法規名稱：AGREEMENT BETWEEN THE TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES AND THE AMERICAN INSTITUTE IN TAIWAN IN THE AREA OF PROBABILISTIC RISK ASSESSMENT RESEARCH

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AGREEMENT BETWEEN THE TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES AND THE AMERICAN INSTITUTE IN TAIWAN IN THE AREA OF PROBABILISTIC RISK ASSESSMENT RESEARCH

WHEREAS subject to the availability of personnel, material, and appropriated funds, the American Institute in Taiwan (hereinafter referred to as the "AIT"), through its designated representative, the U.S. Nuclear Regulatory Commission ("USNRC"), is carrying out a research program in the area of Probabilistic Risk Assessment of Nuclear Power Reactors;

WHEREAS the Taipei Economic and Cultural Representative Office in the United States (hereinafter referred to as "TECRO") has an interest in access to information which has been developed and continues to arise from this program and wishes to collaborate with AIT;

Considering that the AIT and TECRO, hereinafter referred to as the Parties:

1.Have a mutual interest in cooperation in the field of safety research with the objective of improving and thus ensuring the safety of civilian nuclear installations on an international basis;

2.Recognize a need to equitably share both the resources resulting from this research and the effort required to develop those resources;

3.Have an interest in cooperating in the reliability, risk assessment, and other related areas of nuclear safety research;

4.Have been cooperating since January 1, 1999, under the terms

of a five year Agreement between AIT and TECRO in the Area of Probabilistic Risk Assessment Research and have indicated their mutual interest in continuing this cooperation.

They have therefore AGREED as follows:

ARTICLE I - PROGRAM COOPERATION

The Parties, in accordance with the provisions of this Agreement and subject to applicable laws and regulations in force in the territories they represent, will join together for cooperative nuclear reactor safety research in the area of probabilistic risk assessment programs and other related program areas in nuclear reactor safety sponsored by the Parties.

ARTICLE II - FORMS OF COOPERATION

Cooperation between the Parties, through their designated representatives, may take the following forms:

A.The exchange of information in the form of technical reports, experimental data, correspondence, newsletters, visits, joint meetings, and such other means as the Parties agree.

B.The temporary assignment of personnel of the designated representative of one Party or of the designated representative's contractors to the laboratory or facilities owned by the designated representative of the other Party or in which the designated representative of the other Party sponsors research. Each assignment will be considered on a case-by-case basis and may be the subject of a separate attachment-of-staff arrangement between the Parties.

C.The execution of joint programs and projects, including those involving a division of activities between the designated representatives of the Parties. Each joint program and project will be considered on a case-by-case basis and may be the subject of a separate agreement between the Parties, if determined to be necessary by either of the Parties to this Agreement or their designated representatives. Otherwise, it will be ac-

complished by an exchange of letters between the designated representatives of the Parties, subject at least to the terms and conditions of this present Agreement.

D.The use, by the designated representative of one Party, of facilities that are owned by or in which research is being sponsored by the designated representative of the other Party. Use of these facilities may be subject to commercial terms and conditions.

E.If a Party or its designated representative wishes to visit, assign personnel, or use the facilities owned or operated by entities other than the Parties to this Agreement or their designated representatives, the Parties recognize that prior approval of such entities will, in general, be required by the receiving Party or its designated representatives.

F.Any other form agreed between the Parties.

ARTICLE III - SCOPE OF AGREEMENT

The Parties, in accordance with the provisions of this Agreement , will undertake, through their designated representatives, a program for cooperative research in probabilistic risk assessment (referred to as COOPRA). This cooperative program will include technical information exchange in the areas of reliability, risk, and other related areas of research as mutually agreed by the Parties.

The specific elements and details of this cooperation are outlined in Appendix A, which is an integral part of this Agreement. The topics and programs outlined in Appendix A will be updated and adjusted periodically as the programs develop during the time this cooperation is in force.

ARTICLE IV - ADMINISTRATION OF THE AGREEMENT

A.The designated representatives of AIT and TECRO will each designate an Administrator to coordinate and determine the detailed implementation of this Agreement. These Administrators may

, at their discretion, delegate this responsibility to the appropriate technical staff with respect to a given issue.

B.Information on matters related to organization, budget, personnel, or management may be restricted and not provided as part of the general information exchange under this Agreement.

C.AIT and TECRO, through their designated representatives, will endeavor to select technical personnel for assignments to these cooperative programs who can contribute positively to the programs. The technical personnel assigned for extended periods will be considered visiting scientists (non-salaried) within the programs in this Agreement and will be expected to participate in the conduct of the analyses and/or experiments as necessary.

D.Each Party to this Agreement and its designated representatives will have access to all nonproprietary reports written by the technical personnel of the other Party's designated representative assigned to the respective programs that derive from the first Party's participation in those programs.

E.Administrative details concerning questions such as security, indemnity, and liability related to the assignees or trainees will be addressed in personnel assignment agreements between the respective Parties.

F.Travel costs, living expenses, and salaries of visiting technical personnel or personnel participating in program review meetings will be borne by their respective organizations.

