NEA AND ITS COMMITTEES:
HISTORICAL REVIEW
OF THE FIRST FIFTY YEARS
(1958-2008)
Review Draft

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I. INTRODUCTION

When the Nuclear Energy Agency (NEA) of the Organization of Economic Cooperation and Development (OECD) celebrated its 50th anniversary in 2008, it became clear that it would be useful to have a compilation that in one place outlines the facts and figures associated with its development and evolution over the past half-century, and especially with the activities of its Standing Technical Committees (STCs). This document attempts to meet that need.

Of course, other documents have summarized the history of the NEA. This report does not duplicate these earlier works. Rather, it attempts to delve a layer deeper by detailing the evolution of each of the constituent units and major activities of the NEA, and by assembling, for future researchers, as much factual information about the history of the NEA as was possible from readily available resources. In developing this document, the author has attempted, to the extent possible, to identify key events and developments in the history of the NEA, particularly in its Steering Committee, Standing Technical Committees, Data Bank, and Joint Projects. The developments documented in this report include a brief history of each of the committees and activities and the key products and accomplishments of each. In addition, other important factual information about each of the committees and activities is summarized, including about its leadership and its outputs.

It should be noted that this work was not intended to be exhaustive, and is therefore based primarily on readily accessible sources of information and recollections of long-time staffers and others who have been associated with the NEA. As a result, there are gaps in the information, particularly in the earlier history of the NEA. While some of these gaps could be filled by an exhaustive search of the archives, this would be a significantly larger effort. It is felt that the material that has been assembled is sufficient to provide a reasonable view of how the Agency has evolved over time, and what it has accomplished. It is hoped that this report can form the nucleus of a historical record that can be maintained and augmented over time to create a resource for future uses. In addition, it should be noted that, for the most part, the history has only been documented through 2008, to reflect the first 50 years of NEA's history. In a couple of cases, some post-2008 information has been added to assure clarity.

This is not an official publication of the OECD/NEA. Although it was prepared using inputs from a number of present and former members of the NEA staff (and the author gratefully acknowledges those who provided such help), all the facts in this draft have not been confirmed officially. Therefore, the author is solely responsible for the contents of the report, and any omissions or errors are not the responsibility of the OECD/NEA. Corrections to errors or omissions identified by reviewers of this draft will be incorporated into the final version of the report.

II. BACKGROUND

The historical context of the founding of the European Nuclear Energy Agency (ENEA), the predecessor to the current NEA, has been addressed in other publications and will not be recounted in detail here. This very brief summary is intended primarily to put the remainder of this document into context.

The ENEA was formed in the late 1950s during a period of great concern about the energy problems of Europe, and great excitement about the potential for nuclear power. The ENEA was a creation of the Organization of European Economic Cooperation (OEEC), the predecessor to the current OECD, which in turn had originally been chartered in 1948 to administer the Marshall Plan for the economic recovery of Europe after World War II. The focus, and therefore the membership, of the original OEEC was strictly European, although the US and Canada participated as associate members from early in the history of the Organization. (In 1961, the OEEC membership would expand to include non-European countries, and the name would be changed to the OECD.)

As can be seen from Table 2.1, the steps to the formation of the ENEA began with a decision of the OEEC Council of Ministers, its governing body, in December 1953, to commission a report to explore solutions to the energy problems of Europe. The resulting report, "Some Aspects of the European Energy Problem," authored by Louis Armand, focused on the potential of nuclear energy. It was submitted to the OEEC in May 1955 and published in June 1955. The report particularly noted the importance of cooperation in this field. As a result of the report, in June, the Council established a temporary special committee, and by the following February, a permanent body—the Steering Committee for Nuclear Energy (SCNE)—to identify promising areas of effort for the OEEC. As a result of their deliberations, it quickly became clear that an organization was needed to carry out the desired work, and the OEEC Council in 1957 decided to establish the ENEA as a constituent body under its aegis. The ENEA statute entered into force 1 February 1958.

During this same period, interest in the potential uses of nuclear energy was widespread. On 8 December 1953, the US President, Dwight D. Eisenhower made his famous "Atoms for Peace" speech at a United Nations conference, and the interest in international collaboration was strong. Three important intergovernmental institutions focused on nuclear issues grew out of the interests and concerns of that period: the European Atomic Energy Community (Euratom), located in Brussels, Belgium, which was established in March 1957; the International Atomic Energy Agency, located in Vienna, Austria, which was established in July 1957; and finally, the ENEA, located in Paris, France, which was established in February 1958. All were established within a one-year period, and all are still in existence today. The three organizations have distinct, but overlapping mandates and memberships, and the organizations strive to work together to minimize duplication and to coordinate efforts effectively. Some of these linkages will be identified in the descriptions of specific activities later in this report.

Like the OEEC, the ENEA's original membership was strictly European. The original membership included all 17 countries that were OEEC members when ENEA was established: Austria, Belgium, Denmark, France, West Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, and the United Kingdom. The United States and Canada, because of their involvement as associate members of the OEEC, participated in the ENEA as associate members. The accession of other members over time is shown in Table 2.2. As is apparent from the figure, membership in ENEA, and later, NEA usually followed membership in the OEEC (later OECD), but this was not strictly the pattern in every case. It should be noted that, at present, most, but not all, OECD Member Countries are

also members of the NEA. OECD currently has 30 Member Countries, while NEA has 28. The two OECD countries that are not part of NEA are Poland and New Zealand.

OECD Headquarters, former Rothschild Chateau, Paris

Table 2.1: Key events in the evolution of the OECD/NEA

Year	Date (if known)	Event
1947	June	US announcement of Marshall Plan
1948	16 April	Organization of European Economic Cooperation (OEEC) is established
1953	*8 December*	*"Atoms for Peace" speech by US President Dwight D. Eisenhower to United Nations General Assembly*
	14 December	Secretary-General submits report to OEEC Council of Ministers on energy supply difficulties
1955	May	Louis Armand submits report citing potential of nuclear energy and need for European cooperation (published June 1955)
	10 June	Working Party on Nuclear Energy set up
	8-20 August	*First United Nations conference on the peaceful uses of atomic energy*
	15 December	Working Party submits its report
1956	29 February	Council of Ministers establishes Special Committee on Nuclear Energy; four working parties develop proposals
	March	Prof. Leander Nicolaidis, of Greece, appointed chair of the Special Committee on Nuclear Energy
	18 July	Council of Ministers responds to working parties' proposals with a series of actions, including the establishment of a Steering Committee for Nuclear Energy (SCNE)
	November	Prof. Leander Nicolaidis appointed chair of the SCNE
1957	24 January	Working Group on the Harmonization of Legislation established to examine third party liability for damage caused by the peaceful use of nuclear energy (11 members of OEEC join)
	March	European Atomic Energy Community (Euratom) established
	21 March	Working Party on Public Health and Safety established by SCNE
	3 July	Group of Govrenmetnal Experts on Third Party Liability in the Field of Nuclear Energy established by the SCNE, replacing former Working Group (first meeting held January 1958)
	29 July	*International Atomic Energy Agency (IAEA) established*

	20 December	European Nuclear Energy Agency (ENEA) established by Council of Ministers
	20 December	Eurochemic Project inaugurated; first multinational research project established for peaceful purposes
1958	1 February	ENEA Statute enters into force
1961	September	OEEC becomes the Organization for Economic Cooperation and Development (OECD)
1972	20 April	ENEA becomes the Nuclear Energy Agency (NEA) with membership expanded beyond Europe

Table 2.2: OEEC/OECD and ENEA/NEA Membership, 1958-2008*

Year	OEEC/OECD Members	OEEC/OECD Associate Members	ENEA/NEA Members	ENEA/NEA Associate Members
1948	OEEC established with Austria Belgium Denmark France West Germany (1) Greece Ireland Iceland Italy Luxembourg Netherlands Norway Portugal Sweden Switzerland Turkey Trieste (2) United Kingdom			
1949	West Germany			
1950		United States Canada		
1958			ENEA established with 17 OEEC countries	United States Canada Spain
1959	Spain (20 July)		Spain (20 July)	
1961	Becomes OECD with addition of Canada United States			
1964	Japan (28 April)			
1965				Japan
1969	Finland (28 January)			
1971	Australia (7 June)			
1972			Becomes NEA with addition of Japan (23 February)	
1973	New Zealand (29 May)		Australia (1 October)	
1974				
1975			Canada (1 April)	
1976			Finland (1 January) United States (1 October)	
1993			South Korea (24 May)	
1994	Mexico (18 May)		Mexico (18 May)	
1995	Czech Republic (21 Dec)			
1996	Hungary (7 May)		Czech Republic (27	

	Poland (22 Nov) South Korea (12 Dec)		June) Hungary (27 June)	
2000	Slovak Republic (14 Dec)			
2002			Slovak Republic (13 June)	

* Table current through 2008. In 2010, two new members joined OECD—Chile on May 7, 2010, and Slovenia on July 21, 2010. In addition, on May 10, 2010, membership was offered to Estonia and Israel. Some of these countries could eventually become members of NEA, although that had not happened at the date of this publication.

(1) West Germany was originally represented by the combined English and American occupied zones, the Bizone, and the French occupied zone.

(2) The Anglo-American zone of the Free Territory of Trieste also participated in the OEEC until it returned to Italian sovereignty in 1954.

Note: Identification of associate members is not complete.

III. NEA STEERING COMMITTEE

Early History

As previously noted, the current NEA Steering Committee originated in a Special Committee on Nuclear Energy established by the OEEC Council of Ministers on 29 February 1956 to implement the recommendations in the report of the Working Party on Nuclear Energy had submitted on 15 December 1955. Four working parties under the Special Committee developed specific proposals. One of these proposals was to form a Steering Committee for Nuclear Energy (SCNE); this Committee was established on 18 July 1956.

The SCNE moved rapidly to implement some of the early priority proposals. In its first year of existence it established two groups whose activities continue to this day: a working group to examine liability issues associated with the use of nuclear energy, and a working party to address issues associated with exposure to radiation. These activities will be discussed under the specific NEA committees that now have jurisdiction for these areas.

Another important goal of the SCNE was to establish and operate joint multinational undertakings to advance research objectives and to provide resources for the emerging nuclear industry. Three Joint Projects were initiated in the earliest days of the Agency: Eurochemic, an irradiated fuel reprocessing located in Mol, Belgium; Dragon, a high-temperature reactor located in Winfrith, England; and Halden, a boiling water reactor located in Halden, Norway. Of these, only Halden is still operating; however, a number of new Joint Projects have been initiated over the years and a number of projects continue today.

As the SCNE initiated these activities, the Council of Ministers, in turn, recognized the need to form an organizational unit to provide staff and resources for the management of the activities. Therefore, on 20 December 1957, the Council established the ENEA as a separate body within the OEEC. The ENEA Statute entered into force on 1 February 1958, with all 17 members of the OEEC joining the new Agency. Canada and the United States, at the time associate members of the OEEC, assumed the same status in the new ENEA.

Role and Operation of Steering Committee

Upon the founding of the ENEA, the SCNE became its governing body. In this capacity, it has guided the development and evolution of the ENEA, and subsequently, of the NEA. The relationships between the Agency (ENEA, and later, NEA), the Steering Committee, and the Organization (OEEC, and later, OECD) have not changed significantly over time. Therefore, for this discussion, the use of the word “Agency” or “NEA” should be understood to mean both the ENEA and the NEA, and the use of the word “Organization” or “OECD” should be understood to mean both the OEEC and the OECD.

It is important to note that the Agency is a “semi-autonomous” agency within the OECD. As such, it has its own budget and a separate, but highly overlapping, membership. Therefore, the Steering Committee has authority for the Program of Work of the Agency, as well as for decisions on membership and other matters. However, the Steering Committee operates under the overall authority of the Council of the OECD, and the Council both sets the overall budget envelop for the Agency and approves major decisions of the Steering Committee. Furthermore, the Steering Committee operates under the policies of the larger Organization in matters such as personnel policy, and the Agency has relied on the Organization for many central services functions, including

budget and personnel administration, publications, translations, and building management.

All member countries of the NEA are represented on the Steering Committee, which meets periodically in Paris to discuss the business of the Agency, including approving the Program of Work and the allocation of the budget. Each country chooses its own delegate or delegates to the Steering Committee, usually from the government agency or agencies responsible for developing and regulating the use of nuclear technology.

The Steering Committee elects its own Chair and Vice-Chairs on an annual basis. The Chair and Vice-Chairs serve as the Bureau, or executive committee, of the Committee. Since the Steering Committee was established in 1956, there have been a total of 17 Steering Committee Chairs from 13 Member Countries, and a total of 58 Bureau members (including Chairs) from 20 Member Countries. The Agency staff operates under the direction of the Steering Committee, and is managed by a Director-General, appointed by the Secretary-General of the OECD. Since the establishment of the ENEA, there have been a total of seven Directors-General (including one who served in an acting capacity) from six countries. Table 3.1 shows the names, nationalities, terms of service, and positions held in their own governments of the Steering Committee Chairs, and Table 3.2 shows the same information for the ENEA and NEA Directors-General (with the positions being the highest level position each held prior to assuming the position of Director-General). Appendices 1 and 2 provide brief biographical information on most of these individuals.

The Steering Committee currently meets twice a year, and the STCs meet once or twice a year. According to the policy of the Organization, meetings of the Steering Committee, as well as of all Standing Technical Committees, are conducted in both English and French, with simultaneous translation. Over time, the number of Vice-Chairs of the Steering Committee has grown somewhat, as the need to assure representation of different constituencies—large and small countries, as well as regional representation—has been recognized.

The Steering Committee, like the Council of its parent organization, operates by consensus. As always, operation by consensus occasionally requires some delicate accommodations to meet the needs of all constituents. This has certainly been the case in the area of nuclear energy, which historically has seen countries, including countries in the Agency, align in very different directions with respect to the use of nuclear energy for power production.

That the Agency has operated successfully in this environment is a testimony to the good will of all the Member Countries in attempting to find resolutions that accommodate the legitimate interests of all parties. In the first place, the differences of opinion have enforced upon the Agency a strict policy of neutrality with respect to the promotion of nuclear power. This neutrality has probably helped the Agency maintain the objectivity that lends great credibility to the results of its analyses and assessments.

Further, much of the work of the Agency focuses on issues and areas that are not intrinsically promotional. For example, radiation protection and nuclear liability—two of its earliest areas—are of interest to Member Countries whether or not they have nuclear power. In addition, it is broadly acknowledged that safety is a common and important concern, and that it is in the interests of all Member Countries that countries that operate nuclear facilities have the knowledge and resources to do so safely. Therefore, a large portion of the NEA program has always been related, directly or indirectly, to safety issues. Likewise, many matters of economic or other analysis, and other issues, such as waste disposal, have been considered, ultimately, to be in the interest of all Member Countries, whether or not a particular country uses, or intends to use, nuclear power. Thus, the bulk of the work of the Agency has been accepted by all the Member Countries,

despite their different positions on nuclear power, and has been performed as part of the regular Program of Work of the Agency.

However, some Member Countries have an interest in having the expertise of the Agency applied to areas of work that are not of universal interest to all countries. The OEEC/OECD, in common with other international organizations, has a mechanism for allowing countries to support work of specific interest to them through the provision of Voluntary Contributions (VCs) to the budget. This mechanism is most often used when a particular Member Country has an interest in a specific activity in the Program of Work, to which they want to give added support, or desires an activity by the Agency performed for them, such as a peer review.

VCs can also be used to allow a group of countries to support an activity. This practice started early in the history of the ENEA with separate memberships for Joint Projects, some of which have also included non-NEA members among their participants. It has also allowed a separate membership for the NEA Data Bank, in deference to some Member Countries of the Agency that already had such a capability internally. Recently, this mechanism has been used to allow the participation of NEA as the Secretariat for several new international initiatives—specifically, the Generation IV International Forum (GIF) and the Multinational Design Evaluation Program (MDEP)—that will be discussed in subsequent chapters of this publication. Like the Joint Projects, these are multi-national initiatives involving some, but not all, NEA Member Countries, as well as selected non-member countries. It should be noted that the Steering Committee exerts oversight over these activities to assure that they do not interfere with the basic work of the Agency.

As noted above, one major role of the Steering Committee is to set the Program of Work and allocation of budget for the NEA within the overall envelope set by the OECD Council. The decisions of the Steering Committee are based on proposals, developed and forwarded to them by the NEA staff, that are, in turn, based on deliberations of the NEA Standing Technical Committees (STCs). The Steering Committee and the staff thus rely on the collective knowledge of experts from the Member Countries in each of the major technical areas in which the NEA works to assure that the issues important in their countries are identified and highlighted for action. The staff works closely with the STCs as they deliberate, helping ensure that priorities are understood so that the overall Program of Work can be optimized across all the areas of effort and within the available budget. The Steering Committee decides the final Program of Work based on the proposals brought to them by the staff, plus further discussion at their meetings to assure that the proposals are consistent with the Strategic Plan and other objectives of the Steering Committee.

In addition to discussing the Program of Work and the budget allocation, the Steering Committee also endeavors to maintain a broad and forward-looking understanding of the global issues and trends relating to nuclear energy and other nuclear applications in order to proactively provide direction and guidance to the staff of the Agency. As part of this effort, they have undertaken two initiatives in recent years: the development of five-year Strategic Plans, produced in 1999 and 2004; and the institution of a "Policy Debate" at each of their meetings, starting in 1999 (Table 3.3). The Strategic Plan helps to provide a longer-term focus and direction to the Agency's activities over several budget cycles. The Policy Debates are focused on a different topic of interest at each meeting.

The initiation of strategic plans was an outgrowth of an OECD-wide reform. In the context of this reform, the of the OECD established two high-level advisory groups, one on the environment and the other on nuclear energy, to provide an external assessment and to advise him on the future role of the Organization in these two areas. The group on the future role of nuclear energy delivered its report—often called the Birkhofer report, after the chair of the group—in January 1998. One key recommendation was the institution of strategic planning for the Agency.

For the Policy Debates, speakers are assembled from several Member Countries to address an issue from a variety of perspectives. Following the formal presentations, the presenters and the members of the Steering Committee discuss the issue and its possible implications for the NEA. Table 3.3 lists all the Policy Debates that have taken place to date. An examination of the topics will show a broad range over the years. Some of the themes clearly track topical events and concerns, and concerns that go well beyond the nuclear industry alone—the effects of deregulation and security of supply, for example. Other subjects of policy debates have been specifically related to nuclear activities—decommissioning, for example. Some topics, such as radioactive waste management, are long-term issues, while others are selected because of something happening at that particular time, such as the new recommendations of the International Commission on Radiological Protection. Still other topics have been selected to assist the Steering Committee in making decisions regarding the internal activities of the NEA. The expansion of NEA membership and the revision of the NEA Strategic Plan are examples of the latter.

The intent of these policy debates was to assist the Steering Committee in anticipating needs for NEA effort, and the general consensus is that they have been successful in doing so. A number of ideas raised in the Policy Debates have been incorporated in subsequent Programs of Work.

The Steering Committee also sanctions cooperation with other intergovernmental organizations, such as IAEA and Euratom, and with selected non-governmental organizations important in the nuclear community, such as WNU, WNA, WANO, and several major nuclear professional societies. In particular, the IAEA and the EC participate in the NEA Steering Committee meetings, as well as in the Data Bank and all the NEA STCs and their constituent units. In turn, the NEA participates in the annual IAEA General Conference and the NEA Director-General participates in IAEA's Board of Governors meetings. The participation of the EC on NEA committees is formalized in the statute of the NEA; the participation of the IAEA is by agreement between the IAEA and NEA. This agreement has existed since the earliest days of the two agencies.

It should be noted that the IAEA and EC are the only organizations that participate routinely in NEA activities at the Steering Committee level. Non-member countries and non-member organizations may be invited from time to time, such as to make a special presentation or to participate in a Policy Debate. However, they are invited for their technical expertise and they do not participate in the management decisions of the Agency. On the other hand, non-member countries do participate regularly in the STCs, as will be discussed below.

NEA Staff, Budget, and Major Activities

The entire staff of the NEA is currently located in the Paris area. At its inception, the ENEA staff was housed in an old mansion at 38 boulevard Suchet in the city of Paris, very near the chateau that serves as OECD headquarters. This building had been procured by the OECD around the time of ENEA's founding to house the growing OECD staff. In fact, at that time, the building was shared with other offices of the OECD, including agriculture, fisheries, and financial affairs.

As a result, the NEA outgrew the available space in its original building early on, and in the mid-1970s some of the NEA staff (the nuclear development division and the law division), as well as OECD staff from agriculture and fisheries, were moved from the 38 boulevard Suchet facilities to a nearby OECD Ingres Annex at 37bis boulevard Suchet. When the Data Bank activities began, the staff for that activity was housed in a French Atomic Energy Commission (CEA) facility in Saclay, in the suburbs of Paris, and in a Euratom Joint Research Center in Ispra, Italy. When these two sections were consolidated in the late 1970s, the staff from Italy moved to the Saclay office. In June

1992, in an effort to fully consolidate the elements of the Agency, the OECD rented offices for NEA just southwest of the city on Ile St. Germain, an island in the Seine river in the suburb of Issy les Moulineaux, and all the staff from Suchet, Ingres, and Saclay moved there. The entire staff is there today. In addition, the building houses other OECD offices, in particular, the Development Center.

The NEA staff is charged with assuring the satisfactory implementation and completion of the Program of Work within the budget allocated. Much of the actual technical work is done by the STCs and their sub-groups, thus allowing the staff size and budget to stay relatively small, but the staff performs a critical role by managing the activities of the STCs and their sub-groups.

