January 25, 2001

Mr. Song Ruixiang
Vice Minister
State Environmental Protection Administration
No. 115 Xizhimennei Nanxiaojie
Beijing, China 100035

Dear Mr. Vice Minister:

Thank you for the invaluable time you have taken to meet me and to host the hospitable dinner during my recent visit to Shanghai. It was nice seeing you again and to have the opportunity to continue our conversation from when you visited the NRC in August 2000.

Under the terms of the NNSA and NRC Protocol on Nuclear Safety Matters, we have built an active bilateral program of safety cooperation. However, the NRC looks forward to further strengthening this cooperation, particularly in the areas of plant inspection and emergency preparedness and response. I am pleased that you will head a delegation to the U.S. in July 2001 to observe the emergency drill involving the Summer Nuclear Plant. I believe that you will find the drill very informative. I look forward to meeting with you again at the NRC to continue our discussion of safety matters from our meeting in Shanghai last fall.

I am enclosing with this letter a copy of the International Comparison Study that I sent to the Commission in February 1999. As I mentioned before, this study compares the U.S. reactor regulatory program with that of France, Japan, and the United Kingdom. The report illustrates the number of full-time employees and budget needed in those programs to maintain their current level of regulatory safety. This may help you perform an assessment of your staffing and budget as compared to the international experience.

I look forward to the opportunity to continue our safety discussion.

Sincerely,

/S/

William D. Travers
Executive Director for Operations

Enclosure: February 1999 International Comparison Study

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

MEMORANDUM TO: Chairman Jackson

FROM: William D. Travers
Executive Director for Operations

SUBJECT: INTERNATIONAL COMPARISON STUDY

Your memorandum of November 24, 1998 tasked me to conduct a study which compares the NRC regulatory framework to that of France, Japan, and the United Kingdom. Attached is the study report. On January 19, 1999 we provided a draft report to you and to our counterparts in France, Japan, and Great Britain to give them an opportunity to review the way we have characterized their programs. Comments received from each country have been incorporated into the study report and do not change the overall conclusions.

The overall conclusions of the report as characterized in the Executive Summary indicate that comparisons in the aggregate particularly and by individual program are not meaningful. Reasons for this conclusion include:

- many programs performed by NRC are not conducted in a substantive way by other countries;
- infrastructure differences such as the degree of reactor standardization, private vs. public sector licensees, legal structure and public sector participation;
- differences in regulatory approaches which have evolved from public and Congressional expectations, past operational experience, and Commission policy (e.g., degree of independent verification and public-involvement).

Also, the Tim D. Martin Associates analysis, which stimulated the interest in comparing the U.S. reactor regulatory program with that of other countries, omitted resources used by other countries for functions that are performed by the NRC. Typically these functions (e.g., research, technical assistance) are provided by other than the primary regulatory body. This made the U.S. regulatory program appear disproportionately large.

Attachment: As stated

cc w/attachment:
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
Commissioner Merrifield
SECY
OIP
OGC
OPA
OCA
CFO
CIO

Comparison of U.S. Reactor Regulation Programs with that of France, Japan and the United Kingdom

February 2, 1999

I. Study Conclusions

Aggregate comparisons of the resources for reactor regulatory programs of the U.S., France, Japan, and the UK, as done by Tim D. Martin Associates, (TDMA) are not meaningful because they do not compare like programs. Many of the specific regulatory programs conducted by the U.S. are not conducted in a substantive or formal way by some of the other countries (i.e., Enforcement, Investigation, License Renewal, Adjudication, Legal Advice, Operational Experience Evaluation). Other programs are conducted in a substantially different way because of different infrastructure differences or regulatory approaches (i.e., Licensing, Inspection, Performance Assessment, Research, Incident Response, High Level Waste Management).

Infrastructure differences are generally outside NRC's control. These include the degree of standardization of reactor designs, private vs. public sector licensees, the number of licensees and legal structures. These differences alone could easily account for the differences in resource levels allocated to various programs.

The regulatory approach used by the NRC for a given program also affects resource expenditures and is generally more within our control but is largely shaped by expectations from the U.S. public, Congress, past U.S. operational experience and Commission policy. This would include such considerations as the degree of independent verification required for licensee activities and the degree of public participation in regulatory activities. The scope and nature of NRC regulations and programs has also been driven by past operational experiences, such as the TMI accident. Nonetheless, NRC is currently reassessing its reactor regulatory approach and processes in all major programs -- Inspection, Licensing, Performance Assessment, Enforcement, and Regulations.

Given the above, comparison of the U.S. reactor regulatory programs in the aggregate or by program with that of France, Japan, and UK does not appear meaningful.

Notwithstanding the above, the Tim D. Martin Associates' analysis omitted resources expended by other countries for functions performed by the NRC. Typically, these functions (e.g., research and technical assistance) are provided by other than the primary regulatory body. This made the NRC program appear disproportionately large.

II. Background

In the context of the July 30, 1998 hearing, before the Senate Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, the NRC resources devoted to nuclear safety oversight were compared with those of other countries. The basis for the comparisons was data collected by Tim D. Martin Associates. Attachment 1 is a chart prepared by Tim D. Martin Associates which was used in discussions with the Senate staff. The source of the information for other countries appears to have been a 1997 OECD Nuclear Energy Agency report, Status Report on Regulatory Inspection Philosophy, Inspection Organization and Inspection Practices. The chart indicates that "...NRC is larger than other nuclear regulators--more analysis should be performed to understand why."

On November 24, 1998, Chairman Jackson directed the Executive Director for Operations (EDO) to conduct additional study in this area to enable the Commission to provide the Congress with a more informed response (Attachment 2). The study was to include:

Table of Content

Attachments:
1. Tim D. Martin and Associates' Chart
2. Memo from Jackson to Travers dated 11/24/98
3. U.S. NRC Program Description
4. Memos to France, Japan, and United Kingdom dated 12/4/98
5. Response from France
6. Response from Japan
7. Response from United Kingdom

- A description of the program elements of the NRC regulatory framework.
- A comparison of this framework to the nuclear regulatory frameworks of France, Japan and the UK.
- An analysis of the overall usefulness of such studies, including the vulnerabilities present in making comparisons of organizations with differing infrastructures, legal bases, oversight responsibilities, and industry characteristics.
- A comparison of the NRC study with the Tim D. Martin Associates report.

III. NRC Regulatory Framework

The first step was to define the NRC regulatory programs in a manner that would facilitate comparison to other countries with differing structures. The program descriptions and resource information (Attachment 3) were comprised primarily of FY 1999 data from the Budget Estimates for Fiscal Year 2000 for the Nuclear Reactor Safety Arena (Blue Book). On December 4, 1998, the EDO sent letters to counterparts in France, Japan and the UK (Attachment 4) requesting information that would be the bases for the comparative analysis. The letters included a description of the U.S. NRC regulatory structure and programs with associated FTE information.