ARTICLE V - EXCHANGE AND USE OF INFORMATION AND INTELLECTUAL PROPERTY

A.General

The Parties support the widest possible dissemination of information provided or exchanged under this Agreement, subject both to the need to protect proprietary or other confidential or privileged information as may be exchanged hereunder, and to the provisions of the Intellectual Property Addendum, which is an integral part of this Agreement.

B.Definitions (As used in this Agreement)

1.The term "information" means nuclear energy-related regulatory, safety, safeguards, waste management, scientific, or technical data, including information on results or methods of assessment, research, and any other knowledge intended to be provided or exchanged under this Agreement.

2.The term "proprietary information" means information created or made available under this Agreement which contains trade secrets or other privileged or confidential commercial information (such that the person having the information may derive an economic benefit from it or may have a competitive advantage over those who do not have it), and may only include information which:

a.has been held in confidence by its owner;

b.is of a type which is customarily held in confidence by its owner;

c.has not been transmitted by the owner to other entities (including the receiving Party or its designated representative) except on the basis that it be held in confidence;

d.is not otherwise available to the receiving Party, or its designated representative, from another source without restriction on its further dissemination; and

e.is not already in the possession of the receiving Party or its designated representative.

3.The term "other confidential or privileged information" means information, other than "proprietary information," which has been transmitted and received in confidence and which is protected from public disclosure under the laws and regulations of the territory represented by the Party providing the information.

C. Marking Procedures for Documentary Proprietary Information

A Party receiving documentary proprietary information pursuant to this Agreement will respect the privileged nature thereof, provided such proprietary information is clearly marked with the following (or substantially similar) restrictive le-

gend:

"This document contains proprietary information furnished in confidence under an Agreement dated between the Taipei Economic and Cultural Representative Office (TECRO) and the American Institute in Taiwan (AIT) and will not be disseminated outside these organizations, their designated representatives, consultants, contractors, and licensees, and concerned departments and agencies of the authorities in the territories represented by AIT and TECRO without the prior approval of (name of transmitting Party). This notice will be marked on any reproduction hereof, in whole or in part. These limitations will automatically terminate when this information is disclosed by the owner without restriction."

This restrictive legend will be respected by the receiving Party and proprietary information bearing this legend will not be used for commercial purposes, made public, or disseminated in any manner unspecified by or contrary to the terms of this Agreement without the consent of the transmitting Party.

D.Dissemination of Documentary Proprietary Information

1.In general, proprietary information received under this Agreement may be freely disseminated by the receiving Party without prior consent to persons within or employed by the receiving Party, and to concerned authorities in the territory represented by the receiving Party.

2.In addition, proprietary information may be disseminated without prior consent:

a.to prime or subcontractors or consultants of the receiving Party, or its designated representative, located within the geographical limits of the territory represented by that Party for use only within the scope of work of their contracts with the receiving Party in work relating to the subject matter of the proprietary information;

b.to domestic organizations permitted or licensed by the au-

thorities of the territory represented by the receiving Party to construct or operate nuclear production or utilization facilities, or to use nuclear materials and radiation sources, provided that such proprietary information is used only within the terms of the permit or license; and

c.to domestic contractors of organizations identified in D.2.b., above, for use only in work within the scope of the permit or license granted to such organizations;

Provided that any dissemination of proprietary information under D.2.a., b., and c., above, will be on an as-needed, case-by-case basis, will be pursuant to an agreement of confidentiality, and will be marked with a restrictive legend substantially similar to that appearing in Article V. C., above.

3.With the prior written consent of the Party furnishing proprietary information under this Agreement, the receiving Party may disseminate such proprietary information more widely than otherwise permitted in subsections 1. and 2. The Parties will cooperate in developing procedures for requesting and obtaining approval for such wider dissemination, and each Party will grant such approval to the extent permitted by its policies, regulations, and laws of the territory it represents.

E.Marking Procedures for Other Confidential or Privileged Information of a Documentary Nature

A Party receiving under this Agreement other confidential or privileged information will respect its confidential nature, provided such information is clearly marked so as to indicate its confidential or privileged nature and is accompanied by a statement indicating:

1.that the information is protected from public disclosure by the authorities of the territory represented by the transmitting Party and

2.that the information is transmitted under the condition that it be maintained in confidence.

F.Dissemination of Other Confidential or Privileged Information of a Documentary Nature

Other confidential or privileged information may be disseminated in the same manner as that set forth in paragraph D., Dissemination of Documentary Proprietary Information

G.Non-Documentary Proprietary or Other Confidential or Privileged Information

Non-documentary proprietary or other confidential or privileged information provided in seminars and other meetings arranged under this Agreement, or information arising from the attachments of staff, use of facilities, or joint projects, will be treated by the Parties according to the principles specified for documentary information in this Agreement; provided, however, that the Party, or designated representative, communicating such proprietary or other confidential or privileged information has placed the recipient on notice as to the character of the information communicated.

H.Consultation

If, for any reason, one of the Parties or its designated representative becomes aware that it will be, or may reasonably be expected to become, unable to meet the non-dissemination provisions of this Agreement, it will immediately inform the other Party and its designated representative. The Parties will thereafter consult to define an appropriate course of action.