Both the staff size and budget level of the Agency have been fairly stable over recent years, with a total staff of nearly 70 professional and support staff (including the Data Bank), and a budget allocation of 10.2 million euros for the NEA, plus 2.8 million euros for the Data Bank. While it has not proven practical to reconstruct a complete history of the staff and budget of the Agency, recollections dating back to the mid-1960s indicate that the Agency already had some 40-50 staff members at that time, and by the late 1980s, was very close to its present size. This suggests that the Agency grew rapidly in its first decade, and much more slowly thereafter.

It is important to note that the work of the Agency is conducted to a significant extent through the work of the Standing Technical Committees, for which senior professional staff members serve as the Secretariats. Otherwise, it would be difficult to imagine a staff of less than 70 professional and support staff producing some 60 to 70 publications a year! Further, in addition to the formal publications, the Agency produces a number of reports of more limited circulation and several journal-type publications, and organizes a variety of seminars and workshops, and a few training sessions. The Agency does not directly conduct experimental research, but it does play a critical role in the organization and management of a number of international research programs by its role as the technical Secretariat for such activities.

In the case of publications, it has also proven difficult to document the growth in productivity over time. Records of publications produced in the early days of the Agency appear to be incomplete, and many of the early publications are no longer available. Further, the numbers of publications documented do not include the reports, for which it is more difficult to obtain full information. Looking only at lists of known reports, and not including translations, the number of publications per year has taken a dramatic jump in recent years, as Table 3.4 indicates. Likewise, it is difficult to obtain a full count of seminars and workshops, particularly since they vary a great deal in size and formality. However, many of the larger seminars result in publications.

To share resources and avoid duplication, NEA conducts many of its workshops and develops some of its publications jointly with other organizations, primarily the IAEA, and within the OECD, with the International Energy Agency. The NEA and IAEA also hold periodic management meetings to coordinate their efforts. In addition, NEA staff members participate as appropriate in conferences and other activities of other intergovernmental organizations, and on occasion, with international non-government organizations in which the NEA member countries have a special interest because of some key activity.

Although most of the work of the NEA takes place through its STCs, the Steering Committee has supported selective overarching activities. These include the publication of a biannual magazine, NEA News, now in its 26th year, to highlight and disseminate the activities of the Agency to a broader audience. In addition, the NEA arranges or participates in other general activities as appropriate. One recent example was the international ministerial conference conducted in March 2005, together with IAEA, on "Nuclear Power for the 21st Century," which promoted a high-level discussion among

nearly 30 countries on the future role of nuclear power in the context of national energy strategies.

Original NEA Headquarters, 38 Blvd. Suchet, Paris

Current NEA Headquarters, Issy les Moulineaux

Table 3.1: Chairs of the ENEA/NEA Steering Committee, 1956-2008

Years	Chair	Nationality	Affiliation
1956-1961	Leander Nicolaidis (1)	Greece	Professor
1961-1964	Jose Maria Otero y de Navascues	Spain	Professor
1964-1967	Urs W. Hochstrasser	Switzerland	Professor
1967-1969	Hans Henrik Koch	Denmark	Chairman, Executive Committee, Danish Atomic Energy Commission
1969-1973 (2)	Carlo Salvetti	Italy	Vice President, National Committee for Nuclear Energy (CNEN)
1973-1976	Reinhardt Loosch	Germany	
1976-1979	Bo Aler	Sweden	President, Aktiebolaget Atomenergi
1979-1982	Hiroshi Murata	Japan	President, Japan Atomic Energy Research Institute (JAERI)
1982-1985	Ivor Manley	United Kingdom	
1985-1991	Richard Kennedy	United States	Ambassador at Large for Nuclear Affairs, Department of State
1991-1994	Robert Morrison	Canada	Director-General, Uranium and Nuclear Energy Branch, Department of Natural Resources,1980-97
1994-1996	Horg Hermann Gosele	Germany	
1996-1998	Christian Prettre	France	Ambassador to Norway,1989-92
1998-2003	Lars Hogberg	Sweden	• Director-General, Swedish Nuclear Power Directorate (SKI), 1989-99 • Director-General, Ministry of Environment, 2000-01
2003-2005	William Magwood	United States	Director, Office of Nuclear Energy, Science &Technology, Department of Energy, 1998-2005
2005-2006	Jussi Manninen	Finland	Secretary-General, Atomic Energy Commission, 1984-86
2006-	Richard Stratford	United States	Acting Deputy Assistant Secretary, Nuclear Nonprolifera-tion Policy and Negotiations, Bureau of International Security and Nonproliferation, U.S. Department of State

(1) First appointed for Special Committee on Nuclear Energy and then Steering Committee on Nuclear Energy predating ENEA. Continued to serve as first ENEA Steering Committee Chair.

(2) Became NEA in 1972.

Table 3.2: Directors-General of the ENEA/NEA, 1958-2008

Years	Director-General	Nationality	Previous Affiliation (1)
1958-1964	Pierre Huet	France	General Counsel of the OEEC
1964-1977 (2)	Einar Saeland	Norway	Director, Isotope Division, Dutch-Norwegian Joint Establishment for Nuclear Energy Research (JENER)
1977-1982	I. Williams	United Kingdom	Director, Health and Safety Branch, Atomic Energy Authority
1982-1988	Howard Shapar	United States	Executive Legal Director, Nuclear Regulatory Commission
1988-1995	Kunihiko Uematsu	Japan	Executive Managing Director, Fuel Cycle Technology Development, Power Reactor and Nuclear Fuel Development Corporation (PNC)
1995-1997	Sam Thompson, Acting	United States	Special Assistant to the Ambassador-at-large for Nuclear Non-Proliferation and Nuclear Energy Affairs, Department of State
1997-	Luis Echavarri	Spain	Commissioner, Consejo de Seguridad Nuclear

(1) The last position or highest known position prior to joining ENEA or NEA.

(2) Became NEA in 1972.

Table 3.3: Policy Debates of the NEA Steering Committee

Date	Topic
October 1999	Nuclear safety in the CEEC/NIS: What are the implications for future NEA strategies
April 2000	1. Sustainable development and nuclear energy 2. Expansion of NEA membership
October 2000	The impact of deregulation of the electricity market on nuclear energy
April 2001	Infrastructure and the maintenance of competence in the field of nuclear energy
October 2001	Nuclear energy and civil society
April 2002	Radioactive waste management
October 2002	Safety standards for nuclear power plants in an international context
April 2003	The future evolution of the International Radiological Protection System (background and key issues)
October 2003	Revision of the NEA Strategic Plan
April 2004	The changing role of governments
October 2004	The potential contribution of nuclear energy to the production of hydrogen
April 2005	Decommissioning-related liabilities
October 2005	Security of supply
April 2006	Financing of nuclear energy
October 2006	Uranium resources
April 2007	Nuclear research
October 2007	Implications of new recommendations on the International Commission on Radiological Protection (ICRP)
April 2008	Lifetime management for nuclear power plant facilities

Table 3.4: Growth in Number of Publications, 1960-2008*

Years	Average # Publications/Year
1960-64	1
1964-69	3
1970-74	4
1975-79	7
1980-84	11
1984-89	16
1990-94	21
1994-99	24
2000-04	56
2005-2008	59

* Note: Publications count for early years may not be complete.
Translations and reprints not included in count.

IV. NEA TECHNICAL COMMITTEES AND ACTIVITIES:

OVERVIEW

As previously noted, the Standing Technical Committees and the Data Bank of the NEA are responsible for the performance of the Program of Work. NEA also helps coordinate the activities of a number of Joint Projects. The Joint Projects are managed separately from the Program of Work, but fall in some of the same areas. The majority of the Joint Projects are, or have been, safety-related research projects, but there are also several Joint Projects in radiation protection and in waste management.

This section describes a few of the general characteristics that apply to all STCs, as well as, to some extent, to the Data Bank. The basic characteristics of the Joint Projects are also outlined. In the following sections, more detailed descriptions are provided for each of the STCs, the Data Bank, and the individual Joint Projects. In most cases, the sections on the STCs are arranged in order of the original founding of the committee; however, in the case of committees that have a very strong connection, the chronological order has been abandoned in favor of keeping interrelated discussions together. Thus, the section on CNRA follows that of CSNI, and NSC has been put at the end of the sequence so that the discussion of this committee flows into the discussion of the Data Bank.

Standing Technical Committees

There are presently seven STCs. Two of them, the Nuclear Law Committee and the Committee on Radiation Protection and Public Health, actually preceded the formal establishment of the NEA by a few months, although they had different names and somewhat different mandates at that time.

Other working groups that operated early in the history of the ENEA have now disappeared. Some of the earliest work of the Agency included efforts associated with reprocessing and with the development of gas reactors. In the early 1970s, there was also work in such areas as ship propulsion, food irradiation, radioisotope batteries, and direct conversion. The exact names and other information about these groups and their operation are now difficult to recover in detail. However, in several cases, including reprocessing, gas reactors, and food irradiation, Joint Projects existed for some time. The details of known efforts are summarized in the Joint Projects section of this report.

Other committees have been added over the years, and activities have been moved between committees in some cases. The newest committee, the Nuclear Science Committee, was established in 1991, although it had antecedents in other committees. Figure 4.1 shows the overall evolution of the current committees and the Data Bank. A detailed description of the evolution of each of the current committee is described in the sections below.

Changes in the mandates of the committees and in the committee structures have occurred for several reasons, as will be discussed in the following sections. Most commonly, restructuring has resulted from evolution of the work of the committees and the desire to "match" the expertise of committee members with the committee's work.

The members of the STCs are appointed by their countries, and usually come from the agencies within the countries with responsibility for the subjects covered by the particular committee, or from organizations that support those agencies, such as national laboratories. Every country belonging to the NEA has the right to participate in all seven of the STCs. In practice, most countries participate in most of the committees. However, there are some exceptions, based on the activities and needs of the Member Countries. These will be noted below. Each committee meets once or twice a year, usually at NEA

Headquarters in Paris, to review progress and discuss future activities. Like the Steering Committee, the STCs operate by consensus, and the meetings are bilingual. The committees have renewable 5-year mandates.

Most of the STCs conduct their work through a variety of subsidiary groups, which are populated by individuals from the Member Countries with specific expertise in the particular area of activity. There are several types of subsidiary groups: working groups, working parties, expert groups, and ad hoc groups. For purposes of this discussion, the primary distinction that is relevant is that ad hoc groups are generally formed to perform a specific task or to generate a specific product. They are then dissolved, usually within a year or two. Because they are temporary and often short-lived, there have been many such group over the years. It is impractical to reconstruct a comprehensive history of all the short-term entities, and no attempt has been made to do so in this publication.

Some of the STCs and their constituent subunits have selectively invited experts from non-member countries, and even, on occasion, from non-government organizations, as "observers," where the participation of such representatives is of significant value to the group. Such involvement has usually been beneficial to the observer's country as well. Although designated "observers," such representatives are expected to be active participants in the work of the committee. Their performance is monitored, and their continued involvement is dependent on the value they bring. Invitations are highly selective and are limited in number.

Consistent with OECD policy and practice, the NEA recognizes two types of observers: regular observers, who are routinely included in all official meetings of the committees, and ad hoc observers, who are invited when the agenda of the meeting includes items appropriate to the expertise and interests of specific entities. In the case of non-member countries, regular observers are obligated to pay the OECD a small fee, whereas ad hoc observers incur no financial obligation. Non-government organizations do not pay fees for participation.

Recent interests in greater collaboration with non-member countries with significant nuclear programs, such as Russia and China, are leading to increased participation in NEA activities by these countries. In particular, based on a recent agreement with the Russian Federation, they now are invited to participate in all STCs. Slovenia is also a regular observer on all NEA STCs.

As discussed above, the Steering Committee does not have such observers. Observers are intended to be experts who can contribute to the technical dialogue, and not to be involved in Agency policy.

Finally, it should be noted that the European Commission participates in all the STCs and their constituent units, and the coordinating committee of the Data Bank, according to the Statute of the NEA; likewise, the IAEA participates in all these activities, in this case, based on the IAEA-NEA agreement for cooperation. Unlike non-member countries, the EC and the IAEA also participate in the NEA Steering Committee meetings.

The longer-term subgroups are treated much like the committees in terms of having a renewable mandate and having recognized standing in the OECD in its Directory of Bodies. In some cases, in fact, new STCs have evolved from subgroups initially operating under an existing committee. This report traces and documents the existence and evolution of subgroups of the STCs to the extent possible. However, full historical information has not been readily available in all cases.

The heavy involvement of experts from the Member Countries in all the activities of the NEA has allowed, over the years, for the NEA to produce a much greater number of products than the small staff size and budget would have allowed. It also has assured that

all the work of the Agency has the benefit of the top experts around the world in that field, something that again is not always possible within a small staff.

Data is not available for all years in the past, but in recent years, the seven STCs and the Data Bank (discussed further below) bring about 500 national experts a year to NEA committee meetings. Including the subordinate groups of the committees, on average, some 3600 national experts participate each year in policy and technical meetings of the NEA.

As noted previously, the products of the STCs take a variety of forms. Most visible are the publications, many of which are available free and are now on the NEA website, and a few of which are sold. These publications are used by the Member Countries and others, and have been widely recognized for their quality and value to the nuclear community. In addition to the publications, much of the work of the STCs is documented in reports, which do not receive the same degree of visibility, but are nonetheless, important to selected communities.

Other work of the Agency is conducted through seminars and workshops. Many of these are ultimately summarized in publications or reports. Such meetings are held when it is important to the success of an activity to engage in an exchange of information and viewpoints among a number of countries or other entities. Many of these meetings are ultimately summarized in publications and reports to make them available to a larger audience. Furthermore, the conclusions of the meetings may lead to additional work resulting the development of later publications and reports. As previously noted, the historical development of workshops and seminars is known only through publications on these meetings.

NEA also occasionally engages in other types of work. On a selected basis, training activities are conducted, particularly in the field of nuclear law and on computer programs in the Data Bank. However, NEA does not routinely conduct training in other areas, largely because training is a major function of the IAEA.

Joint Projects

Since the earliest days of the NEA, NEA has also helped manage and coordinate Joint Projects. These have usually, but not always, been experiments performed at a facility in one country by a multi-national group. Although NEA has no research facilities and does not conduct experimental research itself, NEA staff has provided Secretariat services for these Joint Projects. These services include both administrative services, like arranging periodic meetings, and substantive services, like working with representatives of the supporting countries to plan research programs. Most of these Joint Projects have been in the area of safety, but several have been conducted in other areas as well, including radiation protection and waste management. All known Joint Projects will be described briefly in a later section of this report.

The Data Bank is different in several respects from the rest of the NEA. It has a different kind of mission, a different history, and a membership that does not include all the Member Countries of the NEA. Key elements of this history, the evolution of the membership, and the nature of the work will be detailed in a later section.

Like the STCs, the activities of the Data Bank are guided by a group composed of representative experts from its Member Countries. This group is a subsidiary of one of the NEA STCs, the Nuclear Science Committee, and is called the Executive Group of the NSC. It develops the Program of Work of the Data Bank within the overall budget established by the OECD Council, and performs other oversight and management of the activities and products of the Data Bank.

It is important to note that the work of the Data Bank involves computer programs and data compilations useful to other work of the Agency, and resources and products are routinely shared between the Data Bank and several of the STCs. As will be discussed in later sections, the work of the Data Bank is tied particularly closely to that of the Science Committee. However, the Data Bank also provides services to several other committees of the NEA though its computer programs and data compilations.

It is also pertinent to note that several member and non-member countries operate computer and data centers of their own, and that the NEA Data Bank maintains close cooperation with these organizations through cooperative agreements and exchanges. The Data Bank works particularly closely with the IAEA, and through them, NEA codes and data are shared with non-member countries and the NEA gains access to codes and standards of those countries. Further, the NEA Data Bank has agreements with their US counterparts for similar cooperation.

Organization of This Document

The following chapters summarize key information about each of the Standing Technical Committees, as well as of the Data Bank and the Joint Projects. For each of the STCs and the Data Bank, we have attempted to identify the following information:

- The origin of the committee and the evolution to its current form, including both factual information (earlier names, basic missions, and dates of existence, to the extent known), and a brief description of events surrounding the creation and changes in the committee;
- A current snapshot of the committee, including its current standing subordinate units, and its members and observers;
- All individuals who have chaired the committee, together with their dates of service, their national origin, and their positions in their national governments, if known;
- Some of the key activities and accomplishments of the committee;
- Which other NEA committees, OECD committees, and external organizations the committee works with most closely.
- For the Joint Projects, a table has been developed showing the dates of activity of all Joint Projects that have been identified, the number of countries involved, and the facility or facilities used for the work, if any. Brief summaries of each of the Joint Projects are provided in Appendix 3.

It should be noted that it has not been possible, to date, to obtain equally detailed information on every committee. For committees that have recently celebrated major anniversaries of their own, such as the NLC and CRPPH, more detailed information was available. For other committees, the information was drawn from available sources and individual recollections. Hence, the summaries of the individual committees are necessarily a little uneven at the present time. In some cases, such as for the Joint Projects, it is not even possible to ascertain that all past Joint Projects have been identified and summarized. However, it is believed that what is documented is correct and as complete as possible, and it is hoped that making as much information as possible available for each committee makes this document more useful than paring down the information to achieve perfect equality of treatment. It is also hoped that, in the future, additional information may be recovered and added to this compilation, and that basic information on ongoing activities and events will be maintained in a systematic fashion to avoid future losses.

Finally, a couple of cautions should be noted:

First, in an effort to avoid unnecessary repetition, the current snapshots of each STC do not repeat information that is common to all of them, namely, that all of them have as participants Euratom (according to the NEA Statute) and the IAEA (by agreement). All of them also have the Russian Federation and Slovenia as regular observers; however, this fact is noted for each committee in order to avoid any confusion in the case of STCs that also have other countries as ad hoc observers.

Secondly, all member countries of the NEA are automatically members of all the Standing Technical Committees. This, of course, is not true of the Data Bank, which has a separate membership, of the Joint Projects, each of which has its own membership. However, it should be noted that, for the STCs, all member countries do not participate equally in all STCs. In particular, smaller countries without commercial reactor programs or plans for commercial reactors do not necessarily participate actively in those STCs that are mainly focused on reactors and other nuclear power-related facilities. The actual countries that participate actively in a particular STC has been noted where that information is available.

Figure 4.1 Evolution of NEA Committee Structure

Year	NLC	CRPPH	NDC	CSNI	CNRA	RWMC	NSC	DB	JP
1957	WGHL GGENL	WPPHS							First JP: Eurochemic
1958		HSC							
1959									
1960							EANDC		
1961									
1962							EARPC		
1963									
1964			NELT					CPL NDCC	
1965				CREST					
1966									
1967									
1968									
1969									
1970									
1971									
1972									
1973		CRPPH		CSNI*					
1974							NEANDC NEARPC		
1975						RWMC*			
1976									
1977			NDC						
1978								DB	
1979									
1980									
1981									
1982									
1983									
1984									
1985									
1986									
1987									
1988									
1989					CNRA*				
1990									
1991							NSC		
1992									
1993									
1994									
1995									
1996									
1997									
1998									
1999									
2000	NLC								
2001									
2002									
2003									
2004									
2005									
2006									
2007									
2008									

* New committee assumes some functions of other committees.

Key:

CNRA	Committee on Nuclear Regulatory Activities
CPL	Computer Program Library
CREST	Committee on Reactor Safety Technology
CRPPH	Committee on Radiation Protection and Public Health
CSNI	Committee on Safety of Nuclear Installations
DB	Data Bank
EANDC	European-American Nuclear Data Committee
EARPC	European-American Reactor Physics Committee
GGENL	Group of Government Experts on Nuclear Liability
HSC	Health and Safety Committee
NDC	Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (Nuclear Development Committee)
NDCC	Neutron Data Compilation Center
NEANDC	NEA Nuclear Data Committee
NEARPC	NEA Reactor Physics Committee
NELT	Study Group on Long-Term Role of Nuclear Energy
NLC	Nuclear Law Committee
NSC	Nuclear Science Committee
RWMC	Radioactive Waste Management Committee
WGHL	Working Group on Harmonization of Legislation
WPPHS	Working Party on Public Health and Safety

V. NUCLEAR LAW COMMITTEE

NLC in Brief

Founded: 24 January 1957 (first NEA Committee)

Names:
- **Working Group on Harmonization of Legislation, established 24 January 1957**
- **Group of Governmental Experts on Civil Liability, established 3 July 1957**
- **Nuclear Law Committee, established 12 October 2000**

Regular Observers: Russian Federation, Slovenia

Ad Hoc Observers:
- **Bulgaria**
- **Hong Kong (China)**
- **Lithuania**
- **Romania**
- **Ukraine**

Current Subsidiary Bodies: None

History and Development

The need for a coordinated international effort to address issues of third-party liability for nuclear activities was one of the earliest tasks identified for coordinated effort in the nuclear area. In fact, the initial effort in this area was a co-operative effort, started in 1956, between the original Special Committee on Nuclear Energy and the Insurance Subcommittee of the OEEC Committee on Intra-European Costs and Payments on issues of legislation and insurance in the field of nuclear energy. The Insurance Subcommittee established a Working Group to study the general framework within which legislative provisions appropriate for insuring nuclear activities could be adopted. On 23 June 1956, the Working Group recommended that the problem of civil nuclear liability and its possible limitations be examined and, further, that an ad hoc committee be created to carry out that task.