The staff then prepared comparisons of the NRC programs with the other three countries based on existing available information and specific responses from the counterparts (Attachments 5, 6, 7). Subsequently, the counterparts reviewed a draft of this report and provided clarifications which have been incorporated. The results of that staff's analysis follow.

IV. Comparisons of the U.S. Regulatory Framework with those of France, Japan and United Kingdom

U.S. NRC:

A comparison of the resource and program differences between the NRC and the nuclear safety regulators in France, UK, and Japan must consider a number of factors. One of these is fundamental differences in the culture/philosophy of nuclear power regulation. For example,

- From the inception of the commercial nuclear power program in the United States, Congress and the public have called for a more comprehensive regulatory safety regime than those that exist in other countries. As a result, the NRC's program has evolved to a more detailed, prescriptive regulatory approach.
- The United States has a long-standing culture of public participation in government decisionmaking that is not typical in other countries. Thus, the NRC, in contrast to its foreign counterparts, has regulatory processes which provide substantial opportunity for public participation. NRC devotes significant resources to matters such as licensing adjudications, solicitation and evaluation of public comments on proposed regulatory actions, maintaining publicly available documents, and conducting business in a public forum.

- The nuclear safety regulator in some of these countries, have traditionally had a more cooperative relationship with their regulated communities. This in turn has resulted in less oversight and the need for fewer and far less prescriptive regulatory requirements.

- The NRC regulates many more reactor designs than its counterparts of these countries. Standardized plants, such as those in France, can be regulated more efficiently.

In addition, the NRC is subject to numerous government-wide statutory obligations unrelated to nuclear regulation that require substantial resources to implement. These statutes include (but are not limited to) the:

- Administrative Procedure Act
- Freedom of Information Act
- Paperwork Reduction Act
- Government in the Sunshine Act
- Federal Advisory Committee Act

France:

The description below is of the French regulatory system now extant; however, the French Government is currently considering a full-scale reorganization, including creating a five-member commission to lead its regulatory activities.

Legislation

Nuclear installations are basically regulated by the Decree of December 11, 1963, amended by three more recent decrees. In particular, its Article 11 defines the role of inspectors. The authorities primarily involved in licensing procedures are the Minister for Industry and the Minister for the Environment (with the consent of the Minister of Health requested). The regulatory organizations are Directorate for the Safety of Nuclear Installations (DSIN), Nuclear Steam Supply System Control Bureau (BCCN), and the nuclear divisions of Regional Directorate for Industry, Research and the Environment (DRIRE). DSIN reports to the Ministry of Industry and the Ministry of Environment. There are also two technical support organizations: the Institute for Protection and Nuclear Safety (IPSN) and the Office for Protection Against Ionizing Radiation (OPRI), which belongs to the Ministry of Health. Also, the Atomic Energy Administration (CEA) does nuclear safety research and development work. DSIN can sign a number of regulatory documents on behalf of the Ministers, except reactor individual licenses which are granted by decrees or arretes: those can only be signed by the Prime Minister or Ministers respectively.

Organization

DSIN, considered the regulatory counterpart to NRC, has about 210 professional staff, including 70 regional inspectors, and an annual budget of approximately $100 million. As in the U.S., the majority of DSIN's funding is recovered from regulatory fees. 210 professional Staff are for DSIN, BCCN and nuclear divisions of DRIREs; among them, 125 are DSIN and BCCN inspectors.

DSIN's responsibilities are:

- drafting and monitoring the application of the general technical regulations;
- implementing licensing procedures;
- organizing and implementing surveillance of the plants by inspectors;
- emergency response in case of an incident or accident;
- providing the general public and the media with information on nuclear safety problems;
- contributing to the activities of international organizations and promoting bilateral relations with the regulatory bodies of other countries.

DSIN also follows nuclear safety research and development work undertaken by organizations under the Ministry of Industry, particularly the Commissariat a l'Energie Atomique (CEA) and the utility Electricite de France (EdF). DSIN's work is also directly supplemented by IPSN, the Regional Directorates for Industry, Research and the Environment (DRIRE); and the BCCN. In fact, BCCN, nuclear divisions of DRIREs and IPSN carry our their work upon DSIN's request. Only 8 DRIREs (among 22) have a nuclear division; within these DRIREs, only the nuclear division works for DSIN. The rest are responsible for tasks which have nothing to do with nuclear safety.

At the local level, the DRIREs implement their tasks of nuclear plant surveillance, which include:

- inspection;
- approval and monitoring of power plants outage programmes; after an annual outage, DSIN would authorize the plant start up, based on DRIRE advice;
- processing of waiver requests (with regards to the general operating rules); only non generic waivers are processed by DRIREs, generic waivers are processed by DSIN; the waiver is always granted by DSIN;
- processing of declared incidents; incidents having generic aspects are subsequently processed by DSIN;
- supervision of pressure vessel regulation (and associated processing of waiver requests);
- supervision of regulations for registered installations (on environmental grounds);
- labor regulation supervision;
- relations with local authorities (prefects, mayors, etc.).

Both the DSIN and DRIREs get technical support from IPSN. There are no resident inspectors, and only limited capability of regional inspection offices. Ongoing inspection is less than in the U.S., but every ten years in-depth safety evaluations are performed for each facility, which are not required in the U.S. DSIN/DRIRE do not regulate radiation safety or safeguards.

IPSN, which is part of the Atomic Energy Administration (CEA), and whose Chairman is the Director of DSIN, has a budget of $260 million and an independent staff of 1270 among which 350 FTE carry out safety analyses, and provides technical safety assessment advice to DSIN and the DRIREs. Most of the remaining 920 staff at IPSN are involved in carrying out reactor safety research to develop and maintain the nuclear infrastructure and to provide consultation to the regulator. IPSN research does not only cover reactor safety, but also radiation safety or criticality safety. Moreover, among the 920 staff, a number provide technical assessment advice to DSIN for transport safety issues as well as to the regulators for safeguards, physical protection and for defense facilities respectively.

Radiation protection is the responsibility of the Office for the Protection Against Ionizing Radiation (OPRI), which is under the supervision of the Labor and Health Ministry, has a staff of

180 and an annual budget of $13.4 million. The regulator for radiation protection is the Health ministry; OPRI provides it with technical advice.

What is regulated

In France there is one national utility (Electricite de France), which operates the 58 licensed commercial power reactors. DSIN also licenses the Commissariat a l'Energie Atomique (which operates the Phenix fast breeder reactor) and the vendors Cogema, Framatome and Andra. In fact, Cogema and Andra are operators of fuel cycle (enrichment, fabrication, reprocessing) and waste disposal facilities respectively. All are "public or para-public entities" where the government is represented on their boards and oversight is provided by the same ministry to which DSIN reports. In fact, DSIN equally reports to two Ministries (Environment and Industry) and in cases where the ministers disagree, the Prime Minister makes the final decision. In addition to the fuel cycle activities which are licensed (e.g., enrichment, fuel fabrication, reprocessing, and vitrification plants, as well as low-level waste storage facilities), there are 58 licensed commercial power reactors of only three standard designs. Currently one site has been identified for use as a possible high-level waste (HLW) underground research laboratory and a second site is being sought.