I.Other

Nothing contained in this Agreement will preclude a Party from using or disseminating information received without restriction by a Party from sources outside of this Agreement.

ARTICLE VI - FINANCIAL CONSIDERATIONS

TECRO will contribute in-kind technical information exchange indicated in Appendix A (Part II) to AIT and its designated representative's program described in this Agreement.

ARTICLE VII - DISPUTES AND WARRANTY OF INFORMATION

A.All costs arising from implementation of this Agreement will be borne by the Party, or designated representative, that incurs them except when specifically agreed to otherwise. It is understood that the ability of the Parties and their designated representatives to carry out their obligations is subject to the availability of funds. It is also understood that the terms herein agreed to represent feasible commitments according to the best understanding regarding resources and costs at the time of signature.

B.Information furnished by one Party to the other under this Agreement will be accurate to the best knowledge and belief of the Party supplying the information. However, the application or use of any information exchanged or transferred between the Parties under this Agreement will be the responsibility of the Party receiving the information, and the transmitting Party does not warrant the suitability of the information for any particular use or application.

C.Cooperation under this Agreement will be in accordance with the laws and regulations of the respective territories represented by AIT and TECRO. Any dispute or questions between the Parties concerning the interpretation or application of this Agreement arising during its term will be settled by mutual agreement of the Parties.

D.AIT and its designated representative make no warranties, whatsoever, for the ability or suitability of any code or other analytical technique to perform in any particular manner for any particular purpose, or to accomplish any particular task. AIT and its designated representative accept no liability for damages of any type that may result from the use of codes or other analytical techniques provided under this Agreement.

ARTICLE VIII - OTHER CONSIDERATIONS

A.All AIT and designated representative computer codes disseminated under this Agreement are to be considered privileged information unless otherwise noted, are protected as such by AIT

and its designated representative, and shall be treated likewise by TECRO and its designated representative. They are, in particular, subject to all of the provisions of this Article including the requirement for an agreement of confidentiality (see Article V) prior to dissemination, with the exception that they need not be marked with the restrictive designation. The codes are subject to this protection in both object and source forms and as recorded in any media.

B.AIT and its designated representative's codes and other related analytical techniques covered under this Agreement, and any improvements, modifications or updates to such codes or techniques, are for the purpose of reactor and plant systems safety research and licensing and will not be used for commercial purposes, or for other benefits not related to the study of reactor safety without the prior consent of AIT's designated representative. Neither will these codes nor any other related analytical techniques be advertised directly or by implication to obtain contracts related to the construction or servicing of nuclear facilities, nor will advertising imply that AIT or its designated representative has endorsed any particular analyses or techniques.

C.All reports published within the scope of this Agreement and all meetings held will be in English.

ARTICLE IX - FINAL PROVISIONS

A.This Agreement will enter into force upon signature, retroactive from January 1, 2004, and will remain in force for a period of five years.

B.The Parties enter into this Agreement with the understanding that reasonable allowances for normal delays will be made in completing the work. The Parties and their designated representatives have the right to utilize information provided under this Agreement after the expiration date; however, all information protected by provisions of this Agreement as proprietary , confidential, privileged, or otherwise subject to restricti-

on on disclosure will remain so protected indefinitely unless mutually agreed otherwise in writing by the Parties.

C.A Party may terminate this Agreement after providing the other Party written notice of its intent to terminate 180 days in advance. The Party not terminating will notify the terminating Party before the effective date of termination if termination will result in the terminating Party receiving a disproportionate share of the expected benefit from this Agreement. Both Parties will endeavor to reach an equitable settlement of the matter through negotiation.

D.The Parties to this Agreement reserve the right to modify or extend the specific activities described in Appendix A within the intended scope of the Agreement upon written concurrence of their Administrators of their designated representatives.

E.If the portion of the research program of any Party that is pertinent to this Agreement is substantially reduced or eliminated, the technical scope described in Article III may be adjusted to substitute research of equivalent programmatic interest upon mutual agreement of the Parties.

IN WITNESS WHEREOF, the Parties have signed the present Agreement.

FOR THE AMERICAN INSTITUTE IN TAIWAN:	FOR THE TAIPEI ECONOMIC AND CULTURAL REPRESENTATIVE OFFICE IN THE UNITED STATES:
_____	_____
BY:	BY:
NAME:	NAME:
Barbara J. Schrage	Jaw-ling J. Chang
TITLE:	TITLE:

Deputy Managing Director	Deputy Representative
DATE: 12/29/04	DATE: 12/29/04
PLACE:	PLACE:
Washington D.C.	Washington D.C.

APPENDIX A
PROBABILISTIC RISK ASSESSMENT PROGRAM ELEMENTS

Part I. AIT AND DESIGNATED REPRESENTATIVE RESEARCH PROGRAMS IN PROBABILISTIC RISK ASSESSMENT

The international cooperative research effort in probabilistic risk assessment (PRA), has been divided into four general areas of research: (1) Methods Development, (2) Analysis of Operating Events, (3) Development of Advanced PC-Based PRA Software, and (4) Regulatory Applications of PRA. The activities planned in each of these areas are broadly described in the following sections.