As a result, the very first entity established by the newly formed Steering Committee for Nuclear Energy was a Working Group on Harmonization of Legislation, on 24 January 1957, to examine third party liability for damage caused by peaceful uses of nuclear energy. Eleven Member Countries of the OEEC joined that activity: Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Portugal, Sweden, Switzerland, and the UK. In addition, the US joined as an observer, along with Euratom, the European Insurance Commission (EIC), and the International Union of Producers and Distributors of Electrical Energy (UNIPEDE), now known as the Union of the Electricity Industry (EURELECTRIC). (As a result of a decision by the NLC in 2006, endorsed by the Steering Committee, the non-governmental organizations, EIC and EURELECTRIC, are no longer regular observers, although they and other non-governmental groups still are invited to meetings as ad hoc observers as appropriate.)

That Working Group was tasked to examine and develop proposals on the issue of harmonizing legislation regarding civil liability for damage caused by the peaceful uses of nuclear energy. In June 1957, it submitted its recommendations to the Steering Committee. The recommendations included a series of proposals for the establishment of a uniform civil liability regime covering nuclear damage. Further, it recommended to the

Steering Committee that a Group of Experts be created to draft an international convention in the field of nuclear third party liability. They advised that this group be composed of members of the Working Group as well as lawyers, insurers and technical specialists.

The Steering Committee quickly acted on this recommendation, and the Group of Government Experts on Third Party Liability in the Field of Nuclear Energy, was established on 3 July 1957. The new committee held its first meeting on 22 January 1958, just days before the formal establishment of the ENEA on 1 February. The committee was to operate under this name until 12 October 2000, when the recognition of the broader range of legal issues the committee needed to address caused the mandate of the group to be broadened and the name to be changed to the Nuclear Law Committee. As a result, the oldest entity within the NEA has the newest name.

Because the Nuclear Law Committee so recently celebrated its own fiftieth anniversary, the information available for this committee is somewhat more complete and detailed than is that of some of the other committees. A colloquium that took place in February 2007 brought together some of the longest-serving members, and the proceedings of that meeting are documented in a report that captures a good portion of the history of this committee. This section is based largely on that colloquium and the resulting report.

One of the highlights noted in that colloquium is that fact that, in 50 years, the Committee and its predecessors have had 8 Chairs, 203 delegates (defining a delegate as someone who comes at least twice), 52 observers, and 14 Secretariat attendees. Several members have served on the committee for many years, including one who has served for over 30 years. All the Chairs of the NLC are listed in Table 5.1.

Other information assembled for that colloquium included information on the evolution of the membership of the NLC. The evolution demonstrates the statement made earlier in this publication that, although all STCs in the NEA are open to all Member Countries, in fact not all eligible countries join every activity. As noted above, 11 of the original 17 members of the OEEC (and ENEA) joined the forerunner of the NLC at the outset. However, the other original members of the ENEA joined the NLC over the next few years, as they recognized the potential value of this activity to some of their initiatives. By the time the Agency became the NEA, all the members of the NEA were members of the NLC or became members at that point.

It should be noted that the reverse is also true. Several countries that are now members of the NEA had participated in the NLC as observers prior to becoming NEA members, namely: the US (since the inception of the ENEA in 1958); Japan (since it became an ENEA observer in 1965), and Hungary, the Czech Republic and the Slovak Republic (which were granted NLC observer status in 1992). Others joined both NEA and the NLC simultaneously, without first having had observer status on the NLC. One exception is Mexico, which joined the NEA in 1994, but has just recently begun to participate in NLC meetings.

In addition to the countries noted above, several other countries have been granted observer status on the NLC in the past, including: Poland (1992); Bulgaria, the Russian Federation, and the Ukraine (1993); Kazakhstan (1995); Lithuania (1996); and Slovenia and the Hong Kong Special Administrative Region, or HKSAR (1998). At present, all countries remain observers except Poland and Kazakhstan; the Russian Federation and Slovenia are regular observers (of the NLC and of all other NEA STCs), while the other five are ad hoc observers. As with all NEA STCs, the European Commission and IAEA have observer status as well.

At the 50th anniversary NLC colloquium, it was also noted, with justifiable pride, that the work of this committee is perhaps unique in the annals of law in that liability provisions were put into place *before* any incident occurred. In fact, the development of nuclear

liability law really preceded the inception of a civilian nuclear industry, and, considering the reluctance of potential investors to act in an environment of legal uncertainty over the liability implications of an accident, was likely one of the key factors that enabled that industry to develop. The steps in implementing those provisions are among the key achievements of the NLC and are highlighted below.

The NLC is also unique among NEA committees in that it has no regular subsidiary bodies, although it has had some ad hoc working groups over the years directed at the accomplishment of specific tasks.

Main Areas of Work and Accomplishments

Although the NLC has, by a few months, the distinction of having a longer history than any other NEA committee, its work has probably been more focused than most of the other STCs, with most of its activities over the entire period dealing with different aspects of nuclear liability.

The NLC's very first undertaking, the drafting of the Paris Convention on Third Party Liability in the Field of Nuclear Energy (generally referred to as the "Paris Convention"), is probably also its most significant accomplishment. It was the first such international convention, and at the time of its development, there were few examples of nuclear liability legislation anywhere in the world. (Around the time the NLC began its work, the Price-Anderson Amendment to the 1954 Atomic Energy Act in the United States, the first such legislation in the world, was just being completed. It became Public Law 85-256 on 6 September 1957. In the rest of the world, such legislation was under consideration in only a few other countries, namely Germany, Switzerland and the United Kingdom, which all enacted legislation in 1959.) The early entry of the ENEA into this arena made it a pioneer in an important new field, and helped establish the new Agency as an organization that could contribute significantly to international nuclear issues and concerns.

The Paris Convention established rules designed to clarify the rights and responsibilities of all parties in the event of a nuclear incident. Its provisions included ascribing responsibility to the operator of the facility, identifying the responsibilities of the country in which the accident occurred, establishing limits of liability and time limits for making claims, requiring insurance, and identifying legal jurisdiction.

Much of the subsequent work of the NLC has involved the Paris Convention in one way or another. Over the years, the NLC has elaborated on the provisions of the Convention, worked on resolving issues arising from the co-existence of another, slightly later, Convention (the Vienna Convention), amended the Convention, and worked on the application of the convention to address a variety of new issues as they arose, including transportation, radioisotopes, uranium resource management, radioactive waste, and terrorism.

The Paris Convention itself evolved rather quickly from the first efforts of the Working Group and, later, the Group of Experts. During the late 1950s, in the very early days of the ENEA, several meetings were held, with participation from the European Insurance Committee, UNIPEDE, the IAEA, and international transport organizations. These meetings resulted in a draft convention and an explanatory memorandum, the Expose des Motifs. The resulting Paris Convention was adopted by the OEEC Council on 29 July 1960 and entered into force on 1 April 1968.

Within a few years, the IAEA developed its own nuclear liability convention, the Vienna Convention on Civil Liability for Nuclear Damage (generally referred to as the "Vienna Convention"). This Convention, adopted within the IAEA on 21 May 1963, drew on the model and experience of the Paris Convention. The Vienna Convention has a different,

but overlapping set of countries subscribing to the Convention, and many similar provisions, but with differences in limits imposed and in other matters.

Even as the Paris Convention was still being ratified, the new Vienna Convention, as well as other needs identified following the completion of the Paris Convention, led almost immediately to the development of further conventions, including the Brussels Convention Supplementary to the Paris Convention on Nuclear Third Party Liability (generally referred to as the "Brussels Convention"), an Additional Protocol to the Paris Convention, and an Additional Protocol to the Brussels Supplementary Convention, both adopted in 1964.

Following the entry into force of the Paris Convention, the Group of Experts continued its work in this area by exploring a number of issues relating to the interpretation and implementation of all the Conventions. Among the key products of the Group of Experts during the ensuing years are the following:

- The development of a model Certificate of Financial Guarantee in 1968.

- A recommendation, endorsed by the ENEA Steering Committee in 1969, dealing with damage to the means of transport of nuclear substances.

- The adoption, on 17 December 1971, of an International Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material. This convention, developed jointly with the International Maritime Consultative Organization, entered into force on 15 July 1975.

- The development, during 1974-5, of a Joint Protocol creating a link between the Paris and Vienna Conventions. This protocol, developed jointly with the IAEA, addressed the issue of a State Party to one Convention being able to ratify the other Convention.

- A decision, adopted by the ENEA Steering Committee in 1977, on the exclusion of certain categories or certain quantities of nuclear substances from the scope of the Paris Convention.

- The establishment of a Working Group in 1977 to revise and modernize the Paris and Brussels Conventions. Issues that the Working Group addressed included changing the unit of account under the Paris Convention from the European Monetary Agreement unit of account to the Special Drawing Right of the International Monetary Fund. The efforts of the Working Group resulted in the completion, in 1980, of amending Protocols for both Conventions. These amendments were adopted on 16 November 1982, and subsequently led to the revision of the Expose des Motifs of the Paris Convention as well.

- A review of the problems of insurance and the indemnification of claims relating to the accident at Three Mile Island 2 (TMI-2) in the United States.

- A recommendation on liability for damage to nuclear substances in the course of transport, adopted by the NEA Steering Committee in April 1981.

- The application of a nuclear civil liability regime to the long-term management of radioactive waste. This effort, which started with an ad hoc group looking at the legal, administrative and financial aspects of the long-term management of radioactive waste, eventually led to the adoption by the NEA Steering Committee, on 10 April 1984, of a decision to include installations intended for the disposal of nuclear substances within the scope of the Paris Convention.

- An examination, conducted during the 1980s, on removing clauses excluding nuclear risks from certain insurance policies.

- An interpretation, endorsed by the NEA Steering Committee in 1987, clarifying that the Paris Convention does cover nuclear installations in the process of being decommissioned.

- A review, starting in 1986, of the implications of the 26 April 1986 accident of the Chernobyl Nuclear Power Plant in the Ukraine, and in particular, of the gaps in the nuclear liability regime made evident by the accident. The work of the Group encompassed as well the implications of the introduction of national legislation in the Federal Republic of Germany establishing a regime of unlimited civil liability of operators for third party nuclear damage, with special focus on the compatibility of such a regime with that instituted by the Paris Convention.

- That review in turn reactivated efforts aimed at establishing a link between the Paris and Vienna Conventions through means of a Joint Protocol. Work on the development of this instrument concluded with the adoption of the Joint Protocol relating to the Application of the Vienna and Paris Convention on 21 September 1998.

- This Joint Protocol led to further questions of its impact on the Brussels Supplementary Convention. These efforts have resulted in the adoption of a series of OECD Council Recommendations in relation to the actual operation of the latter Convention. Further work in the context of the Chernobyl accident addressed the issue of including the cost of preventive measures in the concept of nuclear damage and the question of whether the Paris Convention does, or should, apply to preventive measures.

- Studies to determine at what stage and in what manner the Paris Convention could logically cease to apply to nuclear installations that were in the process of being decommissioned.

- Consideration of the need to increase the amount of the operator's liability together with the corresponding amount of required financial security

- The adoption, in 2000, at the request of the Peoples Republic of China, of an International Declaration providing that the Paris Convention continue to apply to Hong Kong following its handover to the PRC on 1 July 1997, notwithstanding the fact that China is not a party to the Convention.

- As a result of the adoption of a Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage, and of a new Convention on Supplementary Compensation for Nuclear Damage, adopted in Vienna in September 1997, the initiation of similar work on the Paris and Brussels Conventions. This work resulted in the adoption, on 12 February 2004, of a Protocol to Amend the Paris Convention and another Protocol to Amend the Brussels Supplementary Convention.

- In the aftermath of the terrorist attacks in the US on 11 September 2001, a study examining the insurance coverage of damage resulting from a nuclear accident caused by a terrorist act.

- A study on liability and financial security issues applicable to nuclear fusion installations, carried out at the request of the French delegation, host to the future ITER reactor.

A related activity is NEA's coordination of the European Nuclear Energy Tribunal, which hears cases concerning liability over nuclear accidents. This body was originally established by convention on 20 December 1957. The convention came into force on 22 July 1959 and the first judges were appointed 1 January 1960. to hear cases concerning the violation of the European regional nuclear safeguards system operated by the OECD at that time. That jurisdiction was suspended in the 1970s to avoid duplication with IAEA and Euratom systems. The Tribunal's mandate is now restricted to resolving differences concerning the interpretation or application of the Paris and Brussels conventions, and continues to operate under the auspices of the OECD.

In other areas of work, the NLC serves as an important forum for the exchange of information and experience between countries, international organizations and non-governmental organizations, not just in the field of international third party nuclear liability, but also in relation to nuclear law in general. The NLC regularly shares information on the drafting of new international nuclear law instruments or regulations that may have consequences for nuclear energy activities (in particular, European Community legislation and IAEA Conventions and Codes). The NLC also looks regularly at developments in national legislation and regulations in member and observer countries, and periodically, provides compilations of national laws and regulations. The NLC is also responsible for the Nuclear Law Bulletin, a journal inaugurated in 1968 and published twice a year that addresses key issues in the field of nuclear law.

One final activity of the NEA in the field of nuclear law merits mention—that is, the International School of Nuclear Law (ISNL), co-organized between the NEA and the University of Montpellier 1, and conducted annually since 2001. The School, which benefits from the support of the International Nuclear Law Association and the International Atomic Energy Agency, has had significant impact in its short existence.

As previously noted, NEA's activities in the field of nuclear education and training are very limited, as this has largely been the province of the IAEA. The field of nuclear law is one of the few exceptions. It was recognized that the field of nuclear law is a sub-specialty in itself, requiring some specialized background, and that such training needs were not being addressed, in an integrated fashion, in academic institutions or by other organizations. NEA, in partnership with the University of Montpellier 1, stepped into the breach, offering an intensive 2-week summer course to about 60 people a year from 35 countries and the European Commission. Since its inception, about 400 people from 78 countries have participated. The students are generally law students or young legal professionals interested in issues of nuclear law. Invited lecturers cover key technical, legal and policy topics, including: radiological protection, nuclear safety, radioactive waste management, transport of nuclear materials, physical protection, non-proliferation, regulation of trade and nuclear third party liability and insurance. The School provides a certificate to each student, but students may, upon satisfactory completion of the course, a "take-home exam," and a dissertation, apply for a University Diploma (Diplôme d'université - D.U.) in International Nuclear Law.

Relationships with Other Entities

Within the NEA, the staff of the Legal Division supports the work of the entire Agency by providing expert assistance, as needed, on legal matters relating to other NEA activities. Thus, they play a vital role in developing the arrangements regarding such matters as new Joint Projects, agreements with other entities, any new contracts with non-standard provisions, and other contractual-type initiatives. In that capacity, they also work closely with OECD legal staff on matters involving the NEA.

The NLC also maintains close working relationships with a number of government and non-government entities outside the NEA and the OECD. In particular, the NLC has more non-member countries as observers to the Committee's deliberations than does any other NEA committee. Some of these observer countries are signatories to the Paris

Convention, and therefore have a strong and direct interest in the Committee's efforts. The NLC also works closely with the IAEA, the European Commission, and a variety of non-governmental international organizations involved in issues relating to nuclear insurance, and to the transportation of nuclear materials by land or sea. In addition, the NEA legal staff maintains a very close cooperative arrangement with the University of Montpellier 1 on the jointly run International School of Nuclear Law.

Evolving Activities

The NLC continues to work actively on a number of issues in the field of nuclear law. As has historically been the case, a large body of the work continues to be related to issues of international third-party nuclear liability, and in particular, to the Paris Convention that started it all. Most recently, the revisions of the Paris and Brussels Conventions made it necessary to revise the Exposé des Motifs of the Paris Convention. That in turn led to a recognition of the need for a similar document for the Brussels Supplementary Convention as well.

In addition, work continues on such issues as the relationship between these Conventions and other Conventions. For example, the NLC is now studying the Aarhus Convention, an agreement on environmental rights, and its influence on nuclear projects. Further, some of the issues examined in recent years, such as the implications of terrorism, need to be fully integrated into the liability schemes. Likewise, new concerns will have to be explored as they are identified, and also integrated into existing liability schemes.

Other legal activities of the NEA also continue. These areas include work on nuclear legislation and other legal areas outside third-party liability, and more specifically, on the Nuclear Law Bulletin and on the International School of Nuclear Law.

Table 5.1: Chairs of the Nuclear Law Committee and its Predecessors, 1957-2008

Years	Chair	Country
1957-1962	A. D. Belinfante	Netherlands
1963-1965	Mr. Thompson	UK
1966-1970	J.P.H. Trevor	UK
1971-1982 (1)	Maurice Lagorce	France
1983-1984	Mans Jacobson	Sweden
1985-1992	Wouter Sturms	Netherlands
1992-2003 (2)	Hakan Rustand	Sweden
2004-	Roland Dussart-Desart	Belgium

(1) ENEA became NEA in 1972.

(2) Group of Government Experts on Civil Liability became Nuclear Law Committee in 2000.

VI. COMMITTEE ON RADIATION PROTECTION AND PUBLIC HEALTH

CRPPH in Brief:

Founded: 21 March 1957 (second NEA Committee)

Names:
- **Working Party on Public Health and Safety, established 21 March 1957**
- **Health and Safety Subcommittee, established 21 February 1958**
- **Health and Safety Committee, established 14 October 1965**
- **Committee on Radiation Protection and Public Health, established 1 February 1973**

Regular Observers: Russian Federation, Slovenia

Ad Hoc Observers:
- **International Commission on Radiological Protection (ICRP)**
- **International Radiation Protection Association (IRPA)**
- **United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)**
- **World Health Organization (WHO)**

Current Subsidiary Bodies:
- **Working Party on Nuclear Emergency Matters (WPNEM)**

History and Development

Very early on, the Steering Committee for Nuclear Energy recognized the importance radiological health and safety in the operation of nuclear facilities, and at their third meeting, on 21 March 1957, they established a Working Party on Public Health and Safety. The founding charter was published 19 April 1957. The 1957 date gives the CRPPH the distinction of being one of two committees (together with the Nuclear Law Committee) to precede the establishment of the ENEA itself, and makes the current CRPPH, which is a direct descendent of this Working Party, the second oldest committee in the NEA.

Within a month, the new group has documented its main goals and objectives, namely:

- adoption of common health standards governing the permissible exposure to external radiation and concentrations of radioactive materials that may be discharged into air and water;

- determination whether agreement concerning certain general provisions for undertakings producing, dealing with or using radioactive substances would be desirable or a set of instructions could be compiled;

- determination whether agreement on the advance notification of all plans for the disposal of radioactive waste was possible and what the procedures should be for examining such notification; and

- determination of the extent to which there was agreement on establishing an international monitoring body to which countries would periodically report legislative and administrative public health and safety regulations in force and their application, and the procedure for examining such reports.

These same areas have continued to guide the work of the Agency in the area of radiological protection.

The Working Party was intended as a temporary group to establish the initial program of work and a mechanism to implement it. As a result, they were abolished within a year and a permanent group, the Health and Safety Subcommittee, was created on 21 February 1958, just after the establishment of the ENEA. This later became a full committee, the Health and Safety Committee. On 1 February 1973, the Committee on Radiation Protection and Public Health (CRPPH) was created with a new mandate, based on that of its predecessor. At the same time CRPPH was established, the Committee on Reactor Safety Technology (CREST) became the Committee on Safety of Nuclear Installations (CSNI) and issues of regulation moved out of the HSC and to the Subcommittee on Licensing within CSNI.

Because of the broad interest in radiation protection, all ENEA Member Countries participated in the activities of this Committee almost from its outset. The US, as an associate member of the ENEA, also contributed actively in this area. In fact, when the Working Party was established, a new regulation on radiological protection that had just taken effect in the United States became the basis for discussion of proposed European standards. The United States had also played a significant role in introducing "precautionary procedures" (now known as the "precautionary principle") into ENEA discussions.

One of the early areas of activity of the HSC was that of radioactive waste, which at the time was viewed mainly in terms of radiological protection. Prior to the establishment of the Radioactive Waste Management Committee (RWMC) in 1975, general issues of waste management were addressed through a Working Group on Radiation Waste Management. Later, after the establishment of the RWMC, NEA would undertake a project on the marine disposal of radioactive waste called Coordinated Research and Environmental Surveillance Program (CRESP). Since the initial discussions of that work took place before the formation of the RWMC, and since the focus of that work was on the radiological implications, the CRPPH was responsible for the effort, although, of course, they worked closely with RWMC.

The CRPPH recently celebrated its fiftieth anniversary. In conjunction with that celebration, a commemorative review was prepared in 2007 that incorporates reflections of some of the past chairs and others with long-standing involvement with the committee. This section is based largely on that commemorative review, and is therefore somewhat more detailed than are the histories of some of the other committees.

Like the NLC's 50-year summary, the CRPPH summary documents a few interesting statistics relating to the participation of committee members over the years. The CRPPH has had almost twice the number of chairs (15) as the NLC over essentially the same number of years. One committee member participated in CRPPH activities for a span of 32 years, and some half a dozen participated in 20 or more meetings of the Committee.

Main Areas of Work and Accomplishments

While the CRPPH has worked on many issues over its 50 years, a handful stand out, either for the long period over which the CRPPH has been active in the area, or for the importance and visibility of the work, or both. These areas will be discussed in detail below.

However, first, it is of interest to note that one activity of the Committee has been the development of occasional "collective opinions" of the Committee members, designed to try to assess trends and anticipate future needs. Some of the collective opinions developed and published by the Committee have included:

- Radiation Protection Today and Tomorrow (1994)
- Developments in Radiation Health Science and their Impact on Radiation Protection (1998)
- A Critical Review of the System of Radiation Protection (2000)
- Radiation Protection in Today's World: Towards Sustainability (2007)
- Scientific Issues and Emerging Challenges for Radiation Protection (2007)

Each of these reports has accurately identified growing trends and emerging issues in the radiation protection area and has resulted in CRPPH efforts to address these issues. For example, the first report, "Radiation Protection Today and Tomorrow," identified the growing trend toward greater stakeholder involvement in decision-making on technical issues, and led to the initiation of a significant CRPPH effort in this area (described further below). Likewise, the third report, which noted a host of issues relating to the system of radiation protection (including its clarity and coherence, the justification and optimization principles, collective dose, dose limits, trivial doses, and environmental protection), became the focus of discussions concerning revisions of ICRP 60 later in the decade (described further below).

