SECY-98-182

July 28, 1998

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: PRIORITIZATION OF INTERNATIONAL COOPERATIVE RESEARCH ACTIVITIES

PURPOSE:

To provide the Commission with a prioritized list of international cooperative research activities.

BACKGROUND:

COMSECY-96-066 (Attachment 1) directed that "the staff should continue to support active participation in International Safety Programs (option 7). The staff should ensure that these international activities and the related programs are prioritized and appropriately integrated with other NRC research efforts (option 4), and also are properly considered in the establishment and maintenance of core research capabilities (option 5)." SECY-98-076 (Attachment 2) gave consideration to and included international cooperative research activities in its various core capability assessments. It also explained that rather than prioritizing its international cooperative research activities as part of its core capability assessment as originally planned, RES would perform this prioritization during the FY 2000 budget development process and provide it to the Commission after the CFO budget recommendations were forwarded to the Commission.

DISCUSSION:

The staff has prioritized its current active international cooperative research activities (Attachment 3). It did not prioritize cooperative efforts that are under development because there is not currently enough information to apply the criteria. The staff used the criteria and weighting scheme as shown in Attachment 4. The weights assigned to each criterion reflect the staff's view of the relative significance of each criterion to the overall priority. These criteria were derived largely from the metrics for Criterion No. 11 and Criterion No. 12 contained in Attachment 5 to SECY-97-075 (Attachment 5). Although these criteria do not include a direct consideration of quantitative risk estimates, staff plans an office wide prioritization of RES activities for the FY 2001 budget which will include a more quantitative consideration of risk. The staff believes that this prioritization is consistent with the prioritization of research activities performed during the development of the RES budget and reflects the relative importance of these activities. The agreements prioritized in Attachment 3 support various work activities in the RES budget including some high priority user need requests.

The prioritized list at Attachment 3 shows the point score for each activity and also a group number. When prioritizing those activities, they fell into three basic groups as described below. These descriptions accurately characterize most of the activities in each group, but there are some exceptions.

Highest Priority - Group A (22-28 points): These activities are focused on a current safety or regulatory issue or are providing immediately useful safety/risk information, are being performed at one-of-a-kind facilities/locations, are needed to maintain a core capability and are being obtained through leveraged funding arrangements such that the net cost to the NRC is a small fraction of the total project cost.

Second Highest Priority - Group B (17-18 points): These activities are providing immediately useful safety/risk information, are being performed at one-of-a-kind facilities/locations, are not needed to maintain a core capability and are being obtained through leveraged funding arrangements such that the net cost to the NRC is a small fraction of the total project cost.

Third Highest Priority - Group C (13-15 points): These activities are providing immediately useful safety/risk information, are not one-of-a kind (i.e., the work could be performed elsewhere albeit at greater cost to the NRC), are not needed to maintain a core capability and are being obtained through leveraged funding arrangements such that the net cost to the NRC is a small fraction of the total project cost.

In summary, cooperative programs that are focused on a current safety or regulatory issue in a highly unique facility (e.g., high burn up fuel experiments in the CABRI test reactor) received the highest priority ratings. Those receiving lower scores also provide valuable technical information and at comparatively low cost to the NRC. Where necessary, funding for NRC's contribution to these programs is in the current RES budget request for FY 1999/2000. All these programs should be retained because of their cost-effective contribution to NRC's research program.

COORDINATION:

This paper has been coordinated with the Office of the General Counsel which has no legal objection. The Office of Chief Financial Officer has reviewed this Commission Paper and has no objections.

L. Joseph Callan
Executive Director for Operations

Attachments:
1. COMSECY-96-066
2. SECY 98-076 (w/o attachments)
3. Prioritized Listing