1.Methods Development

It is generally recognized that the broad application of PRA to support regulatory decision-making requires methods improvements in a number of risk-significant areas. Among the areas needing improvement are treatment of fire risk, equipment aging, human reliability, and digital systems reliability and risk. AIT and its designated representative's programs in these areas are as follows:

a.Fire Risk

The overall purpose of the fire risk research program is to provide technical information in support of the AIT's designated representative's Risk-Informed Regulation Implementation Plan (RIRIP). In particular, the program will develop

fire PRA methods, tools, data, results, and insights needed by AIT's designated representative to perform risk-informed decision making.

The fire risk program includes activities that: 1) improve qualitative and quantitative understanding of the risk contribution due to fires in operating nuclear power plants (NPPs) and other facilities regulated by AIT's designated representative; 2) support ongoing or anticipated fire protection activities in AIT's designated representative's program offices, including the development of risk-informed, performance-based approaches to fire protection for operating NPPs ; and 3) evaluate current fire PRA methods and tools and develop improved tools (as needed to support the preceding objectives).

Previous work has led to: the development of improved methods, tools, and data in a number of areas, including circuit analysis, fire detection and suppression analysis, and uncertainty analysis; and to the development of fire PRA insights from reviews of past significant fire events. Ongoing work includes efforts to: develop comprehensive, state-of-art guidance for the conduct of fire PRA (and gain insights from plant-specific application; develop (in cooperation with a number of international organizations) an improved understanding of the uncertainties and limitations in current fire models; support ongoing fire-related regulatory efforts (e.g ., the AIT's designated representative's fire protection Significance Determination Process and associated circuits inspections); and support development of the American Nuclear Society full power fire risk standard.

b.Equipment Aging

The objective of this research effort is to assess the feasibility of using reliability-based physics models to incorporate the effects of aging into an integrated probabilistic risk assessment. Earlier work in this area assessed the feasibility of using this technique for the aging of piping.

This work was published in NUREG/CR-5632, in the year 2001. Additional work in this area is the application of this technique to assessing the effect of aging on the failure of in-containment instrumentation and control cables during a loss of coolant accident. A report will be published in 2004 describing a method of assessing the probability of failure of these cables as a function of their age, and the inservice dose rate and temperature the cables are exposed to, with some numerical examples. Additional work will be dependent on obtaining the cooperation of a licensee to provide data on cable insulation materials and the environment of cables.

c.Human Reliability

The general objectives of the human reliability analysis (HRA) research are to: 1) develop improved human reliability analysis (HRA) methods, tools (including guidance), and data needed to support the designated representative's regulatory activities, including the broad implementation of risk-informed regulation; and 2) develop HRA insights to support the development of technical bases for addressing identified or potential safety issues.

Previous work has led to the development of ATHEANA, an improved method for HRA that focuses on the identification of error forcing contexts that increase the likelihood of human errors; the application of ATHEANA in the assessment of pressurized thermal shock (PTS) risk in support of efforts to re-examine the technical basis for 10 CFR 50.61, the PTS rule; and the development of an improved method for HRA quantification that explicitly treats uncertainties. Current work includes the continual use of ATHEANA in PRA applications (e.g., the fire requantification and steam generator tube rupture), the development of an improved method for HRA quantification that includes the use of evidence from a variety of sources; the development of a repository for human event reliability analysis (HERA), and the development of HRA guida-

nce, i.e., an HRA Good Practices document, to support the use of the American Society of Mechanical Engineers (ASME) PRA standard.

d.Digital Systems Reliability and Risk

The increased use of digital instrumentation and control systems in nuclear power plants is introducing some unique reliability and risk issues. This project will be focused on providing methods for more quantitative, probabilistic assessments of digital systems reliability and their impact on overall plant risk, including hardware and software reliability and human-system interface issues. The staff is currently focusing on Failure Mode and Effect Analysis (FMEA) in support of developing reliability models of digital systems. The potential goals are finding a better definition of the reliability problems of digital systems and a better process of applying FMEA to digital systems. The future work is expected to be in the areas of software reliability and the failure rate data development.

2.Analysis of Operating Events

a.ASP Program

The Accident Sequence Precursor (ASP) Program was established by AIT's designated representative in 1979 in response to the Risk Assessment Review Group report (see NUREG/CR-0400, September 1978). The primary objective of the ASP Program is to systematically evaluate U.S. nuclear plant operating experience to identify, document, and rank operating events most likely to lead to inadequate core cooling and severe core damage (precursors), if additional failures had occurred.

The other objectives of the ASP Program are:

* To categorize the precursors by their plant-specific and generic implications,
* To support performance measures contained in AIT's designated representative's annual Performance and Accountability Report to Congress,

* To provide a measure for trending nuclear plant core damagerisk, and
* To provide a partial check on probabilistic risk assessment (PRA)-predicted dominant core damage scenarios.

Events and conditions from licensee event reports, inspection reports, and special requests from AIT's designated representative's staff are reviewed for potential precursors. These potential precursors are analyzed, and a conditional core damage probability (CCDP) is calculated by mapping failures observed during the event onto accident sequences in risk models. An event with a CCDP or a condition with a change in core damage probability greater than or equal to 1 x 10-6 is considered a precursor in the ASP Program.