The most recent collective opinions of the Committee, published in 2007, look extensively forward in terms of emerging scientific and social/decision-making challenges facing radiological protection. These tend to center around the balance of "scientific fact" and "social judgment and values" in radiological protection decisions.

Another general activity worth noting is the use of expert groups. These groups also have sometimes identified emerging issues, but they differ from the collective opinions in that 1) they are the product of independent, ad hoc expert groups rather than of the Committee as a whole, and 2) they focus on very specific issues rather than on broad trends. There have been many of these ad hoc groups formed and dissolved over the years. Some of the areas where the expert groups performed pioneering work or other work of special importance are noted in the discussions below.

Review and Interpretation of ICRP Recommendations

The ENEA effort was not the only international effort to address issues of radiological standards; in fact, it was not even the first such organization. By the time the Steering Committee established this effort within the ENEA, the International Commission on Radiological Protection (ICRP) had already been in existence for some time. (It was originally founded in 1928 as the International X-ray and Radium Protection Committee, and focused on medical applications. Its role was broadened in 1950 to include non-medical uses of radiation, and its name was changed to the ICRP.) The ICRP is an Independent Registered Charity (a not-for-profit organization) in the UK. It has served as an expert advisory body providing recommendations and guidance on radiation protection.

Early on, the Working Party and the ICRP recognized the importance of working together and coordinating their efforts to enable the expert technical community to better interact with governmental bodies. These interactions have, over time, resulted in a coordinated and mutually supportive division of effort. The close working relationships that evolved over time have been enhanced by the efforts of several individuals who have chaired both entities (at different times), or served on both entities (sometimes even at the same time), and who made concerted efforts to foster the synergies between the two organizations. The long and fruitful collaboration between the NEA and the ICRP has proved beneficial to a broad constituency.

In the early days of the ENEA and Euratom, before the current working relationships had developed, there was discussion about what the role of each organization should be. When the ICRP published a set of recommendations in 1958, the ENEA took on the role

of reviewing and interpreting the regulations on behalf of their member countries, some of which were poised to implement the recommendations into their laws and regulations. Euratom's role, at the time, was somewhat restricted because it had only six members. As its membership grew, the interests of the ENEA and Euratom members became more integrated.

Through the years, NEA has contributed to the development of ICRP recommendations through critical reviews of ICRP draft documents, examination of ICRP recommendations at ENEA-sponsored workshops and seminars, and the creation of ENA Expert Groups to develop specific guidance on the interpreting and applying specific concepts. Examples of important subjects treated by NEA over the years include: the concept of "dose constraints" and its use in operational radiation protection; the concept of "collective dose" and its application in the optimization of radiation protection; the concepts of "trivial dose" and "dose of no regulatory concern" for the establishment of "exemption levels" for the use and disposal of very small radioactive sources and very small quantities of radioactive wastes; and the concepts of "potential exposure" and "intervention levels" and their use for radiation emergencies.

This role has continued through the periodic revisions of the ICRP recommendations. The most recent round of review began in 1999 and was completed in 2007 through the mechanism of a series of regional forums taking place in Tokyo (2002, 2004, 2006), Lanzarote (Spain), Taormina (Italy), Prague and Washington, DC, to identify and discuss concerns about the recommendations. Over this period the CRPPH has also produced 13 expert group reports related to the new ICRP recommendations, and held 4 detailed reviews of draft ICRP text (2003, 2004, 20006, 2007). The CRPPH-led reviews of the ICRP recommendations are widely acknowledged to have resulted in changes to the recommendations that made them clearer and more consistent with the needs of the countries using them.

Over the years, the reviews of ICRP recommendations have led to intense discussions on specific issues. NEA has contributed significantly to these discussions, and sometimes has even anticipated them through the work of its expert groups. Some of the major contributions of NEA expert groups to the dialogue include the following:

- Work by the CRPPH, starting in 1977 and 1978, to address issues associated with naturally occurring radioactive materials (NORM). At that time, other international bodies, including ICRP and UNSCEAR, were not addressing this issue. As a result of the CRPPH's interest, however, ICRP took this issue up in 1979. Their work proceeded over the next decade or so, ultimately resulting in ICRP Publication 39, Principles for Limiting Exposure of the Public to Natural sources of Radiation. This had the result of including NORM in the radiological protection system.

- The publication, in 1981, of a report on the Environmental and Biological Behavior of Plutonium and some Other Transuranium Elements. The production of transuranic elements, especially plutonium, and the need to dispose of them, had been identified as a concern relating to the use of nuclear power even prior to the development of this report, and in fact, the issue continues to be an open one today.

- The publication of a report in 1985 on the Dosimetry Aspects of Exposure to Radon and Thoron Daughter Products. Concern about radon had not initially been considered an issue for the NEA, but as it became a broader issue, this report by an expert group positioned the CRPPH to address the issue in its deliberations.

- A report in 1988 on the Gastrointestinal Absorption of Selected Radionuclides. This report followed Chernobyl and expanded on limited work the Committee had previously done that had been limited to workers. The Chernobyl accident had

shown the need to extend such studies to the public. This report was the first analytical work on the subject. The group formulated a rule for evaluating gastrointestinal absorption by children, and this was ultimately adopted by the ICRP. This recognition makes the report one of the more influential products of CRPPH expert groups.

Radioactive Waste Disposal at Sea

A major early effort of the ENEA was the exploration of issues associated with the disposal of radioactive materials at sea. This work, initially resulting from a request by Norway in the early 1960s for a study of the North Sea, took several years to develop, but by 1965, the Committee proposed a study on the experimental disposal of radioactive wastes in the Atlantic Ocean. An NEA expert group did early pioneering work in this area, including holding a seminar on marine radioecology in 1968, and follow-up seminars in 1971 and 1979, that enabled the CRPPH to develop knowledge in this area before the effort became a significant program. NEA work in the area of radioactive waste disposal began in the mid-1970s. The resulting program would be a major one for the Agency, spanning more than 10 years and involving more than 10 disposal campaigns in the Atlantic by the countries involved.

Under the terms of a decision of an OECD Council in 1977 establishing a Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste, the NEA, in consultation with the OECD Environment Committee, was requested to assess the suitability of disposal sites proposed by the national authorities of participating countries and to keep under review sites previously considered suitable. Starting in 1974, experimental radioactive waste sea disposal operations undertaken by participating countries had been carried out at a single site in the North-East Atlantic.

In accordance with the objectives of the Council Decision, an international group of oceanographic and radiation protection experts was convened by the NEA in November 1979 to undertake a review of the continued suitability of the disposal site, taking into account the relevant provisions of the London Dumping Convention and the IAEA Definition and Recommendations for the purposes of the Convention. The NEA Steering Committee confirmed in April 1980 that, on the basis of the review, the existing site was suitable for continued disposal of radioactive waste for the next five years, under conditions specified by the expert group. In 1985, another expert group affirmed the continued suitability of the site for radioactive waste disposal.

At the same time, the Steering Committee agreed on the need to develop a coordinated, site-specific scientific program to increase current knowledge of the processes controlling the transfer of radionuclides in the marine environment, so that future assessments could be based on more accurate and comprehensive scientific data. The Coordinated Research and Environmental Surveillance Program (CRESP) relating to the disposal of radioactive waste at sea was therefore initiated in 1981. CRESP was basically a scientific research program to study the processes regulating the transfer of radionuclides in the marine environment with a view to establishing safety assessments based on detailed and comprehensive scientific parameters. In 1986, in response to a request from the Paris Commission (PARCOM)—a group set up to administer the 1974 Paris Convention on land-based sources of marine pollution—to advise on the presence of radionuclides within the maritime area covered by the Convention for the Prevention of Marine Pollution from Land-Based Sources, CRESP broadened its scope to include these issues.

CRESP was directed by an Executive Group, which reported to the CRPPH, with representatives from participating member countries, including: Belgium, Canada, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Switzerland, the UK, and the US (although the list of active members changed slightly over time). The IAEA and International Maritime Organization (IMO) were also represented on this Group. The work was carried out by Task Groups established to deal with specific topics.

During its lifetime, the coordination of national research programs of participating countries within the framework of CRESP resulted in important international cooperation and consolidated the understanding of the radiological impact of radionuclides in deep water. CRESP produced a number of reports and provided the basic scientific information necessary for the second Review of the Continued Suitability of the Dumping Site for Radioactive Waste in the North-East Atlantic carried out under the auspices of the NEA in 1985. The scientific research developed by CRESP is considered to have achieved a goal beyond its original scope, because it was the first effort as a worldwide study on the behavior of radionuclides released by radioactive waste disposed at sea.

Late in 1993, the Contracting Parties to the London Convention of 1972 voted for a total ban on the ocean disposal of radioactive wastes. As a result of this decision, no further waste was disposed of in the Atlantic. However, scientific studies of the dumping sites continued under CRESP, which in 1985 verified the continued suitability of the sites in terms of their radiological safety. In October 1995, as a result of the 1985 safety study and the opinion of CRESP that no new scientific discoveries were likely in this area, CRESP was terminated by the NEA Steering Committee.

The International System for Occupational Exposure (ISOE)

The need for a study of occupational exposures in the nuclear energy field was first identified in 1980. Over several years, the CRPPH convinced operators of nuclear installations of the value of comparing experience on radiation protection measures in their installations. Today, the ISOE has reached maturity and its reports are eagerly reviewed. The comparison of performance has gained the trust of operators and has had a beneficial effect on occupational exposures.

In the mid-1980s, there was great concern within the radiation protection community that new nuclear safety requirements proposed by regulators, particularly in the aftermath of TMI, would results in increases in the risks to workers at the plants. In particular, new requirements for in-service inspection, plant maintenance, and modifications to plant design (also called backfitting), were expected to result in increased doses to workers. The concern was that such increases imposed risks to workers that were out of proportion to the increases in safety. The OECD established an expert group to analyze and recommend actions on this issue. The group produced a report in 1988 entitled "Implications of Nuclear Safety Requirements for the Protection of Workers in Nuclear Facilities." This report made a number of recommendations, including the desirability of setting up an enhanced international exchange of information on occupational exposure and of practical data on the optimization of protection. The focuses specifically on data related to occupational dose control in specific high-dose tasks.

Following the report, the NEA worked with counterparts in key organizations in member countries, particularly with the CEPN in France (Centre d'étude sur l'évaluation de la protection dans le domaine nucléaire, or the Nuclear Protection Evaluation Center), a non-profit organization created in 1976 to establish a focus for the development of principles and methodologies to assess and manage health and environmental impacts pertaining to the nuclear fuel cycle and for the optimization of radiation protection) and with Brookhaven National Laboratory (BNL) in the US to develop the Information System on Occupational Exposure (ISOE). After a pilot project, conducted from 1989 to 1990, demonstrated the feasibility of such a system, the project was approved. The first meeting of the ISOE Steering Group was held 18 Nov 1991 in Paris and ISOE formally started operations on 1 January1992. The fundamental purpose of the ISOE was to exchange and obtain access to first-hand information on high-dose jobs and on newly developed dose reduction techniques. In addition to individual doses, total collective dose information was collected. The founding meeting included both operators, who

were considered the main source of information, and the regulators, who were recognized as a potential additional resource.

The technical operation of the system was delegated by the NEA to three technical centers, one in France serving Europe, another in the US serving North America, and the third in Japan (which at the time was the only Asian member of NEA with nuclear power plants). These centers were responsible for collecting and disseminating information under the supervision of the ISOE Steering Group and the NEA. The IAEA and the European Commission were actively involved in this effort from the beginning. Since 1993, the IAEA has co-sponsored the system, allowing the participation of utilities and government agencies from non-OECD/NEA countries. In 1997, the IAEA was invited to participate in the ISOE secretariat, and since that time, the NEA and IAEA have formed a Joint Secretariat.

The successful implementation of this system required, first of all, a guarantee to the operators of the confidentiality of the data. The operators were willing to exchange detailed information only with their peer operators. This restriction required the understanding and support of the major regulatory authorities and sophisticated database management. Special computer software was developed to handle the different types of data, allow an exchange between the technical centers, and assure the confidentiality of the data.

The success of this project is demonstrated by the scope of participation and the size of its database today. As of December 2007, ISOE has included 71 participating utilities in 29 countries (334 operating units; 45 shutdown units), as well as participating regulatory authorities of 24 countries. (The participating utilities and participating authorities are those that have agreed to the ISOE Terms and Conditions.) Beyond this, the ISOE database contains information on occupational exposure levels and trends at 482 reactor units (399 operating; 83 in cold-shutdown or some stage of decommissioning)—that is, there is some data for reactors that are not official participants.

The Chernobyl Program

One of the most widely visible activities of the CRPPH has been its response to the accident at the Chernobyl Nuclear Power Plant on 26 April 1986. The NEA moved very quickly to address the consequences of the accident and the issues raised by the accident, and the CRPPH convened a special session on 1-2 September of that same year. Although the IAEA had a mandate to develop coordinated international action, the leadership of the NEA identified a need to conduct an independent review of the situation. The CSNI, of course, was also involved in this issue from the point of view of the reactor technology and the safety of the reactor design, and participated in this meeting.

By March 1987, within a year of the accident, CRPPH had commissioned and published an initial report, entitled "The Radiological Impact of the Chernobyl Accident in OECD Countries." This report, which is probably the most frequently referenced report CRPPH has ever produced, contains information that is still relevant today. It includes a description of the assessments of radiation doses received by the populations of member countries as well as a critical analysis of the measures taken in each country to deal with the situation.

The CRPPH continued to work actively in this area in the ensuing years, in close coordination with CSNI, IAEA and other international bodies—e.g. the World Health Organization (WHO), the UN Development Program (UNDP), and the UN Office for the Coordination of Humanitarian Affairs (OCHA)—in the shared goal of evaluating and dealing with the consequences of the accident. Special meetings of the Committee and of groups of experts made it possible to gather and analyze information about the dispersal of radioactive contamination throughout the northern hemisphere and of its radiological

impact on the public and the environment. The CRPPH also continued to publish independent reports periodically over the next 20 years, including:

- Chernobyl—Ten years On: Radiological and Health Impact. An Appraisal by the NEA CRPPH, November 1995.

- Chernobyl—Assessment of Radiological and Health Consequences: 2002 Update of Chernobyl—Ten Years On, 2002.

- Stakeholders and Radiation Protection: Lessons from Chernobyl 20 Years After, 2006.

The reports from 1987 on continue to be in great demand and use to this day. They are among the NEA reports most frequently downloaded from the NEA Internet site, where they are available without charge. The high degree of interest in these reports demonstrates the unique and important role CRPPH has played in developing the lessons learned from the Chernobyl tragedy.

The International Nuclear Emergency Exercise Program (INEX)

Chernobyl was also the main impetus for another key CRPPH program, although earlier incidents, for example, Cosmos 954 in 1978, also contributed. (Cosmos 954 was a Soviet Navy surveillance satellite containing a nuclear reactor that crashed in the Canadian arctic on January 24, 1978, contaminating a large swath of land with high levels of radioactivity.) The Chernobyl accident brought to light the fact that better preparation was needed to deal with unexpected nuclear events. It also demonstrated dramatically that the consequences of such events are not necessarily restricted to one country, and that countries needed to be able to work together to deal effectively with the incident. In particular, one of the studies performed just after the Chernobyl accident highlighted the differences that existed in emergency planning and response practices between OECD countries.

This study, together with the difficulties countries encountered in public communication, suggested a need to organize international emergency exercises on the management of offsite emergencies following a severe accident. By carrying out such exercises, differences in approach could be identified and good practices highlighted. The goal was to improve the situation by removing unnecessary differences and establishing better trans-boundary connections, in particular between countries with common borders. Such an exercise was conducted in 1993. It became the forerunner to a series of exercises in subsequent years.

To identify aspects of national emergency response that could benefit from improved international coordination, the first NEA International Nuclear Emergency Exercise (INEX-1) was developed as a series of national table-top exercises. For this first exercise, no country would volunteer to "host" the accident, so a fictitious country was created, complete with maps showing cities, hills, lakes, farmland, etc. Using this fictitious locations and a fictitious cross-border scenario, key decision-makers and experts responsible for emergency matters from 16 countries simulated what action they would take to cope with the emergency, both from the country of the accident, and from the neighboring country. The purpose was to identify the mechanisms for communicating with neighboring countries and the international community, to study measures for dealing with the import and export of foodstuffs, and to see how a request for assistance could be made, if needed, and met. The scenario also tested the decision-making process for evacuation or sheltering, and the decisions on where to send the evacuees.

A few weeks later, participants from these countries met in Paris to compare and discuss these responses. to review the results and recommend next steps, particularly in the areas

of communications, data management, countermeasures, and decision-making. Three follow-up workshops provided valuable resources for use by national emergency management authorities. Actions addressed included sometimes controversial ones, such as the distribution of iodine pills.

The positive outcome of INEX-1 led to a series of further exercises in the ensuing years. The second exercise was more realistic. In order to test existing response systems and to examine specific issues within national emergency arrangements, INEX-2 was developed as a series of regional, command-post exercises involving the simultaneous, real-time participation of many OECD and non-OECD countries. Exercise objectives focused on the real-time exchange of technical information, public information and media interaction, and decision making based on limited data. Between 1996 and 1999, four national-based, large-scale exercises were conducted, each with the participation of 30 to 35 countries and 3 to 5 international organizations.

Early in the INEX-2 series, it was recognized that improvements in data management were needed to ensure that emergency decisions and public information are based on appropriate knowledge. An NEA Expert Group, the Working Party on Nuclear Emergency matters (WPNEM) therefore developed a "Monitoring and Data Management Strategy for Nuclear Emergencies, 2000," to better identify key emergency data, and to improve emergency communication, information management and monitoring approaches. Many NEA member countries and international organizations have implemented the strategy detailed in this report. Subsequently, the INEX-2000 exercise was developed in response to the INEX-2 findings. This effort was co-organized through the Inter-Agency Committee on the Response to Nuclear Accidents (IACRNA), a group made up of all relevant UN organizations – IAEA, WHO, WMO, etc., as well as the NEA and the EC. This exercise had many objectives in common with INEX-2, but also, for the first time, addressed questions of civil liability following a nuclear emergency, and involved the efforts of the NEA NLC. Using exercise results, a follow-up workshop tested mechanisms by which potential victims of the simulated accident would be compensated, thus further expanding the scope of the INEX exercise.

In response to the desire of member countries to better master the later response phases to a nuclear or radiological emergency, INEX-3 was planned to expand the scope of INEX exercises still further. Specifically, this exercise took place in 2005 and 2006, and was developed as a table-top exercise to explore consequence management. The exercise simulated a situation where significant contamination of the populated environment has occurred, and addressed decision-making issues in areas such as: countermeasures for agriculture and food supplies; countermeasures for travel, trade and tourism; recovery management; and public information.

Over the course of the four exercises, INEX has involved a total of 59 countries, many of them non-NEA members, and six international organizations. Through these exercises, important lessons in international and national emergency preparedness have been identified and used to make substantial improvements in emergency management arrangements. One of the most important and lasting outcomes of the INEX exercises has been their contribution towards the establishment of an international exercise and information sharing culture. The routine involvement of a broad range of countries in the preparation and conduct of emergency exercises hosted by various international organizations, as well as nationally arranged bi- and multi-lateral exercises, has advanced the global state of preparedness.

Stakeholders

In the 1990s, the role of the public as "stakeholders" began to be recognized in a number of NEA member countries and by the NEA. In the US, authorities were trying to involve the local community in issues associated with the cleanup of the contaminated Rocky Flats site, and in France, authorities were reaching out to the public in the area around the

reprocessing plant at La Hague. The difficulties encountered in the aftermath of the Chernobyl accident made stakeholder involvement an issue for radiation protection as well. Nuclear issues were not alone in this trend—the mid-1990s saw a growing expectation on the part of the public that it would be more directly involved in decision making about technology in general.

As noted above, recognizing these trends, in 1994, CRPPH published its collective opinion paper entitled *Radiation Protection Today and Tomorrow* in which it was observed that the social dimension would play an increasing role in the work of radiological protection specialists.

As a result, the CRPPH initiated some activities to explore the implementation of stakeholder involvement in radiation protection decisions. The first activity was a workshop at Villigen, Switzerland in 1998, entitled "The Societal Aspects of Decision Making in Complex Radiological Situations." This workshop focused on the particularly difficult question of contaminated areas and their restoration to a point were people could continue to live there. The broad, and influential, conclusion emerging from the discussions was that radiological protection must adapt to meet the needs of society and not the reverse.

A second workshop, held in 2001, again at Villigen, was entitled "Better Integration of Radiation Protection in Modern Society." It considered a range of initiatives in a number of countries that demonstrated the growing desire to change the way that radiological protection policy was developed and implemented. The examples examined ranged from high-level priority-setting to mechanisms designed to address specific local level issues. All involved a wide range of stakeholders. The workshop demonstrated, therefore, that the radiological protection community was sensitive to the shift in societal expectations and had begun to develop responses.

