) required by ABET and a corresponding assessment questionnaire.

In line with the Big 12 Engineering Consortium intent, the project faculty will share the newly developed modularized course and its individual classes and modules as much as possible via an online share-site – hosted, for example, free of charge by pbwiki or delivered by an established mechanism such as the UNL eLibrary model which was developed for extension use (an example is at http://plantandsoil.unl.edu)). The faculty who develop the modules will post the materials and provide guidance. Faculty from all of the schools will have free access to view and download the materials for use in any of their own courses, similarly to the possibilities afforded by Massachusetts Institute for Technology's OpenCourseWare (OCW), published on the web at http://ocw.mit.edu/.

In the proposed project, in common with the rest of the Big 12 NE curriculum, schools that develop the 3-credit courses will deliver them in an online format so students anywhere can participate without having to travel to the delivering campus. Following the Big 12 Engineering Consortium enrollment and finance model, students will enroll through a home/enrolling school and pay tuition and fees to that institution. The home/enrolling school will provide the teaching school with the student enrollment information via the ExpanSIS Data System (www.expansis.org) used by the Consortium. Using ExpanSIS, the teaching school will provide the home/enrolling school with the students' grades at the end of the semester. Campus coordinators at the teaching and home/enrolling schools will support the students during the enrollment process, during the semester, and until grades have been submitted for the official transcript. Students will receive credit from their home/enrolling school as if for a traditional, single-institution course. There will be no need to transfer credit between institutions. The system is designed to be simple and transparent for students.

The Big 12 program alliance has concrete benefits for students, faculty, institutions, and society. If any of the Big 12 schools decided to develop a single institution program supported by a training reactor, their planning and development time would amount to several years, at

minimum, and many more years with construction of the reactor. The Big 12 schools have decided to collaborate to ensure all Big 12 students have the opportunity to learn about nuclear science and engineering and even experience working in a reactor, which they can do immediately. Distance delivery of the courses allows students anywhere to take advantage of challenging and attractive education that prepares them soundly for fast-start, nuclear-related careers.

IMPROVEMENTS IN TEACHING INFRASTRUCTURE, EXPERTISE, AND SKILLS

This curriculum development project will enhance the infrastructure at every partner school, and will result in lasting effects on our states, our region, and our nation. The modularized lessons will be incorporated into existing courses to add new elements that were not introduced to students taking those courses before. The 1-3 credit courses will be offered in an online format, and will enhance the educational opportunities available to students who may be interested in nuclear engineering. All new offerings will be used to entice students to consider the nuclear industry as potential for a rewarding career. When the participating students graduate, they will have the advantage of securing attractive positions with prestigious companies in the field. The participating faculty have formed a virtual department that transcends school and state borders. They meet frequently to discuss their approaches to teaching (e.g., textbook selection, order of units) and the latest developments in the field. The faculty specializing in nuclear engineering will share their expertise and help fill the gaps at schools that have limited nuclear engineering expertise. Additionally, the faculty will participate in a new curriculum and instructional design workshop as part of the annual meetings, and will have ongoing access during the project to the consultant educational evaluator Ray Lewis (who is profiled under **CRITERIA FOR DEMONSTRATING PROGRAM SUCCESS** on page 15 of this proposal) as well as the instructional design experts they consult at their home institutions.

The part of the course being developed at UNL is entirely new and has a hands-on exploratory and discovery element to which we give significant priority. So, development of the UNL part of the course in particular will improve the teaching competency and skills in serving online students by helping them conduct experiments successfully without being physically present in the same location. Online collaboration in individual experimental projects is not rare any more, but inclusion of experiments that are conducted by each student enrolled in an online class is quite unusual and we look forward to learning how to accomplish this most successfully, with assured student safety, and to sharing the outcomes as additional instructional strategies for other online courses and curricula. Sharing will involve the participating, and other, Big 12 schools and may involve presentation or publication in association with, for example, the American Society for Engineering Education and its conferences and focus groups. [As mentioned under **INNOVATIVE INSTRUCTIONAL APPROACHES AND TECHNIQUES**, assuring safety for distance students mandates that the radiation used is light, rather than more ionizing or penetrating radiation, but the coverage of topics and the nature of measurements that will be included is broader than might be expected.]