Plant-specific and generic insights and lessons learned from the ASP program, and other issues of interest that were encountered during the precursor analysis of operating experience (e.g., pr- ojection of unanticipated accident scenarios, risk exposure from precursors, and adequacy/availability of risk mitigation measures) are currently being exchanged in annual meetings with OECD countries.

b.SPAR Model Development Program

The Standardized Plant Analysis Risk (SPAR) models are the analysis tool used by staff analysts in many regulatory activities, including the ASP Program. The current set of SPAR models includes PRA models for internal initiating events during full power operation for each operating plant in the U.S. In addition, generic models for low-power and shutdown operations, and Level 2/large early release frequency (LERF) analysis are being developed for several plant categories. Currently, plant specific SPAR models are available only to AIT's designated representative and licensees.

c.Reactor Performance Data Collection Program and Industry Trends Program The objectives of these programs are to:

* Collect industry data and produce industry trends for initiating events, common-cause failures, system and compone-

nt reliabilities, and fire events

* Establish thresholds for the associated industry trends.
* Develop integrated industry indicators and thresholds for the above.
* Produce parameter estimates for use in the SPAR models and other risk analyses for initiating events, components, and common-cause failures.

AIT's designated representative is currently developing a new approach for industry trends. The proposed Baseline Risk Indicator for Initiating Events (BRIIE) uses industry data available from AIT's designated representative's programs, and is closely tied to risk, e.g., core damage frequency. The BRIIE uses a risk-significant subset of initiating events along with appropriate risk weights obtained from the various plant PRAs.

d.Development of Risk Based Performance Indicators

AIT's designated representative is developing a mitigating systems performance index (MSPI) to monitor the performance of six systems based on their ability to perform risk-significant functions. The index comprises two elements - system unavailability and system reliability. Plant-specific PRA models are used to calculate the contribution of component failures and maintenance unavailability to the index, which approximates the change in core damage frequency. AIT's designated representative is currently evaluating several technical issues arising from the pilot plant program and is also investigating the feasibility of implementing the MSPI as part of AIT's designated representative's Reactor Oversight Process.

3.Development of PC-Based PRA Software

The AIT's designated representative has developed and maintains the SAPHIRE (Systems Analysis Programs for Hands-on Analysis Integrated Reliability Evaluations) PRA computer code. SAPHIRE offers a state-of-the-art capability for assessing the risk associated with any complex system or facility. In part-

icular SAPHIRE can be used to assess the risk associated with nuclear power plants in terms of core damage frequency (Level 1 PRA) and containment performance and radioactive releases (Level 2 PRA). SAPHIRE includes GEM, a separate subroutine th- at provides a simplified user interface for performing analys- is using SPAR models, discussed above.

Both the continual advancement of the state-of-the-art in the use of computers and the continual expansion of the use of ri- sk-information in the AIT's designated representative's decis- ion-making, necessitate continual maintenance and improvement of SAPHIRE.

It is expected that this program will continue to provide sof- tware maintenance and user support and expand SAPHIRE capabil- ities by: decreasing size limitations (on the number of basic events, fault trees, sequences, end states, etc. handled by SAPHIRE), speeding up cutset generation and data analysis usi- ng multiple processors, adding work group project integration capability, and creating a web-page type user interface with the goal of reducing complexity without losing SAPHIRE's func- tionality. Furthermore, SAPHIRE's documentation will be revi- sed by issuing a new report for the Windows Versions 6 and 7. Finally, a SAPHIRE interface is being developed to be used in the Reactor Oversight Process.

4.Regulatory Applications of PRA

a.Changes to Reactor Regulations

AIT's designated representative has been actively pursuing the increased use of PRA methods, models, and insights to support regulatory decisions. Among the active programs are those which use PRA results to identify changes needed in reactor safety requirements. There are currently two regul- ations 10 CFR 50.44 "Standards for Combustible Gas Control Systems in Light-Water-Cooled Power Plants" and 10 CFR 50.46 "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water-Cooled Power Plants" that the staff is revising based on current risk information and research results. In

September 2003, AIT's designated representative concluded rulemaking on 50.44 by issuing risk-informed revision to 50.44 which among other changes, eliminated the current requirements for hydrogen recombiners. Proposals are under consideration for risk-informing 50.46.

b.Regulatory Guidance on PRA

AIT's designated representative's staff has developed a draft regulatory guide (RG) that provides guidance to licensees on how to use PRA standards and industry peer review programs to demonstrate that the risk input to a risk-informed decision is technically defensible. This new RG will be accompanied by a Standard Review Plan (SRP) chapter. The main body of the RG provides guidance on the use of PRA standards and industry guidance by licensees to determine the level of confidence that can be afforded PSA insights/results in support of decision-making. AIT's designated representative's staff's endorsement of the standards and industry program will be the appendices to this RG. Specifically, Appendices A and B include the staff's position on the American Society of Mechanical Engineers (ASME) PRA standard and the Nuclear Energy Institute (NEI) peer review process respectively both addressing full-power, internal events, excluding internal fire, Level 1 and limited Level 2 (LERF) PRA. As the American Nuclear Society (ANS) PRA standards are issued on external hazards, low power and shutdown and internal fires, additional appendices will be added to the regulatory guide. The draft RG was issued in November 2002 for public review and comment. A RG for trial use will be issued for pilot applications in February 2004. Pilot applications include different allowed outage time (AOT) for technical specifications changes and 10CFR 50.69.