Following that workshop, a need was felt to move forward further and develop practical guidance for stakeholder involvement in radiological protection decision making. Accordingly, the 3rd Villigen workshop, held in 2003, had as its aim a much broader understanding of how stakeholder participation in decision-making can be appropriately integrated in national and international radiological protection decision-making. In preparation for this, three in-depth analyses of specific case studies were conducted to provide a vehicle for the workshop to identify commonalities in stakeholder involvement processes and their possible implications, and to facilitate discussion of the key issues. These covered: stakeholder involvement in the Canadian review process for uranium production projects in northern Saskatchewan; the ethos project for post-accident rehabilitation in the area of Belarus contaminated by the Chernobyl disaster; and the Rocky Flats controversy on radionuclide soil action levels. As a result of this meeting, the CRPPH concluded that the value of and need for stakeholder involvement in radiological protection decisions, in a graded fashion depending on the decision, had been broadly accepted. From there, the Committee moved on to exploring particular applications more deeply, beginning with the Chernobyl 20-years after report, which focused on how RP professionals could best support stakeholder needs. This was followed by work on the impact of stakeholder involvement on organizational structures, looking at how RP authorities and advisory bodies have evolved to better integrate stakeholder input into their functioning.

The workshops on the ICRP recommendations, discussed above, are another manifestation of stakeholder involvement. In this case, the stakeholders are various countries using, or wishing to use, the ICRP recommendations in their laws and regulations, and the utilities, researchers, medical community and others who may be affected by such rules and regulations. The ability of the NEA to host a forum for the reasoned discussion of such issues by all concerned parties has demonstrated the value of this kind of practice.

CRPPH is not alone among NEA committees in incorporating stakeholder dialogues into some of their activities. The area of waste disposal has been one where local communities have long expressed their interests and concerns, and RWMC has also conducted activities to incorporate these communities into discussions of waste disposal options. These activities are detailed in the section on RWMC.

Other Areas of Effort

Some activities of the CRPPH, while they may not have lasted for such long periods, are of interest either because of their importance at the time, or for other reasons.

For example, one of the earliest issues to occupy the attention of the Committee resulted from the atmospheric nuclear weapons testing by the United States and the Soviet Union between 1945 and 1963, at the height of the Cold War. The CRPPH agreed that national airborne radionuclide monitoring data should be collected by the ENEA and reported in Committee, in collaboration with EURATOM to avoid duplication of efforts. Monitoring included ambient radioactivity in the air and milk, particularly of strontium 90 and cesium 137, and that monitoring results were compiled into periodic ENEA/EURATOM reports, the first of which was issued in 1960. In 1964, with the end of above-ground nuclear testing, the Committee agreed that the exchange of these data could be discontinued.

Another early objective of the Committee, set at the outset of its work in 1957, was to limit the quantity of radionuclides used in the watch- and clock-making industry. Developing those standards took a number of years, in part because of differences of opinion among countries as to the radioisotopes that should be used. Progress languished in the early years until the tragedy of female workers applying luminous paint surfaced publicly in 1966. Even then, it took more time before the member countries developed a consensus on using tritium instead of radium 226 or promethium 147. Ultimately, standards for the use of tritium in luminous instrument dials would be adopted at the very first meeting of the new CRPPH, when it was established in 1973.

Relationships with Other Entities

As noted extensively in the preceding discussion, the 50-year history of the CRPPH and its predecessors has been intimately entwined with the work of the ICRP, a non-governmental international body chartered to make recommendations on standards for radiation protection.

Because of the nature of its work, the CRPPH has also interacted extensively with a number of other international bodies concerned either with radiation or with issues of public and occupational health and safety.

Several of these organizations participate in meetings of the CRPPH as observers. In addition to the IAEA and the European Commission, which participate in all NEA committees, international entities participating specifically in CRPPH activities include three organizations that deal with radiation issues: the ICRP, already discussed; the International Radiation Protection Association (IRPA), which interacts with the Committee on the views of RP professionals on current topics; and the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), which has interacted with the Committee on state-of-the-art RP scientific results and on prioritization of research efforts.

In addition, and largely in the context of the NEA's work on the international Basic Safety Standards, the CRPPH has and continues to interact with the World Health Organization (WHO), the International Labor Organization (ILO), the UN Food and Agriculture Organization (FAO), and the Pan-American Health Organization (PAHO) on various aspects of radiological protection. For example, during the 1990s, the CRPPH

was one of the cosponsoring organizations of the Interagency Committee on Radiation Safety (IACRS)—along with the IAEA, the European Commission, FAO, ILO, PAHO, WHO and UNSCEAR—jointly developing the Basic Safety Standards for Protection Against Ionizing Radiation and for the Safety of Radiation Sources (BSS) published by IAEA.

The CRPPH has also initiated the idea, and worked actively with the IAEA, on the joint development of the International Nuclear Event Scale (INES) that IAEA now runs. This tool, developed in the aftermath of Chernobyl, helps provide information to the public on the severity of an incident at a nuclear power plant based on the safety significance and the off-site risk due to releases of radioactivity. Initially focused on radiation exposure to the public, the concept quickly began to incorporate reactor safety issues, and CSNI also played an active role in the evolution of INES. NEA continues to be involved with this activity, now mainly through the CNRA.

In addition, the CRPPH engages with other groups in the context of specific issues and activities. For example, when CRPPH was working on the concept of radioactive waste disposal at sea, it worked closely with the International Maritime Organization (IMO).

Internally, the issue of radiation protection comes up in almost all other areas of the NEA, and occasionally, in the work of other parts of the OECD. Thus, CRPPH has occasional contacts with the OECD Environment Division, as previously noted. Within NEA, the emergency exercises have now expanded to incorporate issues of compensation, and therefore, now involve the NLC. Some major projects of the CRPPH have related to options for radioactive waste disposal, and therefore, involve working closely with RWMC. Many issues of radiation protection deal with the consequences of incidents at nuclear power plants or other facilities, which are the purview of CSNI in terms of prevention and risk assessment. While regulations strictly associated with radiation protection have traditionally been addressed by CRPPH, any work involving regulations must, of course, be coordinated with the CNRA.

Evolving Activities

With the exception of marine disposal of radioactive waste, most of the areas highlighted above are areas of continuing activity for the CRPPH. The focus of the work changes over time, of course, to reflect specific developments. For example, CRPPH continues its traditional role of working with the ICRP. However, since the ICRP has just published their latest set of recommendations, CRPPH is moving from its role in helping evaluate ICRP proposals to the role of working with member countries on issues that arise in the efforts to implement the recommendations over the coming years.

In other areas, the conduct of international emergency exercises has proven particularly valuable, and has expanded to include other interests, such as compensation for damage to third parties. While much has been learned from exercises already conducted, further exercises can help refine both plans and procedures within countries, and plans for coordination across borders.

The field of stakeholder involvement is still an emerging one, and the work of the CRPPH puts NEA at the forefront in working both on stakeholder issues in the nuclear area, and in working with counterparts outside the nuclear area on common problems and approaches. It is particularly noteworthy that the issue of stakeholder involvement encompasses several NEA committees.

Although the Chernobyl accident occurred more than 20 years ago, reviews of the consequences and their implications are still ongoing. The aftermath of the health effects, the environmental damage, and the interactions between the affected populations and the technical community still raise questions for CRPPH to address. The Committee

thus continues to follow the latest epidemiological studies coming from the Chernobyl accident, and will act on these as appropriate.

Finally, the International System of Operational Exposure (ISOE) continues to be one of the most visible and highly used products of the NEA. It has continuing value as an ongoing repository of information on exposures, and as the key international mechanism for the exchange of occupational exposure management experience and lessons. Originally, the ISOE database was periodically distributed to participants on a CD-ROM. Recently, the information has also been available on-line. The ISOE Network website is currently being enhanced further to make all the ISOE functions and resources—including data entry, data analysis, and experience exchange—more readily accessible to the ISOE end user.

While the area of radiation protection may seem a mature one, in fact there are continuing developments in the understanding of the effects of radiation on the human organism and on the environment. For example, the Expert Group on the Implications of Radiological Protection Science (EGIS) in 1999 and 2007 concluded that the refocusing of biology from the organism to cells and molecules raised potential issues for the system of radiation protection. Also, the Committee's 2007 Collective Opinion (EGCO) noted the emerging challenge of balancing local, national and international agreements, standards and regulations in applying the precautionary principle in specific, local situations. As such, the CRPPH will continue to study important radiological protection issues into the future to best assist its members to identify and address challenges.

Table 6.1: Chairs of the Committee on Radiation Protection and Public Health, 1957-2008

Years	Chair	Country	Position
1957-1959 (1)	Reidear Eker	Norway	Director, Norwegian Cancer Hospital
1960-1965 (2)	S. Halter	Belgium	Information unavailable
1966-1968	E.J. Henningsen	Denmark	Chief Medical Officer, National Board of Health
1969-1971	J. Charles Cornelis	Netherlands	Deputy Director for Radiological Protection, Ministry of Health and Environmental Protection
1972-1973 (3,4)	Bo Lindell	Sweden	Director, National Institute of Radiological Protection
1974-1976	L.D.G. Richings	United Kingdom	Deputy Director, National Radiological Protection Board (NRPB)
1976-1977	Gilbert Bresson	France	Deputy Department Head, Institut de Protection et de sûreté nucléaire (IPSN)
1978-1980	Robert Fry	Australia	Supervising Scientist, Office of the Supervising Scientist
1981-1982	J. Cunningham	Ireland	Head, Radiation Protection and Waste Management Nuclear Energy Board
1983-1986	R. Cunningham	United States	Division of Industrial and Medical Nuclear Safety, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission (NRC)
1987-1992	Roger Clarke	United Kingdom	Director, National Radiological Protection Board (NRPB)
1993-1996	Serge Pretre	Switzerland	Head, Swiss Nuclear Safety Authority (HSK)
1997-1999	Antonio Susanna	Italy	Direzione per la Sicurezza Nucleare e Protezione Sanitaria (ANPA)
2000-2005	Rick Jones	United States	Deputy Assistant Secretary for Worker Health and Safety, Department of Energy (DOE)
2005-	Jacques Lochard	France	Director, Centre d'étude sur l'évaluation de la protection dans le domaine nucléaire (CEPN)

(1) Started as the Working Party on Public Health and Safety in 1957; became the Health and Safety Subcommittee in 1958.
(2) Became the Health and Safety Committee in 1965.
(3) ENEA became NEA in 1972.
(4) Became the Committee on Radiation Protection and Public Health in 1973.

VII. NUCLEAR DEVELOPMENT COMMITTEE

NDC in Brief:

Founded: November 1964

Names:
- **Study Group on Long-Term Role of Nuclear Energy (NELT), established November 1964**
- **Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (shortened name: originally "Fuel Cycle Committee" FCC, now "Nuclear Development Committee," or NDC), established 26 October 1977**

Regular Observers: Russian Federation, Slovenia

Current Subsidiary Bodies:
- **Joint NEA/IAEA Group on Uranium (UG)**
- **NDC Ad hoc Expert Group on Nuclear Energy and Security of Supply (SOS)**
- **Working Party on Nuclear Energy Economics (WPNE)**
- **NDC Ad Hoc Expert Group on Financing of Nuclear Power Plants (FNPP)**

History and Development

By the mid-1960s, the work of the Agency was beginning to shift away from simply being a focal point for Joint Projects and towards examination of a broader array of issues that encompassed policy matters. As a result, in November 1964, a Study Group on the Long-Term Role of Nuclear Energy (in shortened form, Nuclear Energy-Long Term, or NELT) was established. The group was established in November 1964 and became operational in January 1965. In keeping with the membership of the ENEA at the time, its initial focus was, of course, on the role of nuclear energy in Western Europe. This group immediately began looking at issues such as the availability of uranium resources (discussed below), an activity that continues to the present time.

Other work of the Study Group addressed economics and other parts of the fuel cycle, and by the mid-1970s, NELT's work had evolved to the point where, on 26 October 1977, the name was changed to the Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle. This rather long name represented an effort to assure that the title reflected all the major elements of the Committee's work.

Interestingly, at that time, and for some time thereafter, the acronym used for that committee focused on the fuel cycle elements of the work. Thus, its short name was the Fuel Cycle Committee, or FCC. It was not until some time later that the focus changed further, and the Committee, while keeping the same long name, took on a short name that reflected the studies it was doing on economics and policy issues. Thus, it became known, for short, as the Nuclear Development Committee, or NDC. The date of this transition is not clear, but it was certainly after 1983, as the 25th anniversary document on NEA still shows the committee as the FCC. Although the short name changed, work on uranium resources and other fuel cycle issues continued to be performed.

Main Areas of Work and Accomplishments

As the title of the Committee suggests, the work of this Committee is very broad, and over the years, its work and its products have addressed a broad range of issues. Some of the major efforts of the NDC have been recurring studies of uranium resources, of the nuclear fuel cycle, and of the economics of nuclear power. These are summarized below.

Uranium Resource Studies

One of the earliest activities of NELT was to establish a Working Party to compile worldwide uranium and thorium resource estimates. Six countries—Canada, France, Spain, Sweden, the UK, and the US—participated. The first assessment of resources, entitled World Uranium and Thorium Resources, was published in 1965 by ENEA. That first publication had a red cover, as have all subsequent editions; hence, the document has become known informally as "the Red Book." That edition listed uranium resources for 16 countries (with an additional consolidated estimate for a group of countries).

Shortly after the publication of this first edition, the Working Party became a joint effort of ENEA and the IAEA. In 1976, the International Uranium Resources Evaluation Project (IUREP) was set up. Its efforts included visits to countries by small teams of uranium exploration experts. IAEA was involved in these visits. Over the next decade or so, a number of working groups were formed to gather and publish information on a broad range of topics related to uranium exploration, resources and extraction.

The Red Book continued to be published at about 2-year intervals. Starting with the second edition, it was recognized that there was not a commercial market for thorium, so the name of the document was changed to Uranium Resources Revised Estimates, and documentation of thorium resources was reduced to a small section of the document. By 1970, the scope of the report had been broadened to cover a broad range of subjects at the front end of the fuel cycle, and to include projections of generating capacity on the supply side. Consequently, the title of the Red Book was changed to Uranium Resources, Production and Demand, which is similar to its title today.

In the 1980s, efforts to consolidate the various working groups that had been formed either jointly or individually by the NEA and IAEA resulted in the formation of an NEA Uranium Group in October 1984, with representatives from NEA member countries and the IAEA Secretariat. The mandate of the Uranium Group was to plan and prepare the Red Book. In 1992, non-OECD member countries were invited to attend Uranium Group meetings as part of the IAEA delegation. There are now participants from over 20 countries and three international organizations in the activities of the Uranium Group. The enlarged group has resulted in improved access to authoritative information on a broad range of uranium supply and demand issues. Over the years, over 100 countries have provided data for inclusion in the Red Book (not all of them in any given year).

NEA's uranium resource studies now span a period of more than 40 years. In recognition of this fact, in 2006, the NEA produced a "Red Book Retrospective" summarizing the results of the 40 years of studies.

The Uranium Group meetings regularly bring together experts from around the world to review the data, and to serve as a forum for the exchange of information between participating countries. Data presented in the Red Book are official information submitted by the governments of the countries. The Red Book is therefore considered the most authoritative publicly available source of data in the world for uranium resources, exploration, production and production capacity.

Economics of Nuclear Power

Over the past 25 years or so, the NDC has conducted a number of studies of various issues related to the economics of nuclear power. This work has accelerated in recent years as interest in new or renewed use of nuclear power has grown.

Perhaps the most enduring NDC activity in the economics area has been the production of a series of reports, about once every three to five years, projecting the costs of generating electricity for nuclear power plants compared to other electricity sources. The overall objective of the studies is to provide reliable information on the economics of electricity generation for policy makers and industry decision makers.

The first two of these reports were issued by the NEA alone in 1983 and 1986. Subsequent reports, in 1989, 1993, 1998, and 2005, were jointly carried out by the Standing Group on Long-Term Cooperation (SLT) of the International Energy Agency (IEA) of OECD and the NDC. The title and scope of the reports have also changed somewhat over the years, with the first two focusing on a comparison of nuclear and coal-fired power plants, and subsequent reports generalized to address projected costs of generating electricity from all sources. The title of the most recent publication is Projected Costs of Generating Electricity: 2005 Update, and the report analyzes data from coal, nuclear, gas, and renewable sources. Combined heat and power sources are also included.

Each of the reports has been developed by an ad hoc group of experts drawn from the participating countries and several international organizations. Twelve countries participated in the first study, initiated in 1982 and published in 1983. Nineteen OECD countries participated in the most recent study. In addition, through the IAEA, the current report includes generating cost information from three non-OECD countries. The IAEA, the European Commission, and the IEA have participated in all the studies, with the IEA assuming its role as joint sponsor starting in 1989, as noted above.

The projections are relatively near term. For example, the 2005 report evaluates units under construction or planned that could be commissioned between 2010 and 2015. The calculations are based on busbar costs (that is, they do not include transmission, distribution, or costs associated with residual emissions), and entail estimates of the levelized lifetime costs of the plants. The basic methodology has not changed; however, as a result of the liberalization of electricity markets, the most recent report added a section to address the methodological issues associated with incorporating financial risks in generating cost estimates.

This series of reports represents only one area of economics covered by NDC. Some of the other reports produced by the NDC that address various issues related to the economics of nuclear power include:

- Nuclear Energy and its Fuel Cycle: Prospects to 2025 (1982 and several updates), also known as the "Yellow Book."
- Economics of the Fuel Cycle (1985)
- Costs of High-Level Waste Disposal in Geological Repositories—An Analysis of Factors Affecting Cost Estimates (1993)
- Power Generation Choices: Costs, Risks and Externalities (1994)
- Methods of Projecting Operations and Maintenance Costs for Nuclear Power Plants (1995)
- Future Financial Liabilities of Nuclear Activities (1996)

- Low-Level Radioactive Waste Repositories: An Analysis of Costs (1999)
- Studies conducted since 1990 on the capital costs of nuclear power; the most recent report is Reduction of Capital Costs of Nuclear Power Plants (2000)
- Nuclear Power in Competitive Electricity Markets (2000)
- Trends in the Nuclear Fuel Cycle: Economic, Environmental and Social Aspects (2002), which includes sections on economics issues
- Workshops on the external costs of nuclear power in 2002 (2, one w IEA), and the report Nuclear Electricity Generation: What are the External Costs? (2003)
- Decommissioning of Nuclear Power Plants: Policies, Strategies, and Costs (2003)

In addition, there have been studies that addressed larger economic issues, including a study of the Broad Economic Impacts of Nuclear Power (1992), and a study of the general consequences of an accident, called Methodologies for Assessing the Economic Consequences of Nuclear Reactor Accidents (2000).

Other NDC Studies

The NDC has also been active in other issues related to areas identified above, such as decommissioning and the fuel cycle, and over the years, has produced reports such as:

- Nuclear Power and Fuel Cycle Data (1983)
- Cooperative Program on Nuclear Installations Decommissioning Projects (1985)

In addition, the NDC has worked on other issues, such as concerns about the personnel supply chain, partitioning and transmutation, advanced nuclear power technologies, and the government role in nuclear energy. Some recent studies in these areas have included:

- Qualified Manpower for the Nuclear Industry: An Assessment of Demand and Supply (1993), covering 12 OECD countries.
- Studies of advanced water-cooled technologies (1989) and of "spin-off technologies," an assessment of plutonium fuel (1989), and small and medium Rx (1991).
- Since 1989, NEA has been involved in work on Partitioning and Transmutation, with a number of conferences and reports produced between that date and the present.
- Government and Nuclear Energy
- Nuclear Competence Building
- Nuclear Power and Climate Change (1998)
- Nuclear Energy in a Sustainable Development Perspective (2000)

A sampling of other work of the Committee has included:

- Nuclear Energy Data, also known as "the Brown Book;" a fact book published annually since 1983

- Beneficial Uses and Production of Isotopes, several editions, starting in 2000
- Society and Nuclear Energy: Towards a Better Understanding (2002)
- Nuclear Energy Today (2003), a periodic compilation summarizing the status of nuclear power issues
- Risks and Benefits of Nuclear Energy (2007)

Relationships with Other Entities

By its nature, NDC's work often goes beyond the purely nuclear, so the Committee has worked extensively with other parts of the OECD, in particular, the International Energy Agency (IEA), and with other international organizations, in particular, the IAEA. As noted above, two of the major, periodic NDC products originally initiated by NEA are now are developed in partnership with these two organizations: the Projected Costs of Generating Electricity is a joint product of NEA and IEA; and the Uranium Resources, Production and Demand study is a joint effort of the NEA and IAEA.

Evolving Activities

The NDC continues to produce several periodic reports that are highly valued in the nuclear community and elsewhere. In particular, the Projected Costs of Generating Electricity report and the Uranium Resources, Production and Demand report both meet the needs of government organizations and commercial interests seeking authoritative information for planning purposes and for policy development. Other reports containing a wealth of factual information valuable to a variety of users include Nuclear Energy Data, produced annually, and Nuclear Energy Today.

In addition, the resurgence of interest in the further use of nuclear power technology has brought with it an increasing demand for work by the NDC on aspects of the nuclear fuel cycle, alternative technologies for future use, a variety of economic considerations, and issues related to the role of government, the supply of manpower, and the risks versus the benefits of nuclear power. Emerging issues include security of supply, sustainability, and financing nuclear power facilities. The broad scope of the mandate of the NDC allows it to work to integrate a spectrum of information to allow policy-makers in member countries to understand the full variety of issues and perspectives needed to make informed decisions on the development and use of nuclear technology.

Table 7.1: Chairs of the Nuclear Development Committee, 1977-2008*

Years	Chair	Country
1977-1985	J.M. Pictet	Switzerland
1985-1988	Kunihiko Uematsu	Japan
1988-1990	M. Rapin	France
1990-1992	P.M.S. Jones	United States
1993-2002	Allen G. Croff	United Kingdom
2003-	Sylvana Guindon	Canada

(1) ENEA became NEA in 1972.