Differences

The major differences are (a) multiple organizations in France contribute to the regulatory effort; (b) there are fewer reactors (58 in France versus 103 in the U.S.); (c) in France there is only one electric utility/licensee; only one nuclear steam supply system designer; and only one architect-engineer; (d) there are three basic designs; (e) there are no resident inspectors; and (f) the primary regulator does not regulate radiation safety or safeguards. Furthermore, the research program is broader than the research being conducted by NRC. In particular, IPSN supports expensive test programs which are providing valuable information to address reactor safety issues.

Japan:

Legislation

Japan's Atomic Energy Basic Law (No. 186, 1955) established the framework for its nuclear activities. Subsequent legislation also added to the organizations that make up its parallel, double check regulatory system that includes a public hearing process.

In addition, regulatory bodies license on the basis of the Law of Nuclear Source Materials, Nuclear Fuel Materials and Reactors (RNNR Law and the Electric Utilities Industry Law). The Electric Utilities Industry Law stipulates the penalties for the utilities. If a violation against the law is committed by a licensee, they are fined. In the RNNR Law, there are also penalties of which fuel manufacturers or research institutes shall be fined if they treat nuclear fuel without permission or disperse fuel materials outside.

Organization

Nuclear regulatory functions are performed by at least five agencies in Japan, with approximately 450 professional full-time equivalent staff (MITI:200, STA:40, NUPEC:70; JAPEIC:120, NUSTEC:20) with a cumulative budget of $396 million. The expenses of personnel, traveling, research and others in the Ministry of International Trade and Industry

(MITI) and the Science and Technology Agency (STA) are paid for by national revenues. There is a small amount of income generated from license and inspection fees.

Preparing for the next century, the Prime Minister called for 6 reform programs including reorganization of Japan's government agencies in 1997. That reorganization, including that of the nuclear safety regulatory bodies, is ongoing today.

(A) MITI is responsible for regulation, licensing and inspection of operating commercial nuclear power plants. MITI's Agency of National Resources and Energy (ANRE) carries out the Ministry's mandate, including safety examination, safety policy planning, administration and regulation of commercial nuclear power plants with a professional staff of 200; and advisory committee members of 107. MITI grants all reactor licenses (construction and operation). They are supported by the Nuclear Power Engineering Corporation (NUPEC) which, with 70 professional staff, carries out safety analysis and the Japan Power Engineering and Inspection Corporation (JAPEIC), with 120 professional staff, which performs pre-service inspections of nuclear power plants to assure high reliability and safety (including welding inspection). MITI has regional offices and a resident senior specialist for NPP systems.

(B) STA, an administrative body attached to the Prime Minister's office, is responsible for regulating research reactors, reactors under development, materials safety, all fuel cycle facilities including facilities dealing with radioisotopes (except for those used in medical applications), and radioactive waste disposal. STA's Nuclear Safety Bureau (NSB), is responsible for the regulation of research and power reactors under development, overall radiation monitoring, emergency measures, safety reviews of reactors and nuclear fuel facilities, radioisotopes and radiation-generating devices; safeguards and nuclear materials. The NSB is supported by the Nuclear Safety Technology Center (NUSTEC) with 20 professional staff. The Nuclear Safety Commission (NSC) has five Commissioners, and provides advice on policy matters concerning regulations for ensuring safety of nuclear energy (fuel cycle and advanced reactors). As part of the double check system of safety regulation, NSC has the authority to reexamine the nuclear-related safety administration of MITI and STA. The NSC is not a decision-making body.

(C) The Ministry of Transportation regulates the transportation of nuclear fuel and radioactive waste, and has jurisdiction over the regulation and inspection of reactors used for naval propulsion.

What is regulated

The Japanese nuclear regulators license ten utilities with 53 licensed commercial nuclear power facilities (with one reactor under construction and four planned). The Japanese government also regulates a complete fuel cycle, including 2 enrichment plants, 6 fuel fabrication facilities, 2 reprocessing plants, and 4 low-level waste facilities. Japan also has an active fast breeder reactor program.

Differences

In Japan there is a double check regulatory system. Their regulatory system is less prescriptive than that of the United States, with government regulatory institutions working closely with licensees to resolve problems. In the aftermath of two nuclear incidents in 1995 and 1997 the government acknowledged the need for greater transparency and better public communication, and has been working to implement these policies. Furthermore, research activities carried out

by JAERI and NUPEC are broader than the NRC research program. Both organizations support expensive test programs which are instrumental in providing information to resolve complex technical issues.

United Kingdom:

Legislation

The main legislation governing the safety, and enforcement of safety, of nuclear installations is the Nuclear Installations Act as amended, together with the Health and Safety at Work, etc., Act of 1974 and the Ionizing Radiations Regulations of 1985. Under the Nuclear Installations Act no site may be used for the purpose of constructing, commissioning, or operating any nuclear installation unless a license has been granted by the Health and Safety Executive's (HSE) Nuclear Installations Inspectorate (NII).

Each nuclear site license has conditions attached which have the force of law and which place either absolute requirements or require the making of adequate arrangements and compliance with those arrangements. A fundamental feature of one condition is the requirement for the licensee to demonstrate the safety of the proposed operation in a document known as the "safety case," prior to the start of that operation. Breach of any law, regulation or license condition is a criminal offense and the offender may be prosecuted in the UK courts of law. Inspectors appointed by the HSE also have the power to stop unsafe acts or to require improvements to be made within a given time. These powers are carefully set out so as to not take away the absolute responsibility of the licensee for safety on the licensed site. The NII does not license individual operators at the nuclear installation. However, there is a specific license condition which requires persons who control or supervise operations which may affect safety to be duly authorized. Actions of NII are subject to internal review processes and in extreme cases can be subject to review by the UK courts of law (Judicial Review of process only). In the UK there is no appeal against regulatory decisions.)

The Government sets the general policy for siting of nuclear installations, managing radioactive waste and decommissioning but NII develops the detailed policy in relation to nuclear licensed sites. NII implements these detailed policies through the granting of site licenses and its powers under the site license conditions. HSE sets policy in respect of work radiation exposure which is enforced by NII on licensed nuclear installations and by other parts of HSE for other industrial and medical uses of radioactive material. NII also enforces other safety and health regulations in relation to non-nuclear hazards at licensed sites.

Organization

Under the Nuclear Installations Act, HSE recovers most of the running costs of NII, together with the costs of any research thought necessary from licensees.