ACADEMIC FOCUS

This project specifically targets instruction and learning in the Health Physics area, and its subarea of Dosimetry and Measurements, identified in the NRC FOA. As will be gathered from description of its component parts, the course and its modules and individual lessons have been chosen to be widely applicable in other areas of nuclear engineering and to be relevant in other technical areas too. In this section, we provide a timeline and identification of project milestones, followed by an outline of the modules, the associated project activities and responsibilities.

In this 12 month project, faculty and assistants will work on developing and preliminary testing of the course, as well as creating and testing hands-on experimental components suitable to provide for each participating student during course testing and initial course roll-out at both source and receiving institutions. Full initial online delivery of the course will be supplemented by collection and evaluation of student, instructor, and Big 12 faculty feedback and analysis of the course. The project will result in electronically-accessible classes and modules as well as the complete archive of the course, as discussed already in the proposal, and this will provide resources for future offerings of the course as a Big 12 NE elective and for inclusion in other courses, as discussed earlier.

Planning for, and implementing, the whole course and its component elements will involve instructional design and planning for evaluation from the outset by the proposing investigators and senior personnel, the consulting education evaluator Ray Lewis, in coordination with the Big 12 staff, in particular Prof. Mo Hosni and Ms. Dana Reinert. Virtually all of the participants in this project are already skilled and experienced in creating and evaluating ABET course and program outcomes and will seek formative evaluations during testing and during delivery of each module in order to allow adjustment of the delivery or presentation or work of the module in order to achieve the best outcomes of each module and therefore of the course.

A preliminary timeline for the project and its constituent parts follows on the next page.

At least one faculty member from each of Baylor, KSU and UNL will participate in the Big 12 Engineering Consortium Summit meeting held annually in or near Kansas City, Missouri. This meeting will serve project management and project development purposes and will also enable the project team to ensure the close interactions with other Big 12 Engineering Consortium faculty, school administrators and central staff that are important to achieving the greatest initial and continuing impact of the project.

Dosimetry
Fundamentals (KSU)

The one-credit dosimetry module will require the Big 12 Consortium course NE 601 (NE 690 at Kansas State University) as a prerequisite. That course introduces dosimetric quantities and then focuses primarily on calculations of radiation field quantities—such as uncollided flux density, current vector, various interaction rates, and dose—mostly in shielding materials and geometries. The NE 601 course uses the text by Shultis and Faw [Radiation Shielding, American Nuclear Society, LaGrange Park, IL, 2000]. The new Radiation Dosimetry in Nuclear Health Physics distance course, of which this dosimetry module will be a part, focuses more on the relationships of dosimetry with detectors and with biological effects of radiation. It will be based more on the dose assessment text by Faw and Shultis [Radiological Assessment: Sources and Doses, American Nuclear Society, LaGrange Park, IL, 1999].

The dosimetry fundamentals module will consist of about 15 taped sessions, each of about 40 – 45 minutes in length. The fifteen taped sessions will comprise one-third of the three-credit Radiation Dosimetry in Nuclear Health Physics distance course, but also can be used, in whole or in part, in regular on-campus courses, leaving a few in-class minutes for introduction, discussion, and questions. The general topics to be considered in these fifteen sessions include the following:

- Review of dosimetric quantities (3 lectures)

- Radiation protection standards (2 lectures)
- Dosimetric response functions (5 lectures)
- Microdosimetry (1 lecture)
- Natural sources of radiation dose (2 lectures)
- Man-made sources of radiation dose (2 lectures)

Coverage of this material will prepare students for the two modules on radiation detection and biological effects of radiation.