* Information not available for NELT, 1964-1977, which preceded NDC.

VIII. COMMITTEE ON SAFETY OF NUCLEAR INSTALLATIONS

CSNI in Brief:

Founded: 1965

Names:
- **Committee on Reactor Safety Technology (CREST), established 1965**
- **Committee on Safety of Nuclear Installations (CSNI), established 1 February 1973 (assumed regulatory functions of HSC)**

Regular Observers: Russian Federation, Slovenia

Ad Hoc Observer: Union of the Electricity Industry (EURELECTRIC)

Current Subsidiary Bodies:
- **CSNI Program Review Group (CSNI PRG)**
- **Working Group on Risk Assessment (WGRISK)**
- **Working Group on Analysis and Management of Accidents (WGAMA)**
- **Working Group on Integrity of Components and Structures (IAGE)**

History and Development

As previously noted, from its earliest days, the ENEA had a committee that dealt with radiation safety issues, the Health and Safety Committee. Their mandate included regulatory issues associated with radiation protection. Therefore, as it was natural that they began to take on other regulatory issues associated as they arose, such as safety issues relating to the growing number of reactors being built and operated in ENEA member countries. As the number of reactors grew, the interest in a broader range of activities associated with safety issues became apparent.

As a result, the Committee on Reactor Safety Technology (CREST) was established in 1965. As the name suggests, the mandate of this committee was focused on reactor-related issues. However, at that time, the responsibility for regulatory matters was retained under the mandate of the HSC. Within a few years, the need to consider safety issues in nuclear facilities other than reactors was recognized, and CREST was renamed the Committee on Safety of Nuclear Installations (CSNI) on 1 February 1973. Its first meeting was held 13-14 November 1973. At the same time, the Health and Safety Committee became the Committee on Radiation Protection and Public Health (CRPPH). As part of the realignment, the new CSNI took on the regulatory functions of the old HSC. The regulatory activities at the time were managed by a Subcommittee on Licensing under the CSNI.

The CSNI mandate gave it broad responsibility for technical issues relating to nuclear installations of all types, although nuclear power reactors remained a main focus of interest and activity. The CSNI had a prominent role in defining research objectives, both for NEA Joint Projects and in helping member countries develop their own research programs. A major element of that regulation was always research that could help inform regulatory and licensing decisions. Thus, the CSNI role provided information in two directions—it identified problems and issues to help set research agendas, and it provided research results that aided regulatory activities. The Subcommittee on Licensing also provided a forum for licensing authorities on areas that were not strictly technical or scientific in nature.

This assignment was to change again in 1989 when the regulatory functions of the Subcommittee on Licensing were separated and put under another committee, the Committee on Nuclear Regulatory Activities (CNRA). The two committees, however, continued to work very closely. They were managed under the same division of the NEA, and they both used the products of some of the CSNI working groups, particularly the Working Group on Operating Experience (WGOE). In 2005, that working group was moved to the CNRA. The two committees continue to share the use of the services and output of the WGOE.

After the separation of the regulatory function, the CSNI maintained its role as a forum for addressing technical and scientific issues. While the separation may at times make it appear that an extra layer has been added to coordination requirements, it has the benefit that representatives with appropriate expertise and organizational affiliation can be assigned to each committee by each member country.

Among the NEA STCs, the CSNI has one of the largest numbers of standing subsidiary groups to help in the management of its activities.

It is unique among the NEA committees in having a Program Review Group (PRG). The PRG is composed of a small group of senior experts with broad programmatic experience and high-level responsibilities in nuclear safety technology and research assists the CSNI in reviewing proposals from the working groups, ensures that proposals and reports have appropriate focus, and reviews major reports to ensure high quality. It also makes specific recommendations regarding facilities and research programs, Joint Projects, centers of excellence, etc. potentially interesting for present or future international collaboration, and discusses other possible forms of international collaboration, such as data banks, exchange or sharing of experts, networking, etc. This committee has limited membership. It includes representatives from the four member countries with the largest nuclear safety research programs—that is, France, Germany, Japan and the US—plus three experts from other CSNI countries, chosen on a rotational basis. Since the focus is mainly on internal activities of the CSNI, outside organizations and non-member countries do not participate in the activities of this group.

The Working Group on Integrity of Components and Structures (IAGE) advises the CSNI on the topical basis for the management of aging and proposes general principles to maintain the integrity of systems and components. In addition to OECD member countries, the IAEA, EC, and JRC Petten (a Joint Research Center of the European Commission) participate in this working group. The group has three subgroups, dealing respectively with integrity of metal components, integrity of concrete structures, and seismic behavior. They in turn have task groups on specific issues, for example, wire systems.

The Working Group on Analysis and Management of Accidents (WGAMA) is responsible for activities related to potential accidental situations in nuclear power plants, including: reactor coolant system thermal-hydraulics; design-basis accidents, including emergency core cooling system (ECCS) strainer clogging; pre-core melt conditions and progression of accident and in-vessel phenomena; coolability of over-heated cores; ex-vessel corium interaction with concrete and coolant; in-containment combustible gas control; physical-chemical behavior of radioactive species in the containment; and fire safety. The activities of WGAMA focus mainly on existing reactors, but also have application for some advanced reactor designs. In addition to the IAEA, the European Commission, and the Russian Federation, the Union of the Electricity Industry (Eurelectric) also participates in activities of the Working Group.

The Working Group on Risk Assessment (WGRISK) is responsible for helping advance the understanding and use of Probabilistic Safety Assessment (PSA) in ensuring the continued safety of nuclear installations and in improving the effectiveness of regulatory practices in member countries. The working group fosters understanding of the different

methodologies for identifying contributors to risk and assessing their importance. The working group focuses on the more mature PSA methodologies for Level 1, Level 2, internal, external, shutdown, etc. It also considers the applicability and maturity of PSA methods for considering evolving issues such as human reliability, software reliability, aging issues, etc., as appropriate.

Main Areas of Work and Accomplishments

Incident Reporting System (IRS)

One important product developed by the CSNI was the Incident Reporting System (IRS). In the late 1970s, the US Nuclear Regulatory Commission proposed that NEA developed an international reporting system for nuclear events. This system was started in January 1980, initially for a two-year trial period, by the Working Group on Operating Experience (WGOE), at that time a body of CSNI (but now operating under CNRA). By the end of 1981, the operation of the IRS was formally approved by the NEA membership, and by 1983, participation was extended to all IAEA Member States with nuclear power programs. The IRS is the only international reporting system accessible to regulators and governmental organizations providing them with an assessment on safety significant events, detailed information on root cause analysis, and lessons learned from the safety point of view.

The IRS was initially developed to collect information on potential safety-related events at nuclear power plants and to provide it to regulatory authorities. It has since evolved to address not only power installations but also research reactors and fuel cycle facilities around the world. In 1985, the IRS was extended to non-NEA countries through an agreement with the IAEA. The IRS is now operated jointly with the IAEA. A joint NEA/IAEA Advisory Committee provides guidance and advice on how to make the best and most effective use of the system. The database, originally distributed quarterly by CD-ROM, is now made available through a website. Over seventy organizations in 31 countries have access to the site.

International Nuclear Event Scale (INES)

INES was initiated in March 1990 as a joint effort of the NEA and IAEA. It has involved, at one time or another, three different committees of the NEA. It was first conceived by the CRPPH, which envisioned it as a mechanism for communication with the public about the public consequences of an event in terms of its radiation releases. Because of the larger number of countries in its membership and the value of being able to communicate about any event in any country around the world, IAEA was involved from the outset as a co-sponsor, and now manages the activity, with the involvement of NEA. On the NEA side, it quickly came to involve CSNI, and its potential as a tool to assess the safety significance of events became apparent. After CNRA was formed, the NEA responsibility for INES was transferred to that committee because of the regulatory implications of safety-related events.

Operating Event Databases

In the late 1990s, in order to make the data that had been developed through the IRS more useful to operators and regulators for such purposes as the implementation of countermeasures, the development of system improvements, and the development of new designs, a series of projects was begun to analyze certain categories of events and responses to events in detail. In each of these projects, the participating countries provide detailed information about the events and provide financial support for a Clearinghouse that analyses the data and suggests trends and other lessons from these analyses.

To date, the following databases have been developed:

- ICDE (starting in 1998): Common cause failure data exchanges
- OPDE (starting in 2002): Piping failure data exchange
- FIRE (starting in 2003): Fire incident report exchange
- COMPSIS (starting in 2005): Computer-based failure event exchange
- SCAP (starting in 2006): Stress corrosion and Cable Ageing Project

These Projects are operated as Joint Projects, and are further described in the section on Joint Projects below.

State of the Art Reports (SOARs)

Another important activity of the CSNI Working Groups has been the preparation of State of the Art Reports (SOARs) on the major safety topics addressed within these groups. SOARs are designed to bring together the relevant knowledge available in NEA member countries regarding a given subject, to identify areas of consensus on the interpretation of the information in relation to its use for nuclear power plants, and to make recommendations for additional experiments or analyses in areas where there are significant knowledge gaps. Since 1980, twenty-three SOARs have been produced covering a variety of topics in the areas of thermal hydraulics, severe accidents, containment behavior, and fuel safety.

Some of the topics that have been covered include: iodine chemistry, risk monitors, several reports on fire-related issues, organizational factors affecting plant safety, several reports on thermal hydraulics issues, several reports on probabilistic safety assessment (PSA) issues, high pressure melt ejection (HPME) and direct containment heating (DCH), boiling water reactor stability, fracture mechanics aspects of integrity assessment, non-destructive examination practices and results, primary system fission product release and transport, in-vessel core degradation in LWR severe accidents, containments for pressurized water reactors, several reports on non-destructive inspection techniques, PWR fuel behavior in design basis accident conditions, pressure suppression system containments, and two-phase critical flow models.

International Standard Problems (ISPs)

About 50 International Standard Problems (ISPs) have been conducted under the auspices of the CSNI since 1975. The ISPs are devised to use up-to-date, high quality experimental findings to conduct code assessments and, in some cases, code validations. ISPs consist of a round robin exercise where different organizations in different countries perform code calculations that are then compared with the experimental results. Key aspects of the ISP process include rigorous preparation of the input data, strict secrecy regarding the data, and a uniform and agreed method of comparing the results, both in the case of code-to-code results and in the case of code results vs. experiments.

Over the years, CSNI has conducted ISPs using the experimental data from a number of NEA Joint Projects, including LOFT and ROSA, but ISPs have also been conducted using data from other experiments. As in the case of SOARs, the ISPs have covered topics in the areas of thermal hydraulics, severe accidents, containment behavior and fuel safety. Out of a total of 50 ISPs conducted so far, about 20 have involved integral coolant systems experiments, about 10 have involved integral containment experiments, nearly 20 have involved separate effects tests, and one has involved a seismic test.

Relationships with Other Entities

When the CNRA was created, it took the regulatory functions that had formerly been part of the CSNI mandate. Although the separation helped assure that the member countries could provide the right expertise and right institutional representation for safety research issues on the one hand, and regulatory policy issues on the other hand, the separation also requires continued dialogue between the two committees to assure exchanges of important information, cross-fertilization of ideas, and avoidance of duplication of effort. As a consequence, the two committees work together closely. They routinely report at each other's meetings, and hold regular joint Bureau meetings. As appropriate, they also conduct joint workshops and other activities on selected topics of mutual interest.

Furthermore, one of the current subsidiary bodies of the CNRA, the Working Group on Operating Experience (WGOE), was formerly a part of the CSNI, and continues to support the activities of both committees. Finally, the CSNI and CNRA also have a joint task group on plant safety performance. Organizationally, the close interface between the two committees is facilitated by the fact that both of them are staffed by the NEA's Nuclear Safety Division.

Evolving Activities

CSNI has a well-established portfolio of on-going activities. Several of the Joint Projects coordinated by the NEA staff in the Nuclear Safety Division have been in existence since the earliest days of the NEA. Other Joint Projects continue to arise from time to time. Most projects last a few years, but NEA's strong reputation for successfully assisting such projects has created a demand for its services for new projects as needs arise for research to address new safety-related issues or new aspects of old safety-related issues.

In addition, although the Incident Reporting System is now managed by the IAEA, the CSNI has a continuing role on its advisory committee, and works actively to provide guidance and advise on how to make the best use of the system. Current issues include assuring that full reports are submitted on all incidents in a timely manner to assure that the system continues to be a valuable tool in understanding and learning from the experiences of others around the globe.

In addition, the continued operation of existing nuclear power plants, and the growing interest in new and advanced nuclear technologies continue to raise issues that NEA member countries need to address to assure the highest levels of safety in both existing plants and in new designs.

Table 8.1: Chairs of the Committee on the Safety of Nuclear Installations, 1973-2008

Years	Chair	Country	Affiliation
1973-1976	Jean Bourgeois	France	Director, Institut de Protection et de Sûreté Nucléaire (IPSN)
1977-1982	Adolf Birkhofer	Germany	Managing Director, Gesellschaft fur Anlagen- und Reaktorsicherheit (GRS)
1983-1986	William Dircks	United States	Executive Director for Operations, US Nuclear Regulatory Commission (NRC)
1987-1991	Francois Cogne	France	Director, Institut de Protection et de Sûreté Nucléaire (IPSN)
1992-1993	Kazuo Sato	Japan	Executive Director, Japan Atomic Energy Research Institute (JAERI)
1994	Eric Beckjord	United States	Director, Office of Nuclear Regulatory Research, USNRC
1995	Francois Cogne	France	Director, Institut de Protection et de Sûreté Nucléaire (IPSN)
1996-1997	David Morrison	United States	Director, Office of Nuclear Regulatory Research, US Nuclear Regulatory Commission (NRC)
1998-2000	Michel Livolant	France	Director, Institut de Protection et de Sûreté Nucléaire (IPSN)
2001-2005	Ashok Thadani	United States	Director, Office of Nuclear Regulatory Research, US Nuclear Regulatory Commission (NRC)
2006-	Lothar Hahn	Germany	Director, Gesellschaft fur Anlagen- und Reaktorsicherheit (GRS)

IX. COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

CNRA in Brief:

Founded: 3 October 1989

Names: Committee on Nuclear Regulatory Activities (CNRA), 3 October 1989

Members: All NEA Members (in practice, 18 countries participate actively)

Regular Observers: Russian Federation, Slovenia

Ad Hoc Observer: Co-operative Forum for VVER Regulators

Current Subsidiary Bodies:

- **Working Group on Inspection Practices (WGIP)**
- **Working Group on Public Communication of Nuclear Regulatory Organizations**
  - **(WGPC)**
- **Working Group on Operating Experience (WGOE)**
- **Working Group on the Regulation of New Reactors (WGRNR)**

History and Development

The need for NEA to work in areas related to the safety of nuclear facilities was identified within the first decade of its existence, and the first multilateral safety committee of the NEA, the Committee on Reactor Safety Technology (CREST), was created in 1965. At this time, the mandate of the Health and Safety Committee (HSC), whose main focus was the area of radiation protection, included regulatory matters. When CREST was formed, HSC retained that responsibility.

It was not until CREST became the Committee on Safety of Nuclear Installations (CSNI) in 1973 that issues of regulation moved out of the HSC and to the CSNI. At that time, CSNI had within its structure a Subcommittee on Licensing that took on this function. The HSC, with its regulatory functions removed, was reconstituted as the Committee on Radiation Protection and Public Health (CRPPH).

The mandate of the new CSNI gave it responsibility for technical aspects of nuclear installations, and charged it with the task of establishing a dialogue between regulators and research organizations. This charge had two objectives: 1) to assist in the definition of research objectives, and 2) to provide feedback on research results to nuclear regulators. The Subcommittee on Licensing took on the role of serving as a forum for licensing authorities, particularly in areas that were not strictly technical or scientific in nature.

By the end of the 1980s, greater public attention was being focused on regulatory practices. In addition, there was an expanding body of operating experience and lessons learned that could be applied to regulatory practices, and the accumulation of regulatory experience provided a strong basis for exchanging information and understanding on national approaches. Also, increasingly, NEA member countries had different organizations and individuals focused on questions of nuclear safety regulation than on scientific and technical questions related to safety. The need for more focused NEA effort on regulatory matters led naturally to the evolution of a special Standing Technical Committee for this purpose.

By this time, at least three NEA STCs had some involvement with regulatory issues. In addition to the CSNI, the CRPPH was involved with regulatory matters relating to radiation protection, and the RWMC was involved with regulatory matters relating to radioactive waste disposal. Thus, all three committees played a role in establishing the mandate for a new Committee on Nuclear Regulatory Activities (CNRA) to address issues relating to safety-related regulation, licensing and inspection of nuclear installations. Main tasks of the new CNRA were to include:

- An ongoing exchange of information and experience among regulatory organizations in NEA member countries (and other countries participating in NEA work);
- Review of developments that could affect regulatory requirements, with the particular objective of providing a better understanding of the motivation for making changes and improvements; and
- Review of practices and operating experiences in NEA member countries.

The Committee's structure includes three Working Groups. The first of these, the Working Group on Inspection Practices (WGIP), was established in 1990 as one of the first actions of the new Committee, with the goal of examining the conduct of inspections and how the effectiveness of inspections can be evaluated. A Working Group on Public Communication (WGPC) followed a couple of years later, in 2001, in recognition of the importance of communication with the public in gaining the public trust, which in turn is essential for the future of nuclear power. The WGPC facilitates the exchange of information, news, documents, experiences and practices among the communicators in nuclear regulatory organizations.

More recently, in 2005, the CNRA gained a third working group, the Working Group on Operating Experiences (WGOE). This group had actually previously existed under the CSNI. By mutual agreement between the two committees, the WGOE moved to the CNRA, although it continued to serve the CSNI as well as the CNRA. The mandate of this working group is to provide analysis of operating experience, derived from both incident analysis and inspection findings, in order to meet several needs, including to improve the methods and data used in safety assessments (e.g., risk methodologies, accident analysis), to judge the need for additional research (e.g., material degradation mechanisms), and to improve safety in the long term (e.g., through trending, safety significance, etc.).

In addition, from time to time CNRA has created senior Task Groups on specific regulatory issues. Since this report does not attempt to document the work of all the temporary groups that have existed in NEA over the past 50 years, the work of only one of these Task Groups will be specifically noted below.

While all NEA member countries automatically have membership rights to all committees, because of the nature of the work of the CNRA, the countries that normally participate actively are largely countries with significant nuclear activities and facilities. These include: Australia, Belgium, Canada, Czech Republic, Finland, France, Germany, Hungary, Italy, Japan, Korea, Mexico, the Netherlands, Slovak Republic, Sweden, Switzerland, the United Kingdom, and the United States. The Russian Federation, Slovenia, the EC and the IAEA also take part in CNRA activities.

Main Areas of Work and Accomplishments

Over the less than twenty years of its existence, the CNRA has made significant contributions in a number of areas of regulatory interest. A great deal of the work has been on technical issues, but there has also been a significant body of work on socio-

economic and political issues, human factors issues, international issues, decommissioning, radioactive waste disposal, and other regulatory challenges.

One of the major activities of the CNRA has been an annual Special Issues Meeting, initially for the Committee, focusing on in-depth discussions of a specific issue of interest to the member countries. More recently, these meetings have become high-level international forums related to nuclear regulatory challenges.

In late 1996, a Working Party on Future Regulatory Challenges, was established. Its work led to the publication of a widely read report identifying expected challenges over the next decade, and proposed recommendations to address them. The recommendations in this report led further to the development of a series of "little green booklets" and to the creation of a number of Task Groups to address these areas further. The CNRA has made the initial report into a "living document." As such, it is continuously reviewed and updated in conjunction with the program of work of the Committee.

The oldest Working Group within the CNRA, the WGIP, naturally has the longest set of accomplishments. A key product of the group is a compendium of commendable inspection practices. Although these are neither international standards nor guidelines, they have been used as a reference by countries when they review and upgrade their inspection practices.

In addition, WGIP began a series of international workshops on nuclear inspection practices in 1992. The workshops have provided a unique opportunity for nuclear inspectors to meet and "calibrate" their own inspection methods against those of other countries. This exchange of information on regulatory inspection issues also allows inspectors from different countries and backgrounds the opportunity to learn and understand different inspection methods and applications. Workshops have been conducted every two years since 1992. Each workshop has had several different themes, based on issues of interest at that time. Over the years, the workshops have therefore covered many topics, including:

- inspector qualification and training (1992);
- inspections for plant modifications, event investigation and operability considerations (1994);
- inspection planning, plant maintenance and the assessment of safety (1996);
- inspection activities related to older operating plants, risk evaluation and licensee resource commitment (1998);
- inspection activities relating to radiation protection, long shutdowns and subsequent restarts, and the use of objective indicators in evaluating the performance of plants (2000);
- inspection of events and incidents, inspection of internal and external hazards, and inspection activities related to challenges arising from competition in the electricity market (2002);
- inspection activities related to risk-informed inspection, inspections at or near the end of plant life, and inspection of the performance of licensee organizations (2004);
- how international nuclear regulatory inspections can promote, or not promote, good safety culture, inspection of interactions between the licensee and its contractors and future challenges for inspectors (2006); and

• training and qualifying of inspectors, integration of inspection findings, and inspections of new plants and construction (2008).

One of the main products of the WGPC has been the establishment of an informal confidential network between its members to enable rapid electronic communication to report on events of interest, including early warning, alleged events, and other topics of interest to communicators at regulatory organizations. Another important output of the WGPC was the conduct of an international workshop in 2004 on building, measuring and improving public confidence in the nuclear regulator.