(A) The Health and Safety Executive (HSE) is a distinct statutory body of three people which advises and assists the Health and Safety Commission (HSC), and has day to day responsibility for enforcing health and safety legislation. The mandate of the HSE and HSC together is to protect the health, safety and welfare of employees, and to safeguard others, principally the public, who may be exposed to risks from industrial activity. The Executive delegates responsibility for regulation of nuclear safety to its Nuclear Installations Inspectorate (NII).

(B) NII is responsible for granting nuclear site licences and enforcing compliance with the safety conditions attached to these, together with other health and safety legislation. A single licence will cover all activities on a nuclear site from construction through operation into decommissioning. The transitions between these stages are controlled by regulatory powers, such as Directions, Consents and Agreements. The total number of staff currently employed by NII in regulating the UK's nuclear facilities is 237 but this is under review and is like to increase. This comprises 144 inspectors, 2 scientists, and 91 administrative staff. The 'inspector' category includes staff employed on site inspection, project and assessment activities. NII also places contracts with external technical organizations for analyses and research. Technical work directly supporting regulatory issues is funded through a Nuclear Support Studies budget, which is about 2.5 million pounds (USD $4 million) per year. This translates into about 36 staff years of effort. Various contractors are used, including AEA Technology, National Nuclear Corporation, and others. A research effort of approximately 100-140 FTE is jointly funded by HSE and the Industry Management Committee and cannot be directly compared to U.S. research.

The licensees are responsible for the safety of their operations, and must develop their own nuclear safety standards. They must then demonstrate to NII that these reduce the risk to staff and members of the public to as low a level as reasonably practicable, as required by the Health and Safety at Work, etc., Act 1974. NII assesses these submissions against its published Safety Assessment Principles, which represent its own standards.

(C) The Health and Safety Commission (HSC) is a statutory body responsible for advising the Government on most industrial health and safety matters, including nuclear safety. It consists of a Chairman and nine members and is supported by a small staff of five.

What is regulated

NII regulates nuclear power stations, nuclear fuel cycle facilities, radioactive waste management plants, nuclear research facilities including research reactors, the refueling of the UK's nuclear submarines and the atomic weapons sites at Aldermaston and Burghfield.

There are 35 operating power reactors in the UK including one civilian PWR at Sizewell, 14 Advanced Gas Cooled Reactors (AGRs) of various designs and 20 gas cooled Magnox Reactors. The Magnox reactors include steel and prestressed concrete pressure vessel designs. The PWR and AGRs are privately owned by British Energy. The 20 Magnox reactors are owned by BNFL which is a state owned corporation. The fuel cycle plants at Sellafield, Springfields and Capenhurst are also owned by BNFL. Sellafield not only reprocesses fuel for the Magnox and AGR programmers, but also reprocesses fuel from Japan and other countries.

Several facilities are undergoing decommissioning including the prototype fast breeder reactors at Downreay, a Steam Generating Heavy Water Reactor, the Windscale Advanced Gas Cooled Reactor, several material best reactors, two defense related plutonium producing piles and six commercial Magnox reactors.

Differences

In the UK the regulatory body oversees fewer reactor plants. Approximately half of the licensed sites are privately owned and half are public entities although the majority of licensees are now in the private sector. Regulatory responsibilities are not as broad or encompassing as in the U.S. for a single organization. Technical analyses and research are funded via licensing fees and a levy respectively. Finally, the responsible regulatory body, the NII, is not required to hold a hearing before issuing a license. The Director of the Nuclear Safety Directorate has indicated that they will be increasing the staff in the Directorate from 237 to 290.

V. Individual Program Comparisons

Comparison of U.S. Reactor Regulation Programs with those of France, Japan, and the UK

Program: Reactor Licensing		
Country	**Organization**	**Program Differences**
France	1. Directorate for the Safety of Nuclear Installations (DSIN)	1. In France there are laws or regulations governing nuclear power and safe operation. These regulations, prepared by DSIN, are "umbrella" or overall regulations describing objectives or goals to be met. The process in France is less formal whereby DSIN writes letters to the one licensee (EdF) requesting evidence that a particular part of the regulation is being met. The DSIN regulatory approach is much less prescriptive than that of the NRC; it does not systematically issue regulatory guides, NUREGs and the numerous other publications issued by NRC[1]. There are no equivalent processes for 2.206 or 10 CFR 50.59. The licensee has to demonstrate that the provisions he takes meet the safety objectives set forth in the general regulations. DSIN does not have responsibility for regulating financial assurance. Operators are not licensed by DSIN; this is done by the licensee with DSIN maintaining cognizance. DSIN does not regulate radiation safety (or protection). This is the responsibility of the Radiation Protection Bureau of the Ministry of Health with the technical support of OPRI. OPRI has 200 FTE devoted to reactors, other nuclear facilities and medical applications. DSIN is not involved in Safeguards (Material Accounting and Physical Protection). This is the responsibility of HFD (Defense Senior Civil Servant). DSIN is in charge of processing the applications for discharge permits.
	2. Institute for Protection and Nuclear Safety (IPSN)	2. Detailed technical support including all safety assessments required by DSIN.

[1]The process that NRC follows, before issuing a Regulatory Guide or Rule, involving consultation, review and comment is much longer and move complicated (with 45 licensees and legal aspects to be addressed) than the letters sent by DSIN to its single licensee.

Program: Reactor Licensing		
Country	**Organization**	**Program Differences**
Japan	1. Ministry of Int'l Trade & Industry (MITI) Agency of Natural Resources & Energy (ANRE, MITI)	1. Regulations are enforced by several administrative bodies. MITI has the overall responsibility and ANRE implements these regulations. Much of the work is guided by the deliberations of advisory committees. For example, there are advisory committees on Basic Design, Detailed Designed Operations Management and Comprehensive Preventive Maintenance. Advises on policies relating to the safety of nuclear installations. Operators are not licensed, however, persons responsible for operation are required to have defined qualifications.
	2. Nuclear Safety Commission (NSC)	2. NSC consists of 5 members with meetings of subcommittees (250 part time members) held as necessary.
	3. Science & Technology Agency (STA)	3. STA is responsible for safety regulations for R&D and research reactors. Implementation of the regulations overseen by the Nuclear Safety bureau of the STA.
	4. Nuclear Power Eng. Corp (NUPEC)	4. NUPEC performs safety analysis in support of the licensing authority (MITI/ANRE) (70 FTE).
UK	1. Nuclear Installations Inspectorate (NII)	1. Methods of operation are much less prescriptive than those of NRC. UK licensees, when applying for a new site license or consent to build new plant, submit a report which is called the "Safety Case" which includes technical justification and license compliance demonstration. This is reviewed by NII and a license or Consent granted when NII is satisfied. In certain circumstances it may be necessary to hold a public inquiry before the license or Consent is issued, as was the case with Sizewell B, UK's only PWR. (40 FTE) Operators are not licensed.