c.Risk of Dry Cask Fuel Storage

AIT's designated representative is performing a pilot PSA of a spent fuel dry cask storage system, the Holtec International HI-STORM 100. This cask is being studied at a specific BWR

site where the operations can be observed and modeled. (Although developed for a specific cask at a specific site, the analytical models developed for this preliminary study can be modified and applied to other dry cask systems at other reactor sites.) During its service life, the cask has three operational modes - handling in the reactor building, transfer to the storage pad, and storage for 20 years. In each of these modes, accidents that could result in mechanical and thermal challenges to the cask and that have the potential to cause the release of radioactive material, are postulated. Available data are used to estimate accident frequencies. Engineering analyses are used to determine the stresses that would be imposed by the postulated events. Fracture mechanics and other engineering disciplines are used to determine the probability of a cask failing when subjected to postulated accident conditions.

The preliminary results of the PSA suggest that the risk to the public of the HI-STORM cask at the BWR plant is very low compared to the risk of accidents involving the core of operating nuclear power plants. Accidents that have a high conditional probability of failing the cask have a very low frequency. Furthermore, the consequences of the postulated accidents that can fracture the cask and the fuel are low because the energy driving the radionuclides from the fuel pellets is low and the inventory of radionuclides in the fuel pellets is relatively low compared to the reactor inventory. Accordingly, the risk, defined as the sum of the products of the accident frequencies and consequences, is very low.

d.Development of Risk Guidelines for Nuclear Materials and Waste Applications

AIT's designated representative's Commissioners have approved the plans to continue advancements in risk-informing activities in the nuclear materials and waste arenas as a means of improving the AIT's designated representative's Agency's focus on safety, effectiveness, and efficiency, and in reducing unn-

ecessary regulatory burden. As work is completed in the risk informed activities in the nuclear materials and waste arenas, the information will be shared.

Part II. TECRO RESEARCH PROGRAMS IN PROBABILISTIC RISK ASSESSMENT

The international cooperative research effort in the territory represented by TECRO on Probabilistic Risk Assessment (PRA) has been divided into three general areas of research: (1) PRA Model Development, (2) Development of Risk Monitors, and (3) Regulatory Applications of PRA. The activities planned in each of these areas are broadly described in the following sections. The report of each ongoing activity will be issued in a couple of months after the associated project is completed. All reports will be written in Chinese, but an English version of the executive summary will be prepared upon request.

1.PRA Model Development

It is generally recognized that the broad applications of PRA to support regulatory and operational decision-making require comprehensive PRA models for operating nuclear power plants (NPPs) in the territory represented by TECRO. In 1983, PRA methodology was first introduced to the territory represented by TECRO, consulted by an U.S. company and reviewed by AIT's designated representative. PRA models for three operating NPPs have been completed: Kuosheng (GE BWR-6, 1983-1985), Maanshan (Westinghouse 3-loop PWR, 1985-1993), and Chinshan (GE BWR-4, 1988-1991). Level II models were established for each NPP, including internal and external events (typhoon, earthquake, fire, and flooding) at power operation stage. The SETS code was adopted for model construction and a CDC mainframe was chosen as the quantification environment. Since plant-specific data were insufficient at that time, generic data were occasionally used. These reports were written in English.

Starting from 1994, a project co-sponsored by the designated representatives of TECRO, Taiwan Power Company (TPC), and Ins-

titute of Nuclear Energy Research (INER) of Atomic Energy Council (AEC), was initiated. The objectives of this project were (1) to revise the previous models and establish the mechanism to reflect the current plant condition, and (2) to construct a shutdown model for each operating NPP. For revision of the models at power, plant-specific data and design change from commercial operation up to the end of 1994 were collected and analyzed. This information along with the state-of-the-art knowledge was used to reconstruct the models of a PC-based software (NUPRA). These living PRA models were completed at the end of 1995. Due to the limited availability of manpower and other resources, only Level I analyses of internal, typhoon, and seismic events were included in this project. In June of 1997, shutdown models for three NPPs (Level I internal events only) were also completed. These PRA reports were written in Chinese.

Starting from 1997, a project co-sponsored by TECRO's designated representative (TPC) was initiated to refine the living PRA models. The objects of this project were to refine the shutdown models, the level II PRA analyses, and the fire and flooding analyses. The shutdown models were refined and tested on the recent plant outages to show the robustness for all foreseeable outage durations from 30 to 60 days. The level II analyses of PRA at power were updated including the CSET (Containment System Event Tree) and CPET (Containment Phenomena Event Tree) for each NPP. Fire and Flooding analyses were updated including the reconstruction of the event trees, fault trees and data. The refined living PRA models were peer reviewed in 2002.

A project co-sponsored by TECRO's designated representative, TPC, will be initiated in 2004 to incorporate suggestions from PRA peer reviews. Both the PRA models at power and shutdown will be refined.