The WGOE, which operated for a long time under the CSNI before it was transferred to the CNRA, has continued its long-standing mandate of analyzing and providing expert insights from operating experience to reach timely conclusions on trends, lessons learned, and effective responses in the short to medium term, and to promote proposals for reassessment of safety, additional research, new or revised regulatory inspection practices, improvement in managing operations, and other actions to maintain and improve safety in the longer term.

In addition, the WGOE provides NEA's oversight of the Incident Reporting System (IRS), established for the collection and dissemination of operating experience and reviews information from it and from other available databases, and now operated jointly with IAEA. As noted in the section on CSNI, this activity was initiated when WGOE was part of CSNI, but it now continues under CNRA.

In 2007, the WGOE reviewed existing International Operating Experience Feedback (OEF) processes and networks, and their connections with National OEF systems, and developed recommendations for more effective use of international OEF to improve nuclear safety.

At the end of 2007, the CNRA established a new working group, the Working Group on the Regulation of New Reactors (WGRNR). This group will be responsible for dealing with regulatory activities related to siting, licensing and oversight for new commercial nuclear power reactors, both Generation III+ and Generation IV. The working group is intended to support an international forum for exchanging information and experience. One major effort of the new working group will be coordination with the work of the Multinational Design Evaluation Program (MDEP), discussed below. NEA already serves as the Secretariat for portions of this program. Since MDEP does not include a number of countries that are NEA members (conversely, several members of MDEP are not NEA members), the WGRNR will assure that the results of MDEP efforts are extended to other NEA members and will avoid duplicating work MDEP is already doing.

In addition to these very specific activities, the CNRA has devoted considerable effort to several specific areas, namely: plant aging, safety margins during more exacting operating modes, risk assessment, operator responsibility, and inspection practices. Extensive work has also been done in the areas of operating experience, deregulation and public communication. The work in the plant aging area is of particular note, since it has covered a range of technical issues. In addition to work on the aging of plant systems and components, and plant "technology" (which refers to computers and digital instrumentation and control), this area also includes several non-hardware/software issues, including the aging of analytical techniques and plant documentation, and the aging of rules and standards. CNRA's efforts in these areas have taken a number of forms, including the generation of reports and other publications, the conduct of workshops and technical meetings, etc.

Relationships with Other Entities

As noted, the CNRA was created largely from activities that were in the CSNI, and in addition, took on responsibility for covering regulatory activities related to RWMC and CRPPH work. Further, one of its subcommittees, the WGOE, was only recently transferred to the CNRA, and is still charged with supporting the activities of both committees. This history has required close and continuing relationships between the CNRA and the other three committees. The committees routinely report at each other's meetings, hold regular joint Bureau meetings, hold joint workshops and forums on topics of mutual interest, and provide inputs, as appropriate, to each other's reports. In addition to the WGOE, which is now under the CNRA but serves both committees, the CNRA and CSNI also currently have a joint task group on plant safety performance indicators. Organizationally, the two Committees form NEA's Nuclear Safety Division.

The work of the CNRA is of considerable interest to nuclear power plant operators. As such, the CNRA interacts with the World Association of Nuclear Operators (WANO), a group representing virtually all the nuclear power plant operators in the world. CNRA works with WANO and IAEA to maintain and operate a joint NEA/WANO/IAEA Nuclear Events-Based Web System (NEWS). In addition, the CNRA reviews reports and other information relevant to its work from the IAEA, the European Commission, and other international organizations, such as the International Nuclear Regulators' Association (INRA) and the Western European Nuclear Regulators' Association (WENRA).

Finally, CNRA is the third of three NEA committees that has, at one time or another, been involved with the International Nuclear Event Scale. Originally conceived by CRPPH as a mechanism for communicating with the public about radiation releases from events at nuclear facilities, the activity quickly came to involve the CSNI because of the importance of using it as a tool for understanding the safety significance of events as well. When CNRA was formed, it was recognized that this tool was useful in a regulatory context, and CNRA took over the NEA role from CSNI. By that time, IAEA, which had originally been a co-sponsor of the activity because of the larger number of countries it could include in the program, had taken over the management of INES. NEA continues to serve on an advisory committee for INES, and CNRA represents NEA in this function.

Evolving Activities

CNRA has, in the last couple of years, acquired or initiated two new working groups, one covering operating experience for existing facilities and the other covering issues related to new reactors. While the two previously-established working groups, covering inspection practices and public communication, will continue to address the ongoing issues in these areas, the two new groups will bring additional focus on issues related to operating experience and to new reactors.

Neither of these areas is new to the CNRA. The CNRA had long worked closely with the WGOE when it was within CSNI, and the outputs of that Working Group had long informed much of the other work of the CNRA. On the new reactor side, products and activities of the CNRA, as well as the CNRA's support of the Multinational Design Evaluation Program (MDEP), discussed below, presaged the need for expanded work in the area of new reactors. Now, with NEA member countries as well as other countries increasingly looking at the prospects for building new plants, the work in this area is becoming more important.

In addition, issues of regulation continue to have threads to other areas of activity of the NEA, including, as has historically been the case, radiation protection and waste, in addition to reactors and other nuclear facilities, and therefore, to other NEA committees.

A recent activity of the CNRA is its work as the Technical Secretariat of Stage 2 of the Multinational Design Evaluation Program (MDEP), a new multi-national activity set up to enable the regulatory authorities of countries to share knowledge and resources in the assessment of new reactor designs. A key concept of the MDEP is that national regulators will retain authority over all licensing and regulatory decisions. The current membership of MDEP includes both OECD member and non-member countries. Stage 2 was a one-year pilot project to identify areas of potential convergence of regulatory requirements and enhanced co-operation among regulators. This effort is now moving into its implementation phase. If successful, it is expected that the ten countries comprising MDEP will seek to explore other possible areas of new reactor licensing for co-operative analysis and reviews. In addition to its current role as the MDEP Technical Secretariat, as noted above, the NEA has also established a new working group, the Working Group on the Regulation of New Reactors (WGRNR), which will work closely with the MDEP to assure co-ordination between MDEP activities and NEA new reactor licensing studies.

Table 9.1: Chairs of the Committee on Nuclear Regulatory Activities, 1989-2008

Years	Chair	Country	Organization	Title
1989-1994	Eduardo Gonzalez Gomez	Spain	Consejo de Seguridad Nuclear (CSN)	Vice President
1994-1997	Lars Hogberg	Sweden	Swedish Nuclear Power Inspectorate (SKI)	Director General
1998	Christopher Willby	United Kingdom	Health and Safety Executive	Deputy Chief Inspector of Nuclear Installations
1999-2007	Jukka Laaksonen	Finland	The Radiation and Nuclear Safey Authority of Finland (STUK)	Director General
2007-	Michael Weightman	United Kingdom	Health and Safety Executive	Her Majesty's Chief Inspector of Nuclear Installations and Director of the Nuclear Directorate

X. RADIOACTIVE WASTE MANAGEMENT COMMITTEE

RWMC in Brief:

Founded: 23 June 1975

Names: Radioactive Waste Management Committee, 23 June 1975

Regular Observers: Russian Federation, Slovenia

Current Subsidiary Bodies:

- **RWMC Regulators' Forum (RWMC-RF)**
- **Integration Group for the Safety Case of Radioactive Waste Repositories (IGSC)**
    - **IGSC Working Group on the Characterization, the Understanding and the performance of Argillaceous Rocks as Repository Host Formations (CLAY CLUB)**
- **Forum on Stakeholder Confidence (FSC)**
- **Working Party on Decommissioning and Dismantling (WPDD)**
    - **Decommissioning Cost Estimation Group (DCEG)**

History and Development

As noted in the discussion on the history of CRPPH, initially, the focus of NEA's work on radioactive waste disposal was effectively on radiation protection issues. While these continued to remain important, as other issues associated with waste disposal developed, it became clear that expertise outside the radiation protection area needed to be brought to bear on the questions being raised. As a result, the Radioactive Waste Management Committee was established on 23 June 1975, in fact, only a couple of years after CRPPH had taken its current title. At that time, several waste-related initiatives were underway under the auspices of CRPPH, including the Coordinated Research and Environmental Surveillance Program (CRESP), a major project on marine disposal of radioactive wastes. Since this work was largely focused on the radiological implications of seabed disposal, the effort remained under the leadership of CRPPH. CRPPH and RWMC also jointly completed other work related to radioactive wastes that had been initiated under CRPPH.

Main Areas of Work and Accomplishments

As noted above, the early work of the RWMC represented a transition from the involvement of CRPPH in radioactive waste issues and was conducted jointly with them. Legal considerations were also beginning to become important, and some work was done jointly with NLC. Later work involved some of the issues for which the RWMC was formed, namely, the examination of specific geologic formations and the information needed to support analyses of specific sites.

In addition to general studies, at the request of particular countries, the RWMC has undertaken a number of peer reviews of national plans and concepts for geologic disposal. Still later, as public concerns began to be recognized as an important consideration, work was initiated in this area.

Disposal Concepts

The CRPPH and RWMC jointly established an Expert Group in the mid-1970s to address the very long-term radiological protection objectives for waste management. This Expert Group produced a joint report in 1977 entitled, "Objectives, Concepts and Strategies for the Management of Radioactive Waste Arising from Nuclear Power Programs." This report, which marked a turning point in the NEA's activities in this field, enunciated principles that were to become fundamental to the activities of the NEA and of national programs, including:

- The need to proceed with caution before committing to irreversible solutions and the soundness of reasonably long-term intermediate storage for long-lived waste.
- The need to avoid reliance on long-term surveillance to ensure the integrity of repositories.
- The advantages of very long-term containment in stable geological formations and the need for R&D in this field.
- The necessarily theoretical approach to the long-term safety of repositories and the impossibility of conventional empirical demonstration of their safety.
- The advantages of defining an institutional framework at the national level and of sharing responsibility between government authorities and private industry.
- The need to provide adequate finances for waste management under the "polluter pays" principle.

In the early years of the RWMC, responsibilities for waste-related activities started by the CRPPH were shared based on the nature of the project and its status. Thus, The Coordinated Research and Environmental Surveillance Program (CRESP), in which radiological issues were of central importance, remained under the leadership of CRPPH, although RWMC took an active interest in it and was briefed on it at committee meetings. On the other hand, RWMC took the lead on work on the seabed disposal of radioactive waste, which involved high-level waste issues.

In addition, RWMC and CRPPH were jointly responsible for a number of reports in the early years following the establishment of RWMC, including: Decontamination Methods as Related to Decommissioning of Nuclear Facilities (March 1981), and Long-Term Radiological Aspects of Management of Wastes from Uranium Mining and Milling (1984).

RWMC also occasionally coordinated with other committees. For example, it produced a study jointly with NLC on Long-Term Management of Radioactive Waste—Legal, Administrative and Financial Aspects (1984).

At the same time, the RWMC began to address other issues associated with seabed disposal and other long-term disposal options, including issues associated with the packaging of wastes for disposal, the migration of long-lived radionuclides in the geosphere, and the long-term performance of different deep geological options. Because of its importance, the RWMC devoted special effort to the study of argillaceous media for radioactive waste disposal. This effort will be covered separately below.

In addressing these areas, the RWMC has probably produced more publications than any other NEA Standing Technical Committee. Among its products are several Collective Opinions that have addressed key issues from a broad perspective, a number of peer reviews, at the request of member countries, to examine national disposal programs and options, and summaries of several Joint Projects undertaken by groups of countries to conduct research on key issues. The peer reviews and Joint Projects are discussed below.

Some of the key Collective Opinions include:

- Long-Term Management of High-Level Radioactive Waste—Is it Feasible? Is it Safe? The Meaning of a Demonstration (1983)

- Technical Appraisal of the Current Situation in the Field of Radioactive Waste Management—A Collective Opinion by the Radioactive Waste Management Committee (1984)

- Can Long-Term Safety be Evaluated? An International Collective Opinion (1991). This was developed jointly between NEA, IAEA and the EC.

- Environmental and Ethical Aspects of Long-Lived Radioactive Waste Disposal—A Collective Opinion of the NEA RWMC (1995). This publication was the outcome of an international workshop conducted earlier that year in cooperation with the Environment Directorate of the OECD.

Forum on Stakeholder Confidence

This last Collective Opinion, coupled with other events in the 1990s, led to RWMC holding a Forum on Stakeholder Confidence in Paris in August 2000 to help the authorities seeking to site long-term repositories to better work with the local communities to develop mutually acceptable solutions. This issue, which has become important in a number of countries in recent years, has led to further workshops and studies since the year 2000, including additional general workshops on stakeholder confidence, and several workshops that addressed the national context of particular countries.

Fundamentally, the Forum on Stakeholder Confidence (FSC) is designed to help facilitate the sharing of experience in addressing the societal dimension of radioactive waste management. In particular, the FSC process explores means of ensuring an effective dialogue with the public with a view to strengthening confidence in the decision-making processes. This approach has emerged in response to the recognition that the time has past when it was acceptable for exchanges between the promoters of large-scale industrial projects, such as waste management facilities, and civil society to be formal and one-way. A more complex interaction is now taking place among players at national, regional and especially at local levels, as large industrial projects are highly dependent on siting and other local considerations, and a broader, more realistic view of decision making is taking shape.

The FSC convenes a series of alternating meetings and workshops. The annual meetings include topical sessions on specific issues of interest and are used for planning and to elaborate the lessons learnt from the workshops. The national workshops (also held annually) focus on stakeholder involvement in waste management issues in the host country. A wide spectrum of stakeholders from the host country are invited to express their views on the nature of their involvement and the process by which they are involved. Since 2001, visits to the local communities and workshops in a national context have been held in the following locations:

- Finland: Turku (November 2001)

- Canada: Ottawa (October 2002)

- Belgium: Brussels (November 2003)

- Germany: Hitzacker and Hamburg (October 2004)

- Spain: L'Hospitalet de l'Infant, Catalonia (November 2005)
- Hungary: Tengelic (November 2006)

No meeting in a national context was held in 2007; rather, a planning meeting was conducted to develop the next phase of the program. A workshop in the national context was held in France in the fall of 2008.

The meetings and the workshops have resulted in a number of reports on issues, approaches and lessons learned in dealing with stakeholders on radioactive waste disposal issues. Other stakeholder issues, such as for decommissioning, have also been addressed in the course of these activities.

Peer Reviews

In the 1990s, countries began to turn to the NEA for assistance in reviewing their radioactive waste disposal plans and activities from an international perspective, with the aim of assuring the quality and completeness of their own activities.

As a result, the RWMC began conducting "peer reviews" of radioactive waste disposal projects in various member countries. To date, seventeen assessments and related reports have been done for eight countries, including Belgium, Canada, France, Japan, Sweden, Switzerland, the United Kingdom, and the United States. A full list of these projects is provided in Table 10.2.

These reviews are always done at the specific request of a member country and the costs of the review are always funded by the member country. The reviews bring together the expertise of the whole international community to assess the methodology being used by the country in various aspects of its high-level waste disposal program. In one case—the 1997 peer review of the US Waste Isolation Pilot Project (WIPP)—the review was conducted jointly with the IAEA.

The reviews have covered a variety of issues, including the performance assessment methodologies used, the technical bases for HLW disposal, specific geological formations, and post-closure safety analyses. In addition, the projects have resulted in the publication of several reports providing general information and guidelines for waste disposal, and the identification of good practices for safety cases.

These exercises have proved mutually beneficial. The countries that requested the reviews obtained the benefits and insights of the best experts from around the world, which was helpful not only for the technical quality and completeness of their work, but for the confidence it helped build within their countries. The peer reviewers and others were also able to gain insights from the detailed reviews of the efforts of specific countries in tackling the unprecedented challenges of very long-term disposal of long-lived radioactive wastes.

Clay Club

A wide spectrum of argillaceous media are being considered in NEA member countries as potential host rocks for the final, safe, near-surface or at-depth disposal of radioactive waste, and/or as major constituents of repository systems in which waste will be emplaced. These media have a number of favorable generic properties, such as homogeneity, low groundwater flow, chemical buffering, a propensity for plastic deformation and self-healing of fractures by swelling, and a marked capacity to chemically and physically retard the migration of radionuclides.

In this context, the NEA established in 1990 a Working Group on Argillaceous Media,

known informally as the "Clay Club". The Clay Club examines those various argillaceous rocks that are being considered for the deep disposal of radioactive waste, ranging from soft clays to indurated shales. These rocks exhibit a wide spectrum of characteristics that make them useful as barriers to the movement of water and solutes and as repository construction materials. Studies include clay media characterization and modeling.

Initially, the Clay Club launched a compilation and review of the relevant literature on the basic concepts and mechanisms controlling the movement of water, solute and gas through the whole spectrum of argillaceous media being considered for radioactive waste disposal. Subsequent work has included an examination of fluid flows through faults and fractures in argillaceous formations and the complex question of extracting solutions from them. The fluid flow research has also included an evaluation of the advantages and limitations of current approaches. The project has produced a number of products, including a catalog of features, events and processes in argillaceous media, an overview of characteristics of class formations studied with regard to deep geologic disposal, and a state-of-the-art document on the self-healing of clay media.

Regulators' Forum

Finally, another activity the RWMC has instituted to support its members is a Regulators' Forum. The Regulators' Forum is made up of regulators who participate in the work of the NEA Radioactive Waste Management Committee (RWMC). The RWMC Regulators' Forum (RWMC RF) is intended to:

- facilitate multilateral communication and information exchange between RWMC regulators and promotes a frank interchange in open dialogue among peers;
- define and addresses future regulatory challenges and issues in the area of waste management and disposal, including decommissioning and dismantling;
- promote discussion and exchange with other groups involved in regulatory affairs, both within and outside the NEA. The emphasis is on two-way exchanges to benefit from related experience;
- take the initiative within the RWMC in the area of regulation and licensing.

Communication takes place through a one-day meeting once a year prior to RWMC plenary sessions; and an electronic bulletin board reserved for forum members.

Although the primary purpose of this activity is dialogue among the regulators of NEA member countries, as an aid to their interactions, the RWMC has published a report, The Regulatory Control of Radioactive Waste Management: Overview, providing information about the regulatory control of radioactive waste management in 15 NEA member countries, with an emphasis on waste disposal. The report includes information about national policies for radioactive waste management, institutional frameworks, legislative and regulatory frameworks, available guidance, classification and sources of waste, the status of waste management, current issues and related R&D programs. The report provides an important source of reference for all stakeholders interested in learning about international practices in the field of radioactive waste management.

Joint Projects

Over the years, there have been several important Joint Projects in the area of radioactive waste management. Two of these, the Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste, and the Coordinated Research and Environmental Surveillance Program (CRESP), began before the establishment of the

RWMC and were conducted under the auspices of CRPPH . They were previously described in the section on CRPPH and are not further described here.

Joint Projects conducted under the auspices of the RWMC have included: the Stripa Project, a series of in situ experiments conducted at an old iron ore mine in Stripa, Sweden to investigate the mechanical and hydrogeological behavior of granitic rocks to determine their suitability for a high-level radioactive waste repository; the Sorption Project and the Thermochemical Data Base (TDB) Project, both still ongoing (the former intended to demonstrate the potential of thermodynamic models to represent radionuclide sorption in the context of radioactive waste disposal, and the latter designed to assemble a comprehensive, consistent and quality-assured chemical thermodynamic data base of selected chemical elements for modeling for the migration of radioactive elements in engineered barriers and in the geosphere); and two projects associated with the Alligator River in Australia. All are listed in the tables in the section on Joint Projects.

RWMC has also been responsible for several other coordinated research programs conducted over the years that have some of the attributes of Joint Projects but are not formally identified as such. These generally seem to have taken place under the auspices of an RWMC working group, and have not needed separate funding or other arrangements that usually trigger the need for an agreement for a formal Joint Project. Because they were not formal projects, in many cases, details are unavailable or difficult to reconstruct, but it is useful to note them briefly for future reference:

- The Seabed Project, an activity that took place under a working group of the RWMC around the early 1980s to provide scientific and technical information for assessment of the engineering feasibility and long term safety of emplacement of suitably packaged high-level radioactive waste in sedimentary geologic formations of the deep ocean floor. It involved 8 countries, two observers, and the European Union.

- Several activities related to studying the potential transport of radioactive materials, including Intracoin (operating from 1981-84), HYDROCOIN (a project for the modeling of groundwater flow in the context of radioactive waste disposal that operated from 1984-91, and involved 10 countries), PSACOIN (an international code intercomparison exercise on a hypothetical safety assessment case study for radioactive waste disposal), and INTRAVAL (an international project concerned with the use of mathematical models for predicting the potential transport of radioactive substances in the geosphere that ended in 1993 and involved 14 countries and 46 organizations at its peak).

- The International Sorption Information Retrieval System (ISIRS), a computerized sorption data bank and sorting/retrieval/statistical manipulation software package started in the early 1980s and designed especially for storing and generating the laboratory data parametric adsorption models. This effort was followed by the later Sorption and TDB Joint Projects.

Relationships with Other Entities

RWMC, like the other NEA committees, maintains close working relationships with key international organizations, particularly the IAEA and the EC.

Within the NEA, RWMC has the closest relationships with CRPPH, from which it had evolved in 1975. Although their work is now distinct, a key issue in the long-term disposal of waste continues to be the potential for exposure to the public in the long-term, so CRPPH has some continuing involvement in this area. In addition to the areas already mentioned, the RWMC and CRPPH cooperate in other areas of mutual interest, such as on decommissioning and dismantling of nuclear facilities and exemption levels for very low-level radioactive materials.

In addition, since some of the options for the long-term management of reactor wastes involve first extracting the usable material by one of several possible techniques—an issue that NDC deals with as part of its fuel cycle activities—there are some overlaps between RWMC and NDC. In the past, RWMC and NLC worked together on a project with legal issues, although this has not been a routine occurrence.