Program: License Renewal		
Country	**Organization**	**Program Differences**
France	1. Directorate for the Safety of Nuclear Installations (DSIN) *BCCN (Nuclear Steam Supply System Control Bureau)	1. In France a license is granted with no duration limit and thus there is no license renewal process. Every 10 years a safety review is performed (but this is not connected to renewal of a license). There is a special regulation for the Pressure Vessel. BCCN performs a pressure test of the primary circuit before it goes into service, after 1 year of operation and then every ten years (during long outages).
Japan	1. MITI/ANRE	1. There is no license renewal system in Japan. Once the license is issued there is no time limit on the license.
UK	1. Nuclear Installations Inspectorate (NII)	1. Periodic safety reviews (PSRs) are required every 10 years. Once the license is issued there is no license renewal process (7 FTE devoted to PSRs).

Program: Reactor Inspection		
Country	**Organization**	**Program Differences**
France	1. Directorate for the Safety of Nuclear Installations (DSIN) DRIRE (Regional Directorate for Industry, Research and the Environment) [2]	1. There are no resident inspectors. Inspections consist of one day visit to a plant by 2 or 3 persons; 2 from DSIN/DRIRE and 1 from IPSN. These inspections generally focus on conformity with the regulations/requirements.[3] When an inspector finds what he thinks is a safety issue the Head of DRIRE sends a letter requesting corrective actions to the plant manager. If a generic issue is identified, DSIN would require generic corrective actions to the licensee.

[2] DRIREs are not part of DSIN but their nuclear divisions work for DSIN.

[3] Inspection activities in France are indeed as described above. However, note that the number given in the table at part VI (resource comparisons) does not refer to that description; it relates to broader activities which are similar to those of US inspectors. Part of these activities, especially assessment, are performed by IPSN, about 45 FTE.

Program: Reactor Inspection		
Country	**Organization**	**Program Differences**
Japan	1. Ministry of International Trade and Industry (MITI)	1. Performs pre-service inspection, welding inspection and periodic (annual) inspection. These inspections generally focus on conformity with regulations. There are no resident inspectors. The number of inspectors and inspection days is very much less than carried out by the NRC.
	2. Japan Power Engineering & Inspection Corp. (JAPEIC)	2. As an appointed inspection institution, JAPEIC performs inspections of reactor welds. MITI audits the JAPEIC inspection results.
	3. Science and Technology Agency (STA)	3. Performs pre-service inspection, welding inspection and periodic (annual) inspection. These inspections generally focus on conformity with regulations. There are no resident inspectors.
	4. Nuclear Safety Technology Center (NUSTEC)	4. As an appointed inspection institution, NUSTEC performs welding inspections of reactor welds. STA audits the NUSTEC inspection results.
UK	1. Nuclear Installations Inspectorate (NII)	1. There are no resident inspectors but each licensed site has a Nominated Site Inspector who spends at least 30% of their time on site. The number of inspection days is very much less than carried out by the NRC. Each inspection is generally of shorter duration than in the U.S. (31 FTE)

Program: Reactor Performance Assessment		
Country	**Organization**	**Program Differences**
France		No formal program. Performance Assessment is part of the monitoring activity and cannot be distinguished from licensing activities.
Japan		No formal program. Performance Assessment is part of the inspection activities.
UK		No formal program. Performance Assessment is part of the inspection activities.

Program: Reactor Incident Response		
Country	**Organization**	**Program Differences**
France	1. Directorate for the Safety of Nuclear Installations (DSIN)	1. Prefect (local representative of the government) and plant management are responsible for operations in an emergency situation. DSIN serves an advisory role. Early notification of highly significant incidents by telephone to DSIN triggers automatic notification of staff and inspectors. Emergency center at the Ministry of Industry headed by director of DSIN. Other incidents notified by licensee via Telex and an incident report within two months. Significant incidents may result in inspection of plant. Seven exercises per year are carried out to test the emergency management system. (One reactor site therefore has an emergency exercise every three years.)
	2. Institute for Protection and Nuclear Safety (IPSN)	2. Technical safety director of IPSN heads technical team to support and develop DSIN advice. DSIN and IPSN personnel do not go to the site.
	3. Regional Directorates for Industry, Research and the Environment (DRIREs)	3. Immediate response to reactor site and to Prefecture. Potassium iodide tablets pre-positioned locally.
Japan	1. Ministry of Int'l Trade & Industry (MITI)	1. Prompt notification of MITI and local governments by licensee. MITI has senior specialist at each site who report incidents. MITI maintains a NPP Operation Monitoring System similar to the NRC Operations Center.
	2. Advisory committees on Nuclear Power Generation	2. Although mostly longer term follow up of events, these committees could also be involved during a ongoing event.
	3. Nuclear Safety Commission (NSC)	3. Several subcommittees of the Council on Reactor Safety Examination of NSC focus on incident response measures.
	4. Nuclear Power Eng. Corp (NUPEC)	4. Provide technical review in support of incident evaluation (INES).

Program: Reactor Incident Response		
Country	**Organization**	**Program Differences**
UK	1. Nuclear Installations Inspectorate (NII)	1. Licensees are required by the license, expected to make arrangements for notification, recording, investigation, and reporting of abnormal occurrences on the site. Licensee expected to review all occurrences at his own and similar plants with a view to preventing future occurrences. Senior inspector makes judgement on nature of initial response. NII initiates emergency arrangements and sends inspectors to site.

Program: Reactor Operational Experience Evaluation		
Country	**Organization**	**Program Differences**
France	1. Directorate for the Safety of Nuclear Installations (DSIN)	1. Is part of monitoring the application of the general technical regulations and cannot be distinguished from licensing. Often request licensee to provide evaluations of events or conditions discovered at facilities and to propose corrective actions. Request IPSN to assess the information provided by the licensee. Since French reactors are standardized, reactor operational experience evaluations are considered generically applicable to all reactors. Also, since all reactors are run by the same utility, the licensee develops generic modifications. (*NRC evaluations must consider the impact on scores of different designs.) Only significant operational events are reported in writing to DSIN - less significant events are collected in database which French regulators would periodically review. The licensee must provide evaluations of significant events or conditions discovered at facilities and propose corrective actions; based on the advice of IPSN, DSIN may require further actions to be taken and sets the deadlines for implementation at the reactors concerned.
	2. Institute for Protection and Nuclear Safety (IPSN)	2. Reviews operating experience but only events of higher safety significance are reported. The lessor events are not reported but are simply entered into a database. French regulators would periodically review those events. Also program similar to Accident Sequence Precursor program looks at fewer events. Performance indicators are maintained by the licensee.
	3. Regional Directorates for Industry, Research and the Environment (DRIREs)	3. Reviews written reports for proper safety classification. DRIRE with support from IPSN conducts a small number (2-5) of reactive inspections each year to investigate events. Inspection information is not publicly available.