The lectures on dosimetric quantities will cover not only the quantities absorbed dose, kerma, exposure, dose equivalent, effective dose equivalent, and effective dose, but also the concepts of tolerance dose, maximum permissible dose, and maximum permissible body burden. The lectures on radiation standards will discuss the evolution of standards and the various organizations, both national and international, that are involved in setting these standards. The lectures on dosimetric response functions will briefly review the concepts of flux density and flow and how these field quantities are converted into dosimetric quantities by use of various response functions. Included will be an introduction to response functions for evaluation of hazards to humans, which will include description of various phantoms. The lecture on microdosimetry will serve as an introduction for later discussion of bystander effect in the section of the course on biological effects. The lectures on natural and man-made sources of radiation dose will serve to inform students of the various sources, magnitudes, and variances of doses received by humans on earth and in space.

The Nature of Radiation (UNL)

The one-credit Nature of Radiation module of the proposed program is targeted towards undergraduate Nuclear Engineering students but is expected to appeal to students in other disciplines in engineering, in life sciences, and physical sciences. The goals are to stimulate interest in nuclear power, nuclear engineering and the essential health physics by creating additional relevant educational options for students and faculty. The initial UNL module that is the subject of this proposal, on the nature of radiation, will be for university use and, with slight adaptation for demonstration, might be used in recruiting students too. The aim of the module is to make the connection between radiation and biologically important or relevant processes as strong and meaningful as possible for students in preparation for the third module, "Medical Applications of Radiation". To this end, the module includes relevant lectures and includes labs that employ radiolysis-related excitation or ionization in organic materials – both polymer scintillators and glow fluorescent proteins.

The module topics will refer to all forms of radiation relevant in nuclear, medical, scientific, environmental, and cosmic applications and will include the following:

1. Energies and forms of radiation
2. Absorption
3. Fluorescence
4. Wavelength shifting scintillators
5. Wavelength / energy selective detection
6. Engineering applications
7. Biological applications, including biological tags with glow fluorescent proteins
8. Solar cells
9. Survey of effects of radiation

It might be thought unlikely, unsafe, or prohibitive to incorporate a practical, hands-on experiment in a distance education course, but Robertson and his colleagues at UNL have been developing a safe, low-cost approach to radiation demonstration that might be used in schools as part of their current NSF-funded research on novel boron carbide semiconductors and devices. We are therefore confident that it is possible to provide a significant hands-on experimental experience to each registered student, regardless of the institution and program in which the student is enrolled. The materials and light source costs are within the normal costs charged by universities for undergraduate laboratory fees (as is apparent from the illustration and associated discussion, below).

The aim of the experimental component is to reinforce the concepts that are discussed and illustrated in student classes in the course, but to do so in a way that encourages the students to appreciate much more fully how selectively and diversely different materials respond to radiation. By using a low-enough intensity of LED that has a true UV component that is at exceedingly low level but is sufficient to cause fluorescence often in the visible wavelengths of light, we can encourage students to experiment safely with light absorption and fluorescence in other materials, including biological materials and those deliberately tagged with glow fluorescent proteins. The use of light of differing wavelengths like this, rather than alpha, gamma, neutron, x-rays, or even light delivered in more intense form, including bench or keychain-style lasers, is deliberately chosen because it not only guarantees safety and controls dissemination costs and complexity but it allows and enables students to explore experimentally and so discover and learn better for themselves.

Using one LED and an APD plus a discriminator with adjustable threshold and a simple computer-based counter and different WLS fibers, students will be able to explore energy / wavelength dependent absorption of primary radiation, excitation, emission of secondary radiation (fluorescence), energy / wavelength dependent semiconductor detector characteristics, counting statistics, and overall detection efficiency. With simultaneous use of 2 LEDs, students will be able to explore detection of a signal in the presence of a background, including at low signal to background ratio.

The UNL module will be delivered live, with individual classes and student interactions with the instructor being captured and then posted on the course web site for students to use again to assist their learning, as well as to provide an archive to guide subsequent refinement of the module based on instructor and student feedback.