4. Prioritization Criteria
5. Attachment 5 to SECY-97-075

CONTACT: Lloyd J. Donnelly, RES
(301) 415-5828

ATTACHMENT 3

INTERNATIONAL COOPERATIVE RESEARCH ACTIVITIES

GROUP	POINTS	NAME	DESCRIPTION
A	28	Evaluation of Steel Components (European Community)	Performing large scale experiments to validate analytical methods used to predict reactor pressure vessel integrity under accident loading (such as PTS).
A	23	CABRI (FRANCE)	High burnup fuel testing in the CABRI test reactor using a sodium coolant loop and ultimately a water loop. There are a series of twelve tests planned in the water loop and a tenth test being performed in the sodium loop. Directly supports confirming safety of fuel currently in reactors and future revision of criteria for higher burnup.
A	23	NSRR (JAPAN)	Collaboration between NRC/JAERI's nuclear safety research programs, in particular the investigation of reactivity initiated accidents (RIAs) involving high burnup fuel. Directly supports confirming safety of fuel currently in reactor and future revision of criteria for higher burnup.
A	23	Containment Integrity Under Extreme Loads (JAPAN plus 21 organizations from 12 other countries)	Joint NRC/MITI venture. Containment model testing for a steel as well as a concrete model will be performed. Models are designed and built by NUPEC at SNL. Includes round robin pre/post test calculations by the International Community. Provides data to validate computer codes used to predict capacities and risks under DBA conditions.
A	23	Collaboration on Seismic Proving Test of Concrete Containment (JAPAN)	Exchange of information re the testing of two concrete containment models. Exchange of pre/post test analysis results and evaluation of results including comparison of predictions and test results. Designed and built by NUPEC. Tested at Tadatsu in Japan. These large-scale tests provide data for validation of structural and functional integrity estimates used in risk assessments.
A	23	Collaboration on Seismic Issues (JAPAN)	Provides for component testing/analysis and includes: the effects of aging on seismic capacity, piping tests, component fragilities, multi-axial loading shear wall tests, structure to structure interaction tests, and heavy equipment tests. Also provides for information exchange on seismic PRA studies. Provides unique large-scale test data for validation of methods used for design and for use in risk assessments.
A	23	Soil-Structure Interaction on Containment at Hualien (TAIWAN, JAPAN, FRANCE, KOREA, USA)	Study of ground motion and structural containment response at a seismically active site in Taiwan. International venture including Japan, France, Korea, Taiwan, and the USA. This experimental data will reduce significant uncertainties in seismic response calculations and will validate analysis methods.
A	23	Halden Project (12 countries involved)	Covers the following three areas: High burnup fuel performance, safety and reliability; Degradation of in-core materials and water chemistry effects, utilizing the Halden reactor and experimental facilities; and Man-machine systems research, utilizing experimental control room and LWR-simulator facilities. Directly supports fuels, instrumentation and controls, and human factors research program.
A	23	FARO (ITALY plus 10 other European Community countries)	Cooperation in severe accident research related to molten fuel-coolant interaction experiments at the FARO and KROTOS facilities at the CEC Joint Research Center in Ispra, Italy. Directly supports development of analytical tools for assessing FCI and debris coolability.
A	23	JCCRER (Joint	Deterministic effects of occupational exposure at the Mayak production

		Cooperative Committee on Radiation Effects) Project 2.3 (RUSSIA)	facility (Russia). Results will be used to validate currently used predictive models in NUREG/CR 4214 and PRA analysis risk estimates used in NUREG 1150.
A	23	Epidemiological study on Chernobyl (RUSSIA, BELARUS, UKRAINE)	Epidemiological study of radiation induced thyroid disease in Belarus and the Ukraine following the Chernobyl Accident. Results will be used to evaluate the validity of existing dose standards for the public.
A	23	NRC-IPSN Agreement on sharing of data from WG 7 (JCCNRS) (FRANCE)	Study of leukemia and other hematologic diseases among cleanup workers in the Ukraine following the Chernobyl Accident. Results will be used to evaluate the validity of existing occupational dose limits.
A	23	Irradiation Assisted Stress Corrosion Cracking (IASCC) (EPRI plus 13 countries)	Perform material(s) studies to determine mechanisms and effects of neutron irradiation in promoting stress corrosion cracking of reactor vessel internals.
A	22	Garner Valley Strong Motion Study (FRANCE and JAPAN)	Investigation of the propagation of strong ground motion through a shallow soil column. This data will validate methods of calculating ground responses. In conjunction with Hualien data, will address major uncertainties in seismic response analyses.
A	22	Evaluation of RPV Materials from Japan Power Demonstration Reactor (JPDR) (JAPAN)	Performing mechanical property tests and micro structural studies on materials removed from the decommissioned JPDR pressure vessel in order to validate embrittlement correlations.
B	18	Sandia Lower Head Failure Experiments (OECD project-membership - TBD)	Experiments and analysis of reactor vessel lower head failure under severe accident conditions. Directly supports development and validation of a model for RPV lower head failure under a variety of severe accident conditions, including assessing likelihood of success of accident management strategies. Currently under evaluation for an OECD cooperative project.
B	18	Integrity of Nuclear Piping-Structural Material Issue (Battelle Columbus - lead) (JAPAN, KOREA)	Analytical and experimental studies related to piping material and structural issues conducted by Battelle. Provides technical basis for leak-before-break criteria for intermediate sized pipe and will assess margin of flawed pipe in view of changes to ASME Section III design rules.
B	18	RASPLAV (Kurchatov Institute) NEA/OECD Project (RUSSIA plus 16 other countries)	Program consists of both experimental and analytical work dealing with molten corium pool behavior in the lower head of the reactor pressure vessel during the late phase of a postulated severe accident sequence. Numerous small-scale separate effects experiments are being carried out to measure thermo-physical properties to gain much needed understanding of corium chemistry. Directly supports assessment of whether or not in-vessel retention of molten core material is possible using external flooding.
B	18	PHEBUS (FRANCE plus 10 European Community countries)	Collaboration between the NRC/IPSN's Phebus FP experimental program including investigation related to severe fuel damage, fission product release, and transport and containment performance. Directly supports code assessment. NRC financial contribution is paid in full.
B	17	RRC - Kurchatov Institute (RUSSIA/FRANCE)	Cooperative program that includes analysis of high burnup fuel experiments and developing a 3D reactor transient physics code. Directly supports NRC efforts to upgrade analytical tools to support high burnup fuel reviews.
C	15	MACE (EPRI plus 12 countries)	Ex-vessel debris coolability experiments that directly support modeling the coolability of core debris in the reactor cavity.