Program: Reactor Operational Experience Evaluation		
Country	**Organization**	**Program Differences**
Japan	1. Ministry of Int'l Trade & Industry (MITI)	1. Overall responsibility for oversight of operational experience evaluation of commercial power reactors in Nuclear Power Safety Administration (NPSA) Division of MITI. NPSA publishes annual report similar to U.S. performance indicators. NPSA also picks investigation topics for NUPEC (below) to analyze in more detail. No Accident Sequence Precursor program. NPSA also solicits the review of the Nuclear Power Plant Operations Management Subcommittee on matters relating to abnormal events and operations management.
	2. Nuclear Power Eng. Corp (NUPEC)	2. NUPEC is a contractor outside government similar in part to the Institute for Nuclear Power Operations (INPO) in U.S. Develops the safety information data base as directed by NPSA.
	3. Nuclear Safety Commission (NSC)	3. NSC is a specialized subcommittee (Deliberation Committee on Analysis and Evaluation of Accident and Failure in Nuclear Installations) within NSC deal with operational experience.
	4. Science and Technology Agency (STA)	4. Nuclear Safety Bureau of STA evaluates reactors during the research and development stage.
UK	Nuclear Installations Inspectorate (NII)	Reactor operational experience evaluation is seen as primarily a responsibility of the licensee. NII operational experience evaluation activities are viewed as an integral part of the inspection activities with limited support from its Central Strategy Unit. However, resource in this area is to be increased.

Program: Reactor Technical Training		
Country	**Organization**	**Program Differences**
France	DSIN, IPSN, and DRIRE	IPSN and one third of DSIN and DRIRE staff are recruited from high level engineers within the Commissariat a l'Energie Atomique (CEA). These personnel already have extensive practical experience in nuclear issues. Other DSIN and DRIRE staff, including managers, are qualified civil servants. All inspectors and some headquarters personnel receive simulator training. The government does not maintain in-house simulators. Combined level of effort devoted to training per employee within DSIN, IPSN, and DRIRE is similar to the NRC.
Japan	Ministry of Int'l Trade & Industry (MITI)	Inspectors are university degreed engineers with two years of on the job training. There are several training courses for inspectors and regulatory staff, including mock-up simulator training. Refresher training is provided. The government does not maintain in-house simulators.
UK	Nuclear Installations Inspectorate (NII)	Inspectors are all technically and professionally qualified. They typically hold professional engineer status and have suitable experience in an appropriate field. Internal training programs cover legal and other activities to ensure that an inspector is competent to inspect and enforce legislation. Few of the staff receive simulator training. The government does not maintain in-house simulators.

Program: Enforcement		
Country	**Organization**	**Program Differences**
France		The process in France is not as formal as in the U.S. as the regulation does not provide for direct enforcement sanctions. Citations can be made through the courts, but this is not a current practice. While DSIN does not impose enforcement sanctions, if plant safety is questioned, the Director can request the operator to shut down at once.
Japan	MITI	Various governmental organizations in Japan have enforcement authority. For example, the Minister of MITI appears to have the authority under their Reactor Regulation Law, and their Electricity Utilities Industry Law to conduct "examinations" and enforce the requirements of these laws. Japan has an enforcement program, however, Japan's legal system, general philosophy regarding regulation, and relationship between the regulator and the regulated entity are different than the U.S. MITI uses a different process for resolving problems than the NRC's process of issuing enforcement actions frequently.
UK	Nuclear Installations Inspectorate (NII)	UK has an enforcement program, however, its legal system, general philosophy regarding regulation, and relationship between the regulator and the regulated entity are different than the U.S. Approximately half of the licensed sites are owned by public entities. The majority of discrepancies identified by NII are addressed at the individual inspector and plant operator level without the need for formal documentation or regulator issued enforcement action. However, more significant discrepancies are dealt with through formal enforcement action.

Program: Reactor Investigations		
Country	**Organization**	**Program Differences**
France		No formal program.
Japan	Ministry of Int'l Trade & Industry (MITI)	No formal program.
UK		No formal program.

Program: Reactor Legal Advice		
Country	**Organization**	**Program Differences**
France		In contrast to the NRC, France's nuclear safety regulator devotes very limited resources to the provision of legal advice relating to nuclear reactor safety, licensing, and environmental impacts. To the best of our understanding, the relative lack of need for legal resources stems from France's adoption of broad, generally non-prescriptive regulations. Legal advice, when needed, is given by a separate "Commission" of experts, the Interministerial Commission for Basic nuclear Installations, which is not part of the DSIN.
Japan		MITI and STA have their own legal advice staff. They not only perform legal advice on nuclear regulatory matters but also other matters concerning MITI and STA responsibilities.
UK		In contrast to the NRC, the UK's nuclear safety regulator devotes very limited resources to the provision of legal advice relating to nuclear reactor safety, licensing, and environmental impacts. To the best of our understanding, the relative lack of need for legal resources stems from the U.K.'s adoption of broad, generally non-prescriptive regulations.

Program: Reactor Adjudication		
Country	**Organization**	**Program Differences**
France		In contrast to the NRC, France's nuclear safety regulator does not have a public adjudicatory or hearing process for the licensing of its nuclear power plants. However, this process includes a public inquiry performed by the Prefect after DSIN gives a positive advice on the files submitted by the applicant.
Japan		MITI and STA have a public adjudicatory or hearing process for the licensing of its nuclear power plants.
UK		In contrast to the NRC, the UK's nuclear safety regulator does not have a public adjudicatory or hearing process for the licensing of its nuclear power plants.

Program: Reactor and Plant Performance Research Reactor Materials and Component Behavior Research		
Country	**Organization**	**Program Differences**
France	Institute for Protection and Nuclear Safety (IPSN)	Resources: In FY1997 IPSN's budget was FF 1,489.4 Million ~ $298M. IPSN has approximately 1270 FTEs, among which 350 FTEs perform safety assessments for DSIN. Many of the remaining IPSN staff (920 FTE) perform research functions similar to those carried out by RES. However, unlike NRC, IPSN is supporting expensive test programs such as the Phebus program on fission product release and transport, the Cabri program on high burnup fuel, and the BETHSY thermal-hydraulic test program, etc. Major Differences from NRC/RES: In France there is a single standard reactor design of the pressurized water reactor type with dry containment. In a simple term, this enables the French to conduct research activities for that design which results in substantial saving of resources. For example, the analysis tools that are being developed to assess plant performance under normal, and accident conditions (e.g., fuel behavior, thermal-hydraulics, severe accidents, etc.) are designed to handle that standard design. Furthermore, both the industry and the regulator fund and share selected research results and fund and use the same analytical tools that are developed by IPSN. While there are several drawbacks to such reliance on the same analytical tools by the industry and the regulator, there is significant reduction in resources as compared to developing independent analysis tools. By contrast, the USA has several different reactor designs (e.g., pressurized and boiling water reactors) different types of steam generators (e.g., U-tubes, Once Through), several type of containment designs (e.g., dry, sub-atmospheric, ice condenser, pressure suppression Mark I, II, and III) with several balance of plants designs. The research needs and the technical bases to support each of these different designs are unique. Hence our research activities must encompass all these different design variations. For example, the NRC analytical tools must be developed and assessed using data that are applicable to all types of reactor designs. This places additional burden on RES to develop data for PWRs and BWRs.