2.Development of Risk Monitor

PRA modeling is generally recognized as a powerful tool in pr-

oviding risk information to decision-makers. But due to the difficulty in understanding and interpreting the results generated from PRA model, usually only PRA experts or ones who have been involved in model development can easily manipulate the models. In order to promote the application of PRA on decision-making in NPPs, on the basis of the accomplished living PRA models on all of the three operating NPPs in the territory represented by TECRO, TECRO's designated representatives, INER and TPC, have collaboratively developed a risk monitor, the Taipower Integrated Risk Monitor (TIRM), for each NPP in July of 1997. The scope of this program was limited to PRA Level I , internal events only.

The main features of TIRM include: Top Logic Fault Tree adopted, risk profile display of 24 hours re-quantification for a new plant configuration in less than 10 minutes, using P&IDs as interface for configuration change (at power only), risk prediction for maintenance plan (each plan up to 96 hours). Other features include display of historical risk profile, list of components under maintenance, status of Critical Safety Functions (CSF), qualitative Risk Manage Guideline (RMG), etc. Risk profile, CSF, and RMG for a shutdown schedule were also developed for each NPP.

Due to TIRM's robust function and its successful development, since June of 2001, the nuclear regulatory body in the territory represented by TECRO has requested that each NPP evaluate shutdown risk before TEPCO's designated representative, TPC, performs refueling outages and calculate the associated risk profile daily by the TIRM. However, for further risk-informed applications, only Core Damage Frequency (CDF) index involved in TIRM is not sufficient. The constraint features of TIRM's fault tree engine about how to add a powerful fault tree engine and about how to incorporate the LERF index become a challenge to the next generation of risk monitor. A new risk engine, INERISKEN, developed by INER was incorporated into the TIRM-2. By introducing the new powerful risk model solver IN-

ERISKEN, the TIRM-2 is designed to have more capabilities and to run faster than TIRM does. The TIRM-2 provides both CDF and LERF calculations by solving the new risk model with CDF model and LERF model within several minutes. In 2003, an advanced approach to construct a new risk model for TIRM-2 and to integrate LERF into TIRM-2 has been developed successfully. Currently, the TIRM-2 at power and refueling outages has been released to all of the three operating NPPs for their usage. This powerful risk monitor, TIRM-2, has replaced TIRM to provide the basis of risk-informed applications. With the capability of performing CDF and LERF calculations, the TIRM-2 becomes a very helpful tool in monitoring the risk associated with various plant states and provides further information directly for risk-informed applications.

The risk engine, INERISKEN, is more powerful than NURELMCS (a commercial code) and is used to replace the NURELMCS in TIRM-2. A new risk measure, LERF, was resolved simultaneously in addition to CDF. Risk measures of both CDF and LERF can be resolved with a particular risk model that can only be recognized by INERISKEN. The results can be obtained within 5 minutes for any plant configuration. An enhanced version, the version 2.0 of TIRM-2 will be developed to comply with the changes in the updated living PRA models incorporating suggestions of PRA peer review in 2006.

3.Regulatory Applications of PRA

Since July of 1997, a risk-informed regulation project sponsored by the authorities of the territory represented by TECRO has been conducted by the staff of TECRO's designated representatives, INER and TPC. The objectives of 5-year project were : (1) to review the adequacy of the current regulations at shutdown operating conditions, (2) to establish regulatory review guidelines for On-Line Maintenance (OLM) applications, and (3) to establish regulatory review guidelines for applications of changes on the current licensing basis. The scope of the study includes the adequacy of the current operating procedur-

es, maintenance schedule, and safety policy. Unlike the situation in the territory represented by AIT that treats OLM as one of the activities covered by the Maintenance Rule, the issue of OLM is treated as one of the changes of the current licensing basis in the territory represented by TECRO. Regulatory guidelines for changes of current licensing bases (e.g., OLM, changes of Surveillance Test Intervals and In-Service Testing) were developed during fiscal years 1999-2002. Pilot programs of RHR OLM for each NPP were endorsed by TECRO's designated representative, AEC, in 2003.

Risk-informed fire analysis applications in cable tray fire wrapping issues for Kuosheng and Maanshan NPPs are on-going. The study of pilot plant, Chinshan NPP was finished in 2003. An optimal alternative for Appendix R was suggested. A display system, RIFADISP, was also developed to show the important results of the study.

A pilot study of Risk-Informed In-service Inspection (RI-ISI) for RHR system of Kuosheng NPP was finished in 2003. Full scope studies of RI-ISI for all NPP will be preceded in the near future.

A table-based Significance Determination Process (SDP) of the Reactor Oversight Process (ROP) has been provided by AIT's designated representative to determine the safety significance of resident inspection findings. After a preliminary screening (Phase 1 of SDP) of inspection findings, an assessment process is conducted to obtain a risk approximation and to help the inspectors determine the risk significance (Phase 2 of SDP). TECRO's designated representative INER has developed a window-based tool with the SDP context to help the resident inspectors perform the Phase 2 SDP assessment and obtain the associated results more quickly and precisely. This SDP tool has released its beta version in 2004 and it is expected to be completed in 2005.