Medical Applications of Radiation (Baylor/KSU)

Baylor University, with assistance from Kansas State University, will prepare a one-credit module on radiation effects in materials of medical interest. This module, Medical Applications of Radiation, will address the effects of radiation on biomaterials and add in some coverage on the effects on engineering materials used in medicine. For example, ionizing radiation is used to cross-link ultra-high molecular weight polyethylene in total hip replacements in order to make them more wear resistant. However, the downside of that is that they become more brittle and have problems with failure by brittle fracture. Therapeutic uses of radiation in medicine also will be addressed, including discussion of the detrimental side effects. For example, the use of radiation to treat tumors in the spinal cord results in downstream weakening of the bone in the surrounding vertebrae.

Topics to be covered in this module include a review of types of radiation; radiation dosimetry; biological effects of radiation, including manifestations of overexposure in mammals and humans; and the use of radiation in medicine. The first subtopic under radiation in medicine will be imaging, using conventional x-rays, mammography, computed tomography, single-photon emission computed tomography, and positron-emission tomography. The second subtopic under radiation in medicine will be the therapeutic use of radiation to treat cancer, including harmful side-effects of successful cancer treatment, such as reduced strength in vertebral bone after successful radiotherapy of spinal cord tumors. The third subtopic under radiation in medicine will be the use of radiation to sterilize or alter the properties of implantable materials, such as the radiation-induced cross-linking of polyethylene total joint replacement components, which improves the wear resistance while damaging fracture toughness. We will evaluate covering other applications of radiation, such as the design and use of radioactive stents, which are used to reduce the possibility of re-stenosis.

Assessment of the Baylor class

Drs. Skurla and Jordan have extensive experience in conducting assessment of learning. Dr. Jordan has led both the ABET and regional accreditation assessment processes for our department and has also been trained in assessment evaluation as part of his training to become an ABET program evaluator. Drs. Skurla and Jordan will conduct surveys of students' attitudes towards the on-line class and compare them with surveys taken for both on-line courses and traditional classes. They plan to create a faculty team of other engineering professors who will assess selective samples of student work and compare them in quality to similar types of work done in other elective courses at Baylor. It is anticipated that the Baylor students who take this class will be taking it live (in person) and their performances will be measured against those students who take it on line. This will help assess the effectiveness of taking the course on line.

Baylor University has large pre-health and forensic anthropology programs, and students in these majors as well as engineering students could take advantage of the opportunity to enroll in a course of this nature. This would extend the nuclear education infrastructure beyond the department of mechanical engineering into the health sciences at Baylor.

CURRICULUM EMPHASIS AND EVOLUTION

The Big 12 Engineering Consortium will pursue two strategies for reaching students who may not otherwise become aware of the opportunities in the NE field:

- Develop and distribute modularized lessons that can be offered as 1-credit courses and added to existing non-nuclear courses.
- Develop and delivery 3-credit courses.

The project we propose adopts both of these strategies in order (a) to maximize the potential for reaching non-NE students to encourage their interest in the NE field and in nuclear engineering and related fields and (b) to provide a new technical elective course for NE students, as well as for students in other engineering majors, such as mechanical engineering and electrical engineering, whose graduates are primarily the engineers hired by the nuclear industry.
The course will serve as a technical elective in the Big 12 NE program and fills a gap in this program and in NE and other engineering programs at the participating schools. The proposed modular approach to nuclear education allows flexibility. Some individual lessons can be incorporated into non-nuclear courses and thus expose a large student population to nuclear concepts; this will increase interest in taking the 3-credit courses, possibly as part of a certificate

or minor program at one of the participating schools. The 3-credit courses also can be taken as technical electives as part of normal science and engineering curricula. For example, Baylor University has large pre-health and forensic anthropology programs, and students in these majors as well as engineering students could take advantage of the opportunity to enroll in a course of this nature. This would extend the nuclear education infrastructure beyond the department of mechanical engineering into the health sciences at Baylor.