C	13	International Cooperative Group on Environmental Assisted Cracking (EAC) (80 organizations from 16 countries)	Information exchange and analysis to evaluate mechanisms and effects of environment (water chemistry, temperature and irradiation) on cracking of pressure boundary materials (piping., reactor vessels, etc.).
C	13	Cooperative Agreement on PRA (17 countries involved, includes agreements under consideration)	Cooperative research in probabilistic risk assessment that includes technical information exchange in the areas of reliability risk and other areas of research such as methods development, analysis of operating events, development of advanced PC-based PRA methods, and regulatory applications of PRA.
C	13	CAMP (thermal-hydraulics) (28 countries involved, includes agreements under consideration)	Code Application and Maintenance. (Codes include RELAP5/MOD3, TRAC-PF1/MOD2, TRAC-BF1). Resolving the deficiencies and maintaining a single internationally recognized code(s); share experience on code scaleability, applicability; uncertainty studies; a well documented code assessment database; analyses performed (using the code); and maintain and improve user expertise and user guidelines for applying the codes.
C	13	Thermal Hydraulic Code Improvement with the CEA (FRANCE)	Exchange of thermal-hydraulic analytical codes and experimental data (cooperation under negotiation) in support of T/H code development.
C	13	CSARP (severe accidents) (21 countries involved; includes agreements under consideration)	Collaboration and information exchange in the nuclear safety severe accident research programs including severe fuel damage, fission product release, transport and containment performance. Research programs include: reactor pressure vessel integrity, fuel-coolant interactions, hydrogen behavior, fission product behavior; and direct containment heating. Also, information exchange of a number of analytical codes including their use and applications.
C	13	ROSA-IV for AP600 (JAPAN)	Research cooperation and exchange of information based on the experimental program to perform simulated integral testing of the AP600 PWR design. NRC to conduct confirmatory integral system testing of the AP600 reactor safety features and thermal hydraulic performance under normal and abnormal system behavior in support of T/H code development.
C	13	International Cooperative Group on Radiation Damage Mechanisms (11 countries involved)	Information exchange and analysis to evaluate mechanisms of radiation damage of reactor pressure vessel, steels and weldments.

ATTACHMENT 4

INTERNATIONAL PROGRAM:

PRIORITIZATION CATEGORY	CRITERIA / WEIGHTING POINTS		
Value of Contribution to NRC's Regulatory Program	Directly supports resolution of current safety or regulatory issues (10 Points)	Immediately useful for safety assessments, improving analytical tools/databases, enhancing risk information, etc. (5 Points)	Will help maintain awareness of international research developments and is expected to have future benefit (2 Points)
Feasibility of Using Alternative Sources	Costs, timing or other factors would make it impractical or impossible to do the work elsewhere (10 Points)	Would be more expensive or take longer, but it would still be practical to do work elsewhere (5 Points)	
Contribution to	Contributes to a current core capability (5 Points)		

Core Capability			
Resource Leverage	Joint program with 67% or more paid by others **OR** joint program with no out of pocket expenses to NRC (In-kind contributions only) **OR** NRC program where costs are significantly reduced by foreign contributions (3 Points)	Joint program with 33-66% paid by others (2 Points)	Joint program with less than 33% paid by others (1 Point)

ATTACHMENT 5

METRICS

SUPPORT AREA NO. 1: PROVIDE THE TECHNICAL BASES FOR REGULATORY DECISIONS ON REGULATORY OR SAFETY ISSUES (INCLUDING THE RESOLUTION OF GSIs) STEMMING FROM POWER PLANT OPERATIONS, EVENTS, MATERIALS USES AND LICENSE AMENDMENT REQUESTS

Criterion No. 1: Frequency of occurrence:

HIGH - Issues stemming from power plant operations, events, materials uses and license amendment requests are expected to arise one or more times per year.