In addition to the progress of TIRM-2 and the window-based SDP tool, on-line maintenance of RHR systems for current three op-

erating NPPs of TECRO's designated representative TPC has been approved in October of 2003. Dedicated PRA models mentioned above were established for all of the three nuclear plants by 1992. The third party, ABS Consulting of United Stated and Professor George Apostolakis of MIT have reviewed the accomplished living PRA reports on all of the three NPPs operating in the territory represented by TECRO in 2002. The regulatory body in the territory represented by TECRO has accepted the associated peer review reports in December of 2003 and is well satisfied with the PRA quality. Other subsequent risk-informed applications will be proposed soon. It is expected that a new era of risk-informed applications will be initiative in the territory represented by TECRO.

INTELLECTUAL PROPERTY ADDENDUM

Pursuant to Article V of this Agreement:

AIT and TECRO shall ensure adequate and effective protection of intellectual property created or furnished under this Agreement and relevant implementing arrangements. AIT and TECRO agree, through their designated representatives, to notify one another in a timely fashion of any inventions or copyrighted works arising under this Agreement and to seek protection for such intellectual property in a timely fashion. Rights to such intellectual property shall be allocated as provided in this Addendum.

I.SCOPE

A.This Addendum is applicable to all cooperative activities undertaken pursuant to this Agreement, except as otherwise specifically agreed by AIT and TECRO through their designated representatives.

B.For purposes of this Agreement, "intellectual property" shall have the meaning found in Article 2 of the Convention Establishing the World Intellectual Property Organization, done at Stockholm, July 14, 1967; viz., "intellectual property ' shall include the rights relating to:

- literary, artistic and scientific works,

- performances of artists, phonograms, and broadcasts,
- inventions in all fields of human endeavor,
- scientific discoveries,
- industrial designs,
- trademarks, service marks, and commercial names and designations,
- protection against unfair competition,

and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields."

C.This Addendum addresses the allocation of rights, interests, and royalties between AIT and TECRO and their designated representatives. Acting through their designated representatives, AIT and TECRO shall ensure that the other Party can obtain rights to intellectual property allocated in accordance with the Addendum by obtaining those rights from its own participants through contracts or other legal means, if necessary. This Addendum does not otherwise alter or prejudice the allocation between

- AIT and nationals of the territory represented by AIT which shall be determined by the laws and practices applicable in that territory or
- TECRO and nationals of the territory represented by TECRO which shall be determined by laws and practices applicable in that territory.

D.Disputes concerning intellectual property arising under this Agreement should be resolved through discussions between AIT and TECRO and their designated representatives. Upon mutual agreement of AIT and TECRO, a dispute shall be submitted to an arbitral tribunal for binding arbitration in accordance with the applicable rules of international law. Unless AIT and TECRO or their designated representatives agree otherwise in writing, the arbitration rules of the United Nations Commission on International Trade Law (UNCITRAL) shall govern.

E.Termination or expiration of this Agreement shall not affect

rights or obligations under this Addendum.

II.ALLOCATION OF RIGHTS

A.The designated representatives of AIT and TECRO shall be entitled to a non-exclusive, irrevocable, royalty-free license in all countries to translate, reproduce, and publicly distribute scientific and technical journal articles, reports, and books directly arising from cooperation under this Agreement. All publicly distributed copies of copyrighted work prepared under this provision shall indicate the names of the authors of the work unless an author explicitly declines to be named.

B.Rights to all forms of intellectual property, other than those rights described in Section II(A) above, shall be allocated as follows:

1.Visiting researchers, for example, scientists visiting primarily in furtherance of their education, shall receive intellectual property rights under the policies of the host institution. In addition, each visiting researcher named as an inventor shall be entitled to share in a portion of any royalties earned by the host institution from the licensing of such intellectual property.

2.

(a) For intellectual property created during joint research, for example, when the designated representatives of AIT and TECRO, participating institutions, or participating personnel have agreed in advance on the scope of work, the designated representatives of AIT and TECRO shall be entitled to obtain all rights and interests in the territory they represent. For inventions made in the territory represented by AIT, AIT's designated representative shall have first option to acquire all rights and interests in territories not represented by AIT or TECRO. For inventions made in the territory represented by TECRO, TECRO's designated representative shall

have first option to acquire all rights and interests in territories not represented by TECRO or AIT. If research is not designated as "joint research," rights to intellectual property arising from the research will be allocated in accordance with paragraph II.B.1. In addition, each person named as an inventor shall be entitled to share in a portion of any royalties earned by either institution from the licensing of the property.

(b) Notwithstanding paragraph II.B.2.(a), if a type of intellectual property is available under the laws of the territory represented by AIT but not under the laws and practices applicable in the territory represented by TECRO, the designated representative of AIT shall be entitled to all rights and interests worldwide. Notwithstanding paragraph II.B.2.(a), if a type of intellectual property is available under the laws and practices applicable in the territory represented by TECRO but not under the laws of the territory represented by AIT, the designated representative of TECRO shall be entitled to all rights and interests worldwide. Persons named as inventors of the property shall nonetheless be entitled to royalties as provided in paragraph II.B.2.(a).