Some of the additional advantages of structuring the 3-credit course for delivery in the form of closely-coupled, immediately consecutive 1-credit modules are these:

- Students will be exposed to complementary course topics given by the most relevant instructors and to representative educational styles of several Big 12 schools, thus helping the students to mature in their learning and interaction skills at a stage in their undergraduate programs that this can do so without unsettling the students.
- Faculty and administrators at Big 12 schools without nuclear reactors will become more strongly engaged in the process of educating and encouraging their own students and those at other Big 12 schools in NE and in nuclear-associated career paths.
- The modular course structure increases the potential that additional faculty in other schools and degree programs (including physics, biology, electrical engineering or mechanical engineering) will incorporate at least some of the products of this project into their own courses. This will increase the impact achieved by funding of this project.

We also anticipate that the likelihood of additional or alternative modules, rather than full courses, being created is much greater for several reasons: There would be an initial context to support the additions or alternatives. The prospect of, and actual effort involved in, creating additional modules would be less daunting. Additional or alternative modules could enable a degree of customizing of the technical elective according to individual student or individual school needs or choices, for example if module number N in the course could (a) be chosen by the course faculty from one of two alternatives in advance of a particular semester and year in which the course is offered or (b) be chosen by a student from alternative modules N at the time the student enrolls in the course.

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 this URL to the Office of Management and Budget Cost Circulars is included for reference to:
A-21 (now 2 CFR 220)
A-87 (now 2 CFR 225)
A-122 (now 2 CFR 230
A-102:

http://www.whitehouse.gov/omb/circulars_index-ffm

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.

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 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

§ 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 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 VI 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 VI, 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's 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 should 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, 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. § 215.40-48
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 must be in accordance with the Grantee's Travel Regulations or the US Government Travel Policy and Regulations at: www.gsa.gov/federaltravelregulation and the per diem rates set forth at: www.gsa.gov/perdiem, absent Grantee's travel regulation. Travel costs for the grant must be consistent with provisions as established in Appendix A to 2 CFR 220 (J.53). All other travel, domestic or international, must not increase the total estimated award amount.

Domestic Travel:
Domestic travel is an appropriate charge to this award and prior authorization for specific trips are not required, if the trip is identified in the Grantee's approved program description and approved budget. Domestic trips not stated in the approved budget require the written prior approval of the Grants Officer, and must not increase the total estimated award amount.

All common carrier travel reimbursable hereunder shall be via the least expensive class rates consistent with achieving the objective of the travel and in accordance with the Grantee's policies and practices. Travel by first-class travel is not authorized unless prior approval is obtained from the Grants Officer.

International Travel:
International travel requires PRIOR written approval by the Project Officer and the Grants Officer, even if the international travel is stated in the approved program description and the approved budget.

The Grantee shall comply with the provisions of the Fly American Act (49 USC 40118) as implemented through 41 CFR 301-10.131 through 301-10.143.

Property and Equipment Management Standards
Property and equipment standards of this award shall follow provisions as established in 2 CFR 215.30-37.

Procurement Standards
Procurement standards of this award shall follow provisions as established in 2 CFR 215.40-48

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 and retain title 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 for this award shall follow OCOI requirements set forth in Section 170A of the Atomic Energy Act of 1954, as amended, and provisions set forth at 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 an intra-agency Appeal Board to review a grantee appeal of an agency action, if required, which will consist of the program office director, the Deputy Director of Office of Administration, and the Office of General Counsel.

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 215.60-62.

Monitoring and Reporting § 215.50-53

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 or deducted from the total project cost allowable cost as directed by the Grants Officer or the terms and conditions of award.
- Budget Revision – 2 CFR 215.25
    - The Grantee is required to report deviations from the approved budget and program descriptions in accordance with 2 CFR 215.25,and request prior written approval from the Program Officer and the Grants Officer.
    - The Grantee is not authorized to rebudget between direct costs and indirect costs without written approval of the Grants Officer.
    - The Grantee is authorized to transfer funds among direct cost categories up to a cumulative 10 percent of the total approved budget. The Grantee is not allowed

to transfer funds if the transfer would cause any Federal appropriation to be used for purposes other than those consistent with the original intent of the appropriation.