Program: Reactor and Plant Performance Research Reactor Materials and Component Behavior Research		
Country	**Organization**	**Program Differences**
France (Continued)	Institute for Protection and Nuclear Safety (IPSN)	IPSN is the only Organization within CEA in charge of developing NPP safety technology. Other organizations, e.g., DSIN relies on IPSN for both code development and performing plant analysis. By contrast, in selected areas, the NRC maintains similar disciplines within its staff or through contractors.
	Nuclear Reactor Directorate (DRN)	IPSN is not the only organization, even within CEA, in charge of developing NPP safety technology. The Nuclear Reactor Direction DRN of CEA also has programs in this area: these programs are developed for EDF and/or Framatome and/or (in some cases for IPSN). DRN has approximately 1500 FTE of which about half (750) are devoted to reactor technology and safety research. We assume about half of these (300-400) are devoted to safety research similar to that conducted by NRC. Besides, EDF and/or Framatome can develop their own codes or use codes from foreign organizations: an example is for severe accidents where EDF uses the American code MAAP while IPSN developed its own code, ASTEC.

Program: Reactor and Plant Performance Research Reactor Materials and Component Behavior Research		
Country	**Organization**	**Program Differences**
Japan	1. Japan Atomic Energy Research Institute (JAERI). Several departments at JAERI are involved directly or indirectly in nuclear safety research.	1. <u>Resources:</u> In 1996, JAERI had 1,149 FTEs and ¥120 billion. It is difficult to deduce from the information we had the exact number of FTEs directly involved in reactor safety research. It is estimated based on interaction with JAERI that 350-400 FTEs are involved in reactor safety research which is similar to that conducted by RES. This figure does not include the supporting staff at NSC/STA. <u>Major Differences from NRC/RES:</u> JAERI is involved in a much broader research than that being conducted by RES. For example, JAERI supports large experimental programs, e.g., the ROSA thermal-hydraulic test facility which was used by NRC to run confirmatory test programs for the AP600, and the Nuclear Safety Research Reactor, which is being used to generate data on high burnup fuels. JAERI, however, does not develop reactor safety codes similar to those being developed by the NRC for thermal-hydraulics, severe accidents, and fuel behavior codes. One major difference between JAERI and RES is that some of their activities are being performed for promoting and developing nuclear technology. In addition to the items below, JAERI conducts research on fuel cycle safety research (e.g., burn-up credit for spent fuel storage and transport), and environmental safety research (e.g., radioactive waste management). Finally, JAERI does not develop analytical tools similar to ones being developed by the NRC to assess plant performance under normal and accident conditions.

Program: Reactor and Plant Performance Research Reactor Materials and Component Behavior Research		
Country	**Organization**	**Program Differences**
Japan	2. Nuclear Power Endearing Corporation (NUPEC)	2. <u>Resources:</u> In FY 1996, NUPEC had 346 FTEs and ¥28.4 Billion. Supported by MITI. It is responsible of performing engineering tests for NPP components for demonstrating of reliability & safety of NPP. <u>Major Differences from NRC/RES:</u> NUPEC focuses on testing the safety and reliability of nuclear power generation equipment, safety analysis for nuclear power plants, and improving the nuclear power technology. As such, its mission is similar to the Office of Research mission, however, they are supporting very expensive test programs nationally and internationally (e.g., Phebus, Sandia containment model). Direct comparisons, however, are difficult, since some of the responsibilities of NUPEC include promoting nuclear energy.
UK	1. Nuclear Installations Inspectorate (NII)	1. <u>Resources:</u> FY 97 Budget – $16M and 6 FTEs and 26 contractors employees. Research into generic nuclear reactor safety issues is managed by an Industry Management Committee (IMC), which comprises representatives of the nuclear Licensees and NII. The safety issues are identified by NII and placed on a Nuclear Research Index, and Technical Working Groups (TWGs) under the IMC consider proposals for resolving these and oversee progress with contracts. The industry usually arranges and funds the contracts to resolve the technical issues itself, and the contractors report back to NII through the TWGs. In some cases, however, NII considers it more appropriate to place contracts itself, and then recovers the costs through a levy on the industry. The combined spent on IMC and levy-funded research is about 10 million pounds (USD$ 16 million) per year. Once again, a number of contractors are involved. NII commissions research to assist regulatory decisions for these using its Nuclear Support Studies budget. <u>Major Differences:</u> Most research is performed by industry • NII supports few projects and relies heavily on international collaborations • Uses NRC-Developed safety analysis codes

Program: High Level Radioactive Waste Management		
Country	**Organization**	**Program Differences**
France	DSIN	France is considering three options for safe management and disposal of high-level waste (HLW): - deep geologic disposal, - long-term surface storage, and - chemical separation and transmutation. France practices commercial reprocessing of spent fuel; the principal waste form is vitrified HLW, although some spent fuel may be directly disposed. France has recently identified the Muese clay site as a research laboratory for geologic disposal. They are planning to identify a second research site in a granite formation; a granite site which had been under consideration in the Vienne Department has been rejected as unsuitable. The French Parliament is scheduled to make a decision on the future course of the French program, based on the outcome of these research activities, in 2006.
Japan	Science and Technology Agency/Nuclear Safety Bureau	The regulatory authority for HLW management in Japan is the Nuclear Safety Bureau, within the Science and Technology Agency. Japan practices reprocessing of commercial spent nuclear fuel and is considering deep geologic disposal of vitrified HLW, and separation and transmutation of long-lived radionuclides, prior to geologic disposal of the residual waste. A long period of research and development is planned to select and demonstrate the safety of the disposal technology, Japan plans to store HLW for 30 to 50 years. Regulations for safe management and disposal of HLW are still being developed.

Program: High Level Radioactive Waste Management		
Country	**Organization**	**Program Differences**
UK	1. Nuclear Installations Inspectorate (NII) 2. Department of Environment Transport and the Regions (DETR)	The regulatory authority for HLW management at nuclear licensed sites is the Nuclear Installation Inspectorate. The UK practices reprocessing of spent nuclear fuel, so that the waste form is primarily vitrified HLW. However, privatization of the nuclear power industry in the UK has led to the consideration of direct disposal of spent nuclear fuel. The policy relating to the long term environmental impacts of HLW disposal the responsibility of DETR. The UK current policy for HLW is to store it for a minimum of 50 years. The government is currently considering what future national policy should be, and a Committee of the House of Lords visited the NRC in May 1998 for briefings on the U.S. laws, policies and regulations for radioactive waste disposal, to assist in formulating national policies and legislation in this area.