MEDIUM - Issues stemming from power plant operations, events, materials uses and license amendment requests are expected to arise in the foreseeable future, but at a frequency of less than HIGH (above).

LOW - Issues stemming from power plant operations, events, materials uses and license amendment requests are not expected to arise in the foreseeable future.

Criterion No. 2: Safety or regulatory significance if they occur:

HIGH - The issues stemming from power plant operations, events, materials uses and license amendment requests are likely to raise significant doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identifies a major gap in the scope of NRC's regulations or regulatory guidance.

MEDIUM - The issues stemming from power plant operations, events, materials uses and license amendment requests are likely to raise moderate doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identifies a moderate gap in the scope of NRC's regulations or regulatory guidance.

LOW - The issues stemming from power plant operations, events, materials uses and license amendment requests are likely to raise little doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identifies a small gap in the scope of NRC's regulations or regulatory guidance.

SUPPORT AREA NO. 2: PROVIDE THE TECHNICAL BASES FOR REGULATORY DECISIONS ON REGULATORY OR SAFETY ISSUES (INCLUDING THE RESOLUTION OF GSIs) STEMMING FROM NEW OR EVOLVING TECHNOLOGIES AND/OR RESEARCH RESULTS

Criterion No. 3: Likelihood of change:

HIGH - The technology is evolving at a rapid rate and is expected to continue at that rate for the foreseeable future, or a significant amount of new results is expected from ongoing or planned research activities.

MEDIUM - The technology is evolving at a moderate rate and is expected to continue at that rate for the foreseeable future, or a moderate amount of new results is expected from ongoing or planned research activities.

LOW - The technology is evolving at a slow rate and is expected to continue at that rate for the foreseeable future, or a limited amount of new results is expected from ongoing or planned research activities.

Criterion No. 4: Safety or regulatory significance, if the change occurs:

HIGH - The new or evolving technologies and/or research results are likely to raise significant doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identify a major gap in the scope of NRC's regulations or regulatory guidance.

MEDIUM - The new or evolving technologies and/or research results are likely to raise moderate doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identify a moderate gap in the scope of NRC's regulations or regulatory guidance.

LOW - The new or evolving technologies and/or research results are likely to raise little doubt regarding the ability of the licensee's safety measures, such as systems, structures, components, procedures, or programs to maintain acceptable safety margins (e.g., in preventing core damage, off-site release, morbidity, or mortality), or identify a small gap in the scope of NRC's regulations or regulatory guidance.

SUPPORT AREA NO. 3: DEVELOP, MAINTAIN, AND APPLY ANALYTICAL TOOLS/DATABASES--MAINTAIN INSTITUTIONAL TECHNICAL KNOWLEDGE BASE

Criterion No. 5: Breadth and frequency of application of tools/databases:

HIGH - Tools/data are expected to be used many times each year and/or they apply to a wide range of applications; e.g., multiple reactor types, phenomena, issues, events.

MED - Tools/data are expected to be used several times each year and/or they apply to a few broad-based applications.

LOW - Tools/data are expected to be used only occasionally and/or they apply to a few narrowly focused applications.

Criterion No. 6: Degree of improvement needed in tools/databases:

HIGH - Major deficiencies exist in tools/data that will prevent their use in addressing expected safety or regulatory issues, or tools are highly inefficient to use.

MED - Deficiencies exist in tools/data that will detract from their usefulness in effectively addressing expected safety or regulatory issues, or tools are moderately inefficient to use.

LOW - Deficiencies exist in tools/data that should be corrected to optimize their value, but there are no significant deficiencies, or tools have minor inefficiencies that could be eliminated.

Criterion No. 7: Value of tools/databases/knowledge base to the regulatory process:

HIGH - Tools/databases/knowledge are expected to be highly effective and efficient in making significant safety or regulatory decisions with no reasonable alternative being available, and/or knowledge base is highly complex and limited to a single person or very limited number of people.