- Allowable Costs – 2 CFR 215.27

b. **Federal Financial Reports**

The Grantee shall submit a "Federal Financial Report" (SF-425) on a quarterly basis for the periods ending March 31, June 30, September 30, and December 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 is due within 90 days after expiration of the award. The report should be submitted electronically to: Grants_FFR@NRC.GOV. ***(NOTE: There is an underscore between Grants and FFR).***

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 should 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 may 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 on a semi-annual basis unless otherwise authorized by the Grants Officer. Performance reports should be sent to the Program Officer at the email address indicated in Block 12 of the Notice of Award, and to Grants Officer at: Grants_PPR.Resource@NRC.GOV. ***(NOTE: There is an underscore between Grants and PPR).***

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 Office of Human Resources requires the submission of the semi-annual progress report on the SF-PPR, SF-PPR-B, and the SF-PPR-E forms. The submission for the six month period ending March 31st is due by April 30th, or any portion thereof. The submission for the six month period ending September 30th is due by October 31st or any portion thereof.

d. Grant Performance Metrics:

The Office of Management and Budget requires all Federal Agencies providing funding for educational scholarships and fellowships as well as other 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 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:

Curriculum Development Awards

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.

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 Leadership of Reducing Text Messaging While Driving
Pursuant to EO 13513, Grantees should encourage employees, sub-awardees, and contractors to adopt and enforce policies that ban text messaging while driving company-owned, rented vehicles or privately owned vehicles when on official Government business or when performing any work for or on behalf of the Federal Government.

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."

Trafficking In Victims Protection Act Of 2000 (as amended by the Trafficking Victims Protection Reauthorization Act of 2003)

Section 106(g) of the Trafficking In Victims Protection Act Of 2000 (as amended as amended, directs on a government-wide basis that:

"any grant, contract, or cooperative agreement provided or entered into by a Federal department or agency under which funds are to be provided to a private entity, in whole or in part, shall include a condition that authorizes the department or agency to terminate the grant, contract, or cooperative agreement, without penalty, if the grantee or any subgrantee, or the contractor or any subcontractor (i) engages in severe forms of trafficking in persons or has procured a commercial sex act during the period of time that the grant, contract, or cooperative agreement is in effect, or (ii) uses forced labor in the performance of the grant, contract, or cooperative agreement." (22 U.S.C. § 7104(g)).

Executive Compensation Reporting

2 CFR 170.220 directs agencies to include the following text to each grant award to a non-federal entity if the total funding is $25,000 or more in Federal funding.

Reporting Subawards and Executive Compensation.

a. *Reporting of first-tier subawards.*

1. *Applicability.* Unless you are exempt as provided in paragraph d. of this award term, you must report each action that obligates $25,000 or more in Federal funds that does not include Recovery funds (as defined in section 1512(a)(2) of the American Recovery and Reinvestment Act of 2009, Pub. L. 111–5) for a subaward to an entity (see definitions in paragraph e. of this award term).

2. *Where and when to report.*

i. You must report each obligating action described in paragraph a.1. of this award term to *http://www.fsrs.gov.*

ii. For subaward information, report no later than the end of the month following the month in which the obligation was made. (For example, if the obligation was made on November 7, 2010, the obligation must be reported by no later than December 31, 2010.)

3. *What to report.* You must report the information about each obligating action that the submission instructions posted at *http://www.fsrs.gov specify.*

b. *Reporting Total Compensation of Recipient Executives.*

1. *Applicability and what to report.* You must report total compensation for each of your five most highly compensated executives for the preceding completed fiscal year, if—

i. the total Federal funding authorized to date under this award is $25,000 or more;

ii. in the preceding fiscal year, you received—

(A) 80 percent or more of your annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) $25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

iii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at *http://www.sec.gov/answers/execomp.htm.*)

2. *Where and when to report.* You must report executive total compensation described in paragraph b.1. of this award term:

i. As part of your registration profile at *http://www.ccr.gov.*

ii. By the end of the month following the month in which this award is made, and annually thereafter.