VI. Resource Comparisons

Aggregate resource comparisons do not consider the number and types of programs that are executed by different countries. Even comparisons of resources at the program level may not be meaningful given the differences in such factors as: infrastructure differences and regulatory approach.

The following table compares FTE information where available by program and an FTE to reactor ratio.

Resource Comparisons					
	FTE and Ratio Comparisons				
Reactor Program	U.S.	France	Japan	UK	Comments
Licensing (FTE/Reactor)	475 (4.6)	240 (4.00)	310[1] (5.8)	40 (1.1)	Differences are not substantial between U.S., France & Japan and likely attributable to difference in standardization, number of licensees and regulatory relationship with licensee. Also, other countries do not license plant operators.
License Renewal	55	NA	NA	NA	NA
Inspection (FTE/Reactor)	634 (6.2)	103 (1.7)	UNK[1]	31 (0.9)	1. No Resident Inspectors in France & the UK. 2. U.S. sets higher threshold for independent verification by inspection. 3. Does not include radiation safety or safeguards for France.
Performance Assessment (FTE/Reactor)	62 (.6)	UNK[2]	UNK[1]	10 (.3)	Given lack of formal assessment programs, comparisons not meaningful.
Incident Response	33	17	UNK[1]	7	French regulators play less of a leadership role. Great Britain sends inspector to site.
Op. Exp. Eval.	49	UNK[2]	UNK[1]	1	No formal programs. Comparisons not meaningful.

[1]Includes MITI (200), STA (40) and NUPEC (70). 240 is the total number of MITI and STA staff engaged on these programs, and it is difficult to give breakdown by program

[2]Part of Licensing

Resource Comparisons					
	FTE and Ratio Comparisons				
Reactor Program	U.S.	France	Japan	UK	Comments
Technical Training (FTE/Employee)	39 (.02)	10 (.03)	UNK[1]	3 (.02)	Ratios are very close.
Enforcement	19	NA	UNK[1]	2	NA
Investigations	33	NA	UNK[1]	NA	NA
Legal Advice	19	NA	UNK[1]	1	NA
Adjudication	9	NA	UNK[1]	NA	NA
Research (FTE/Reactor)	349 (3.4)	650-750[3] (11.2-12.9)	626-676[4] (11.8-12.71)	100-140[5] (2.9-4.0)	The diversity of reactor standardization and different research strategies make comparisons not meaningful. France and Japan have a broader research programs than the United States.
Totals	1776	1020-1120	936-986	195-235	
Operating Reactors	103	58	53	35	

VII. Tim D. Martin Associates Study

This study concludes that comparisons of regulatory programs among countries is not meaningful. However, if such comparisons are attempted, they should compare like programs.

The resources that were used by Tim D. Martin Associates (TDMA) for comparing ratios of regulatory staff per power reactor appear to be based on discussions TDMA had with the International Atomic Energy Agency (IAEA) who had provided TDMA with available data from a 1997 study conducted by the Nuclear Energy Agency. The data we collected from our counterparts is not consistent with these estimates. It also appears that the analysis did not

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[3]The estimated number of staff in ISPN devoted to reactor safety research activities is about 350 FTE and CEA/DRN has approximately 750 FTE devoted to reactor technology and safety research. Of these approximately ½ (300-400) are assumed to be involved in "safety" research.

[4]Includes effort by JAERI and NUPEC.

[5]This includes the combined time spent by the Industry Management Committee and HSE's levy funded research and therefore cannot be directly compared.

account for resources expended by organizations other than the primary nuclear regulator. Some of these omissions and differences in programs are explained below.

France: The French regulatory authority is DSIN with BCCN and the nuclear divisions of DRIREs. IPSN is a technical support organization with 1270 staff among which 350 provide technical support to DSIN. Of the remaining 920 it is estimated that 350 do research reactor research work. However, the research programs in France are broader than of those in the NRC and include extensive test programs. CEA/DRN also conducts thermal-hydraulics, reactor physics and fuel studies (300-400 FTE). In total, DSIN, ISPN and CEA/DRN are estimated to expend approximately 1020 to 1120 FTE for reactor regulatory activities. However, further detailed analysis would be required to determine the differences between the scope and depth of individual programs and research activities between NRC and NRA.

The TDMA study reported approximately 350 professional staff for 60 power reactors in France. DSIN does not regulate radiation safety or safeguards, does not license the reactor operators and does not have a resident inspector program.

Japan: The TDMA study reported approximately 400 professional staff for 53 power reactors in Japan (MITI & STA). However, MITI & STA staff are estimated at 240 FTE and technical regulatory support work is performed by NUPEC (70 staff), JAPEIC (120 staff) and NUSTEC (20 staff). Also, research work is estimated to be between 626-676 FTE. Much of this work would be done by the NRC's Office of Research and NRR Technical staff. Factoring in these support staff who do work for MITI & STA would bring Japan's professional staff equivalent to 936-986. However, further study would be required to determine the differences between NRC and MITI & STA for staffing individual programs and research and technical support activities.

United Kingdom: The TDMA study reported approximately 145 professional staff for 35 power reactors and 6 commercial gas cooled reactors. This does not account for approximately $4M in contractor support (36 FTE) and research estimated to be at a level of 100-140 FTE. There are a number of differences between NII and NRC. A major difference is that in the UK all the operating nuclear power stations are owned by only two companies and this has enabled NII to operate a goal setting regulatory regime rather than the prescriptive system operated by NRC. NII does not have a Resident Inspector Program. NII also regulates large fuel cycle, nuclear weapons production and nuclear submarine refueling facilities.

Summary: The data used in the TDMA study does not account for all research and technical support functions conducted in France, Japan and the UK. While the nature of these functions may vary from country to country, they cannot be ignored if comparisons are to be made. The following chart shows how the ratios can be affected if these functions are included. Even these ratios cannot be meaningfully compared, however, because the functions performed are different, and the nature and type of technical contractor support needs further analysis.

Ratios after Adjustment				
	United States	France	Japan	United Kingdom
TDMA/NEA report (FTE)	1700	350	400	145
Revised Estimate	1776	1020-1120	936-986	195-235
Number of Reactors	103	58	53	35
TDMA Ratio	16.5	6.0	7.6	4.1
Revised Ratio	17.2	17.6-19.3	17.7-18.6	5.6-6.7

Attachments:
1. Tim D. Martin and Associates' Chart
2. Memo from Jackson to Travers dated 11/24/98
3. U.S. NRC Program Description
4. Memos to France, Japan, and United Kingdom dated 12/4/98
5. Response from France
6. Response from Japan
7. Response from United Kingdom