MED - Tools/databases/knowledge are expected to be effective on efficient in making safety or regulatory decisions and alternatives would be time consuming and costly, and/or knowledge base is relatively complex and limited to a single person or very limited number of people.

LOW - Tools/databases/knowledge are expected to be useful in making safety or regulatory decisions, but there are other alternatives that could be employed at little additional cost, and/or knowledge base is common and rather widely understood.

SUPPORT AREA NO. 4: PROVIDE THE TECHNICAL BASES FOR IMPROVEMENTS TO REGULATORY FRAMEWORK (i.e., REGULATIONS, REGULATORY GUIDES, CODES AND STANDARDS, NEW INITIATIVES)

Criterion No. 8: Need to improve requirements and/or guidance:

HIGH - The regulatory improvement is needed for adequate safety; or it will have a significant impact on regulatory efficiency or regulatory flexibility for a majority of licensees or applicants in any category (i.e., there is a major gap in NRC's regulations).

MEDIUM - The regulatory improvement is needed as a safety enhancement; or it could have a significant impact on regulatory efficiency or regulatory flexibility for a significant number of licensees or applicants in any category.

LOW - The regulatory improvement could have an impact on regulatory efficiency or regulatory flexibility for a significant number of licensees or applicants in any category.

Criterion No. 9: Need to support new NRC regulatory initiative and/or approach:

HIGH - A significant contribution will be made to support a new NRC regulatory framework or approach such as risk-informed, performance-based regulation.

MEDIUM - A moderate contribution will be made to support a new NRC regulatory framework or approach such as risk-informed, performance-based regulation.

LOW - A small contribution will be made to support a new NRC regulatory framework or approach such as risk-informed, performance-based regulation.

SUPPORT AREA NO. 5: IMPROVE THE TECHNICAL BASES OF REGULATION THROUGH INVOLVEMENT IN RESEARCH WITH DOMESTIC AND FOREIGN ORGANIZATIONS

Criterion No. 10: NRC's commitment:

HIGH - There is or will be a formal agreement between the NRC and one or more organizations for cooperative research or the cooperative effort is a U.S. Government-mandated program or the cooperative effort is a major contributor to the regulatory program of another country.

MEDIUM - There is no formal agreement, but NRC maintains ongoing participation in research-related activities with organizations such as DOE, EPRI, IAEA, and NEA.

LOW - There is no formal agreement, but NRC participates in research- related activities on an ad hoc basis.

Criterion No. 11: Value of contribution to regulatory programs:

HIGH - The results from cooperative programs directly support resolution of safety or regulatory issues and are not otherwise available, or the cooperative program is vital for NRC to sustain a core research capability.

MEDIUM - The results from cooperative programs provide information immediately useful for code assessment, confirmatory information, or expanded databases, but are not essential to resolution of safety or regulatory issues.

LOW - The results from cooperative programs help maintain awareness and have potential for use over the long term.

Criterion No. 12: Leverage factor for NRC resources:

HIGH - 67% or more of the work on cooperative efforts is done by or paid for by others.

MEDIUM - 33-66% of the work on cooperative efforts is done by or paid for by others.

LOW - Less than one-third of the work on cooperative efforts is done by or paid for by others.

SUPPORT AREAS NO.6: RESPOND TO OVERSIGHT GROUPS (COMMISSION, CONGRESS, PUBLIC, ACRS, ACNW, NSRRC)

Criterion No. 13: Likelihood of occurrence:

HIGH - The subject matter is sufficiently important to oversight groups that future requests for status reports or insights are expected to occur several times a year, as results are available.

MEDIUM - The subject matter is of moderate interest or the pace of new developments is such that oversight groups are likely to request status reports or insights about twice a year.

LOW - The subject matter is usually addressed on an annual frequency (or less often), which suggests that the issue does not require immediate resolution, the technical progress is slow due to the complexity of the problem, and/or it is a recurrent topic.

Criterion No. 14: Complexity and significance of subject matter:

HIGH - The oversight groups need to be in the position to give guidance and direction in this area and to incorporate current findings into policy decisions. It is a national or international issue of high regulatory or safety significance that requires prompt action. This would be the case in an abnormal incident involving potential significant risk to the public or in the resolution of a complex design issue relating to a license application.

MEDIUM - Technical issues under consideration are those in which there are diverse opinions regarding the means to resolve differences among the licensee, staff, or interested technical community. These differences may arise from lack of data or technical knowledge from conflicting data and opinions, or from several alternative approaches to address the perceived issue.

LOW - Technical issues are reasonably well understood and the path to their resolution is relatively straightforward and agreed upon.