c. *Reporting of Total Compensation of Subrecipient Executives.*

1. *Applicability and what to report.* Unless you are exempt as provided in paragraph d. of this award term, for each first-tier subrecipient under this award, you shall report the names and total compensation of each of the subrecipient's five most highly compensated executives for the subrecipient's preceding completed fiscal year, if—

i. in the subrecipient's preceding fiscal year, the subrecipient received—

(A) 80 percent or more of its annual gross revenues from Federal procurement contracts (and subcontracts) and Federal financial assistance subject to the Transparency Act, as defined at 2 CFR 170.320 (and subawards); and

(B) $25,000,000 or more in annual gross revenues from Federal procurement contracts (and subcontracts), and Federal financial assistance subject to the Transparency Act (and subawards); and

ii. The public does not have access to information about the compensation of the executives through periodic reports filed under section 13(a) or 15(d) of the Securities Exchange Act of 1934 (15 U.S.C. 78m(a), 78o(d)) or section 6104 of the Internal Revenue Code of 1986. (To determine if the public has access to the compensation information, see the U.S. Security and Exchange Commission total compensation filings at *http://www.sec.gov/answers/execomp.htm.*)

2. *Where and when to report.* You must report subrecipient executive total compensation described in paragraph c.1. of this award term:

i. To the recipient.

ii. By the end of the month following the month during which you make the subaward. For example, if a subaward is obligated on any date during the month of October of a given year (*i.e.*, between October 1 and 31), you must report any required compensation information of the subrecipient by November 30 of that year.

d. *Exemptions*

If, in the previous tax year, you had gross income, from all sources, under $300,000, you are exempt from the requirements to report:

i. Subawards,

and

ii. The total compensation of the five most highly compensated executives of any subrecipient.

e. *Definitions.* For purposes of this award term:

1. *Entity* means all of the following, as defined in 2 CFR part 25:

i. A Governmental organization, which is a State, local government, or Indian tribe;

ii. A foreign public entity;

iii. A domestic or foreign nonprofit organization;

iv. A domestic or foreign for-profit organization;.

v. A Federal agency, but only as a subrecipient under an award or subaward to a non-Federal entity.

2. *Executive* means officers, managing partners, or any other employees in management positions.

3. *Subaward:*

i. This term means a legal instrument to provide support for the performance of any portion of the substantive project or program for which you received this award and that you as the recipient award to an eligible subrecipient.

ii. The term does not include your procurement of property and services needed to carry out the project or program (for further explanation, see Sec. __ .210 of the attachment to OMB Circular A–133, "Audits of States, Local Governments, and Non-Profit Organizations").

iii. A subaward may be provided through any legal agreement, including an agreement that you or a subrecipient considers a contract.

4. *Subrecipient* means an entity that:

i. Receives a subaward from you (the recipient) under this award; and

ii. Is accountable to you for the use of the Federal funds provided by the subaward.

5. *Total compensation* means the cash and noncash dollar value earned by the executive during the recipient's or subrecipient's preceding fiscal year and includes the following (for more information see 17 CFR 229.402(c)(2)):

i. *Salary and bonus.*

ii. *Awards of stock, stock options, and stock appreciation rights.* Use the dollar amount recognized for financial statement reporting purposes with respect to the fiscal year in accordance with the Statement of Financial Accounting Standards No. 123 (Revised 2004) (FAS 123R), Shared Based Payments.

iii. *Earnings for services under non-equity incentive plans.* This does not include group life, health, hospitalization or medical reimbursement plans that do not discriminate in favor of executives, and are available generally to all salaried employees.

iv. *Change in pension value.* This is the change in present value of defined benefit and actuarial pension plans.

v. *Above-market earnings on deferred compensation which is not tax-qualified.*

vi. Other compensation, if the aggregate value of all such other compensation (e.g. severance, termination payments, value of life insurance paid on behalf of the employee, perquisites or property) for the executive exceeds $10,000.