RWMC's work also has some overlap with the interests of the OECD Environment Directorate, and the two groups have occasionally collaborated on projects, as noted above.

Evolving Activities

The issue of long-term waste disposal continues to be a significant one in a number of NEA's member countries. Certainly, all countries operating nuclear power plants ultimately have to address this issue. In recent years, the number of reports produced by RWMC has reflected the growing activity in NEA member countries to address this important issue.

This activity is expected to continue over a number of years, since both the decision-making process and the construction process are likely to be protracted in most countries. Considering the growing importance of public involvement in decision-making in NEA countries, the continued work is likely to include continued efforts to address stakeholder issues, both in general and in a country context.

Further, as countries narrow their choices, the responsible authorities, other policy-makers, and the public are likely to find NEA peer reviews a valuable option for an independent review of the option chosen. There is also likely to be a need for continued research efforts in selected areas related to waste disposal.

Table 10.1 Chairs of the Radioactive Waste Management Committee, 1975-2008

Year	Chair	Country	Affiliation
1975-1977	R.P. Randl	Germany	Head, Nuclear Fuel Cycle Division, Federal Ministry for Research and Technology
1978-1979	B. Verkerk	Netherlands	Reactor Centrum Nederland
1980-1982	L.A. Nojd	Sweden	AB Atomenergi Studsvik
1983-1985	Paul A. Dejonghe	Belgium	Centre d'etude de l'energie nucleaire (SCK/CEN)
1986-1990	Rudolph Rometsch	Switzerland	NAGRA
1990-1994	R.H. Flowers	United Kingdom	Chief Technologist (Nuclear), Atomic Energy Research Establishment UKAEA
1995	Henri E. Wallard	France	Director-General, ANDRA
1996-1998	M. Allegre	France	President, ANDRA
1998-2001	Soren Norrby	Sweden	Director, Division of Nuclear Waste Swedish Nuclear Power Inspectorate (SKI)
2001-2006	Margaret V. Federline	United States	Nuclear Regulatory Commission
2006	Alexander Nies	Germany	Bundesministerium für Umwelt (BMU)
2007	Margaret V. Federline (interim chair)	United States	Nuclear Regulatory Commission
2007-	Marie-Claude Dupuis	France	Director-General, ANDRA

Table 10.2: Peer Reviews of National Radioactive Waste Disposal Projects

Early Peer Reviews (unpublished by NEA)

Review of the KBS-3 Plan for Handling and Final Storage of Unreprocessed Spent Nuclear Fuel—Ministry of Industry Report Ds I 1984:17 (Review requested in 1984)

Review of the Onshore Disposal Committee Research Program on Geologic Disposal of Radioactive Waste in the Netherlands (OPLA Program) in the Netherlands, Final Report on Phase 1, Ministry of Economic Affairs, The Hague, 1989 (Review requested in1989)

SKI Project-90, A Review Carried Out By AN OECD/NEA Team of Experts, May 1992 (Review requested in 1990)

Commission of the European Communities and OECD Nuclear Energy Agency, Research Program for Onshore Disposal of Radioactive Waste in the Netherlands—A Review Carried out by a Joint CEC/NEA Group of Experts OPLA Committee, Executive Summary (OPLA-II Program) (Review requested in 1993)

1995 (publication date)

The Disposal of Canada's Nuclear Fuel Waste. Report of the OECD Nuclear Energy Agency Review Group.

1997 (publication date)

International Peer Review of the 1996 Performance Assessment of the US Waste Isolation Plant (WIPP). Report of the OECD Nuclear Energy Agency International Review Group.

The SKI SITE-94 Project: An International Peer Review Carried out by an OECD/NEA Team of Experts, ISSN 1104-1374, ISRN SKI-R—97/41--SE

1999 (publication date)

OECD/NEA Review of the Nirex methodology for scenario and conceptual model development, NEA/RWM/PEER (99)1

OECD/NEA International Peer Review of the Main Report of JNC's H12 Project to Establish the Technical Basis for HLW Disposal in Japan, NEA/RWM/PEER (99)2

Exchanged comments and responses as preparation for the workshop between the OECD/NEA international review group and the JNC staff, NEA/RWM/PEER (99)3

2000 (publication date)

SR 97: Post-closure Safety of a Deep Repository for Spent Nuclear Fuel in Sweden. An International Peer Review, ISBN 92-64-18261-6

2002 (publication date)

An International Peer Review of the Yucca Mountain Project TSPA-SR. Total System Performance Assessment for the Site Recommendation (TSPA-SR), ISBN 92-64-18477-5, www.nea.fr/html/rwm/reports/2002/nea3682-yucca.pdf

2003 (publication date)

The French R&D Programme on Deep Geological Disposal of Radioactive Waste. An International Peer Review of the "Dossier 2001 Argile", ISBN 92-64-02136-1, www.nea.fr/html/rwm/reports/2003/nea4432-andraeng.pdf

Above is available in French as: Programme français de R-D sur le stockage géologique de déchets radioactifs. Revue internationale par des pairs du Dossier 2001 Argile, ISBN 92-64-02137-X, www.nea.fr/html/rwm/reports/2003/nea4588-andrafr.pdf

SAFIR 2: Belgian R&D Programme on the Deep Disposal of High-level and Long-lived Radioactive Waste - An International Peer Review, ISBN: 92-64-18499-6, www.nea.fr/html/rwm/reports/2003/nea4431-safir2.pdf

2004 (publication date)

Safety of Disposal of Spent Fuel, HLW and Long-lived ILW in Switzerland - An International Peer Review of the Post-closure Radiological Safety Assessment for Disposal in the Opalinus Clay of the Zürcher Weiland, ISBN 92-64-02063-2, www.nea.fr/html/rwm/reports/2004/nea5568-nagra.pdf

Above is available in German as: Die Sicherheit der geologischen Tiefenlagerung von BE, HAA und LMA in der Schweiz. Eine internationale Expertenprüfung der radiologischen Langzeitsicherheitsanalyse der Tiefenlagerung im Opalinuston des Zürcher Weinlands, ISBN 92-64-02064-0, www.nea.fr/html/rwm/reports/2004/nea5568-nagra-ger.pdf

2005 (publication date)

International Peer Reviews in the Field of Radioactive Waste Management - General information and guidelines / Revues Internationales par des pairs dans le domaine des déchets radioactifs - Informations générales et lignes directrices, ISBN 92-64-01077-7, http://www.nea.fr/html/pub/ret.cgi?div=RWM#6082

International Peer Reviews in the Field of Radioactive Waste Management. Questionnaire on principles and good practice for safety cases / Revues internationales par des pairs dans le domaine des déchets radioactifs. Questionnaire sur les principes et bonnes pratiques concernant les dossiers de sûreté, NEA/RWM/PEER(2005)2, http://www.nea.fr/html/rwm/docs/2005/rwm-peer2005-2.pdf

Safety of Geological Disposal of High-level and Long-lived Radioactive Waste in France. An International Peer Review of the "Dossier 2005 Argile" Concerning Disposal in the Callovo-Oxfordian Formation, ISBN 92-64-02299-6, http://www.nea.fr/html/rwm/reports/2006/nea6178-argile.pdf

Above is available in French as: Sûreté du stockage géologique de déchets radioactifs HAVL en France - Examen international par des pairs du "Dossier 2005 Argile" concernant le stockage dans la formation du Callovo-Oxfordien, ISBN: 92-64-02300-3, http://www.nea.fr/html/rwm/reports/2006/nea6179-havl.pdf

XI. NUCLEAR SCIENCE COMMITTEE

NSC in Brief:

Founded: 4 March 1960

Names:

- **European-American Nuclear Data Committee, 4 March 1960 and European-American Reactor Physics Committee, February 1962**
- **Nuclear Data Committee, 7 March 1975**
- **and Reactor Physics Committee, March 1974**
- **Nuclear Science Committee, 1 October 1991**

Regular Observers: Russian Federation, Slovenia

Current Subsidiary Bodies:

- **Working Party on International Nuclear Data Evaluation Co-operation (WPEC)**
- **Working Party on Multi-scale Modelling of Fuels and Structural Materials for Nuclear Systems (WPMM)**
- **Working Party on Scientific Issues of Reactor Systems (WPRS)**
- **Working Party on Nuclear Criticality Safety (WPNCS)**
- **Working Party on Scientific Issues of the Fuel Cycle (WPFC)**
- **Executive Group of the NSC (Data Bank Management Committee)**
  - **Scientific Co-ordination Group of the Joint Evaluated Fission and Fusion (JEFF) Data Project**

History and Development

In the early years of the ENEA, two committees were established to carry out the scientific mandates of the Agency—the European-American Nuclear Data Committee in 1960 and the European-American Reactor Physics Committee in 1962. While these were ENEA committees, they were so named to reflect the active participation of the United States in the establishment and initial activities of the committees. Later, after Japan and other non-European countries joined the NEA, the designation European-American was dropped from both committee names. Except for the NSC, the dates given above reflect dates the committees first met under each name.

The purpose of the Data Committee was to facilitate the sharing of resources among national research centers and to reinforce research co-operation in the area of nuclear data. The Reactor Physics Committee had as its initial mission the mandate to review the existing state of knowledge in specific areas of reactor physics in order to identify gaps, discrepancies, and research needs, as well as to help co-ordinate appropriate research.

By 1964, the ENEA also established two closely related activities, the Computer Program Library in Ispra, Italy, and the Neutron Data Compilation Center in Saclay, France (jointly called the ENEA Common Services). These will be discussed in more detail in

the following chapter. However, it should be noted here that, even though the work of the ENEA Common Services was funded and managed by a subgroup of the ENEA membership, it worked very closely with the two scientific committees in support of their needs. As discussed in the following chapter, in January 1978, the two Centers of the NEA Common Services had been combined into a single entity called the NEA Data Bank, and the group in Ispra moved to Saclay. In 1991, the two scientific committees also merged. The combined entity was called the Nuclear Science Committee. The realignment brought all the component scientific activities closer organizationally.

Main Areas of Work and Accomplishments

The work of the NSC is largely focused on scientific and technical issues in the areas of reactor physics, fuel cycle physics and chemistry, criticality safety and radiation shielding. NSC studies of the reactor physics, fuel cycle, fuel behavior, thermal hydraulics and dynamics/safety of present and future nuclear power systems, and their performance of uncertainty analyses of present and future nuclear power systems help provide member countries with up-to-date information to preserve knowledge on and develop consensus in these areas.

Work in the reactor physics area has addressed:

- reactivity characteristics;
- core power/flux distributions;
- core kinetics and reactivity control;
- reactivity coefficients;
- safety/system dynamics;
- vessel dosimetry;
- uncertainty analysis in modeling.

Fuel cycle aspects that have been considered include fuel loading and discharge requirements, fission product and minor actinide inventories and radiotoxicity profiles versus time. Fuel behavior, thermal hydraulics and kinetics/safety are considered in the context of their impact on reactor performance. Radiation transport and dosimetry work covers aspects relevant for reactor vessels and internals, and irradiation facilities.

The work covers a variety of reactor types, including present generation LWRs with advanced and innovative fuels, and evolutionary and innovative LWRs and HWRs, as well as novel reactor systems (such as GNEP and Generation IV Systems), and accelerator-driven (sub-critical) and critical systems for waste transmutation.

In the fuel cycle area, the NSC deals with scientific issues in various existing and advanced nuclear fuel cycles, including fuel cycle physics, associated chemistry and flowsheets, the development and performance of fuels and materials, and accelerators and spallation targets. Particular efforts include work on heavy liquid metal technology, benchmarking of thermal-hydraulic loop models for lead-alloy cooled advanced nuclear energy systems (LACANES), and work on chemical partitioning and separations criteria.

The NSC also has significant activities addressing the technical and scientific issues in the area of criticality safety. Specific areas of interest include investigations of static and transient configurations encountered in the nuclear fuel cycle, including fuel fabrication, transport and storage.

Finally, the NSC has a considerable effort in the area of radiation shielding, and periodically produces new releases of the radiation shielding experiments database (SINBAD). The last release was in 2007. Currently the SINBAD database contains compilations for 42 reactor shielding, 27 fusion neutronics, and 15 accelerator shielding experiments. This work is jointly carried out by the Radiation Safety Information Computational Center (RSICC) at Oak Ridge National Laboratory in the United States

and by the NEA Data Bank. Data for 84 experiments has been collected. The major emphasis has so far been on fission reactor shielding. Facilities used for measurements have now been closed down and there was an urgent need to preserve the data. Data for fusion blanket neutronics and for accelerator shielding experiments are also included.

A large part of the work in all these areas is based on international benchmark exercises. These are conducted to validate models and data used by member countries to predict the behavior and performance of different nuclear systems. As noted above, the work of the Science Committee is very closely integrated with activities of the Data Bank, and results from international benchmark exercises of the Science Committee are incorporated in the Data Bank's documentation of computer programs and nuclear data, particularly in the areas of fuel performance, criticality safety, and radiation shielding.

Relationships with other entities

The close links between the Nuclear Science Committee and the Data Bank already mentioned have historical, organizational, and practical origins. Although the Science Committee includes all NEA members and the Data Bank does not, the two activities have always been coordinated by the organizational arrangements within the NEA. Currently, the linkages exist both in the fact that the Data Bank is managed by a subsidiary body of the Science Committee known as the Executive Group of the NSC. This group operates under the NSC and reports to the NSC in the same way as other subsidiary bodies of NEA Standing Technical Committees. In addition, both the staff of the Nuclear Science Division (that is, the NEA staff group that supports the work of the NSC) and the staff of the Data Bank report to the NEA Deputy Director for Safety and Development.

The NSC work in the reactor physics area is also coordinated very closely with the work of the NDC and CSNI in order to ensure the respective work programs are complementary, and to provide advice and support where required and undertake common work where appropriate.

Internally, close working relationships are also maintained between scientific efforts in the areas of reactor physics and the fuel cycle.

Evolving Activities

The need for good scientific data to support nuclear programs and activities in member countries continues. Therefore, work can be expected to continue on a variety of issues related to current reactors, as new experimental data and more sophisticated computer programs provide an improved understanding of the physical and chemical phenomena of normal and abnormal reactor operations.

In addition, new issues continue to emerge that require new scientific investigations. For example, recent work has examined the scientific and technological limits to very high burn-up fuel cycles, the possibility of burning weapons-grade plutonium in existing light water reactors in the form of mixed-oxide fuel, aqueous and pyrochemical processes being used or developed for reprocessing irradiated fuel, issues related to nuclear waste repositories and advanced fuel cycle scenarios, and advanced technologies for partitioning and transmutation of nuclear wastes.

If current interests in advanced reactor technologies continue in a number of NEA member countries, more analysis of these technologies will be needed. For example, the NSC has already been conducting studies related to coupled neutronics and to thermal-hydraulics transients in the Pebble Bed Modular Reactor (PBMR), as well as studies on the use of different fuels (including low-enriched uranium, plutonium and thorium) in High Temperature Reactors (HTRs), and is beginning work on innovative fuels and materials.

Table 11.1: Chairs of the Nuclear Science Committee and its Predecessors, 1960-2008

EANDC/NEANDC					EACRP/NEACRP			
Year	**Comm.**	**Chair**	**Country**		**Year**	**Comm.**	**Chair**	**Country**
1960-1961	EANDC	R. F. Taschek	United States		1962	EACRP	T.Fry	United Kingdom
1962-1963	EANDC	J. Spaepen	Euratom		1962-1963	EACRP	B.Spinrad	United States
1964-1965	EANDC	E. Bretscher	United Kingdom		1964	EACRP	P.Mummery	United Kingdom
1966-1967	EANDC	G. C. Hanna	Canada		1965	EACRP	B.Spinrad	United States
1968-1969	EANDC	P. Weinzierl	Austria		1965	EACRP	P.Mummery	United Kingdom
1970-1971	EANDC	W. W. Havens	United States		1966-1967	EACRP	V.Raievski	France
1972-1974 (1)	EANDC	J. Story	United Kingdom		1968-1969	EACRP	E.Critoph	Canada
1975-1976	NEANDC	S. Cierjacks	Germany		1970-1972 (1)	EACRP	G.Campbell	United Kingdom
1978-1979	NEANDC	R. E. Chrien	United States		1973	EACRP	W.Hannum	United States
1981-1982	NEANDC	K.H. Böckhoff	Euratom		1974	NEACRP	M.Duret	Canada
1984-1985	NEANDC	A. Michaudon	France		1975-1976	NEACRP	H.Küsters	Germany
1987-1988	NEANDC	A.B. Smith	United States		1977-1978	NEACRP	J.Barré	France
1990-1991	NEANDC	S.M. Qaim	Germany		1979-1980	NEACRP	C.Till	United States
					1981-1983	NEACRP	J.Askew	United Kingdom
					1984-1985	NEACRP	M.Salvatores	France
					1986-1987	NEACRP	L.LeSage	United States
					1988-1989	NEACRP	K.Shirakata	Japan
					1990-1991	NEACRP	P.Wydler	Switzerland

NSC

1991-1994	NSC	Jacques Bouchard	France
1995	NSC	Renato Martinelli	Italy
1996	NSC	Shojiro Matsuura (acting)	Japan
1997-2000	NSC	Massimo Salvatores	France
2001-2006	NSC	Tomas Lefvert	Sweden
2007-	NSC	John Herczeg	United States

(1) ENEA became NEA in 1972.

Note: Early chairmanships are based on records that indicate who presided at each meeting of the respective committees.

XII. DATA BANK

Data Bank in Brief:

Founded: 17 July 1964

Names:
- **ENEA Common Services, 17 July 1964, consisting of:**
  - **Computer Program Library, Ispra, Italy**
  - **Neutron Data Compilation Center, Saclay, France**
- **Data Bank, January 1978**

Members:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Republic of Korea, Mexico, the Netherlands, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom

Observers: Russian Federation, Slovenia

History and Development

In view of the increasingly important role computers were beginning to play in nuclear power activities, on 17 July 1964, ENEA signed an agreement with Euratom to establish a Computer Program Library (CPL) at Euratom's scientific information processing center at the Ispra Joint Research Center (JRC) in Italy. The original purpose of the library was to improve interactions between the originators of computer programs and the scientists and engineers that used those programs, particularly for reactor calculations, so that the most efficient and economic use could be made of the computers required to run those programs, which were large and expensive at that time. The functions of the library were to include the collection, editing and dissemination of nuclear computing programs from laboratories in Europe and the United States.

Early participants in the ENEA Computer Program Library were: Austria, Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom and Euratom. The United States, which had its own code centers, was not a member of the CPL, but a cooperative arrangement was developed that allowed the exchange of programs with the Argonne Code Center and the Radiation Shielding Information Center at Oak Ridge. The Library also had access to computer programs developed in Canada.

The activities of the ENEA CPL included the testing and distribution of programs of interest in the nuclear field; the circulation of several publications ("Nuclear Program Abstracts" and "Computing Facilities") containing abstracts of all computer programs available for distribution and brief descriptions of processing systems used in nuclear science, as well as periodical newsletters with other information of interest; and advisory activities.

Early in the history of the CPL, it became clear that there was considerable interest by non-member countries in having access to the computer programs in the ENEA CPL, and by 1 January 1968, the IAEA and ENEA agreed that IAEA could establish a Computer Program Service located on the premises of the ENEA CPL establishment at Ispra. This Service was initiated as a test in 1968, and has continued to the present. The agreement allowed the Library to obtain programs written in non-OECD countries for distribution to

participating OECD countries, while at the same time, allowed the Library to fulfill requests from non-OECD countries for its programs. The agreement also included a compensation plan for the additional resources required by the Library to fulfill the additional requests.

At the same time, a Neutron Data Compilation Center (NDCC) was established in Saclay, on the outskirts of Paris. The NDCC provided nuclear physics data services and built an integrated database for neutron cross-section data and bibliographic information. The NDCC was one of a Four-Center network of regional neutron data centers, the other three being the National Neutron Cross Section Center (NNCSC), Brookhaven, US; the Nuclear Data Center (CJD), Obninsk, USSR; and the IAEA Nuclear Data Section (NDS) in Vienna. The input data produced in each center were shared with the other centers in a common format. The exchange also included bibliographic information that was periodically published in book form as the Computer Index to Neutron Data (CINDA). The experimental data were subject to a comparison and correction process leading ultimately to the generation of "evaluated data files," which constituted the best estimates for the values and accuracy of the data they covered, and were used throughout the world as a basis for power reactor calculations.

In January 1978, the NEA Data Bank was created to consolidate the functions and personnel of the two NEA Data Centers, which until that time, had both operated separately, but under the common jurisdiction of the Nuclear Science Division. At that time, the group at Ispra was moved to Saclay. The merger of the two operations allowed costs to be reduced by cutting administrative and logistic overheads and by optimizing the use of the expensive computing facilities. The new center also took advantage of the complementarity of the two work programs and the skills and experience of their respective staffs.

At the time of the merger, the membership of the Data Bank included 16 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, and the United Kingdom. The staff of 27 was managed by the head of the Nuclear Science Division and was housed in a building provided by the French Atomic Energy Commission at its Saclay research center.

As noted previously, the Data Bank is managed by a subsidiary body of the Nuclear Science Committee called the Executive Group of the NSC. The membership of this Executive Group consists of representatives of the currently 22 member countries of the Data Bank. The Executive Group sets the direction for the work of the Data Bank.

After the creation of the Data Bank, the original activities of the two earlier centers continued under two groups within the Data Bank. One group was a computer program service that performed functions corresponding to the previous CPL, and was responsible for receipt, testing and distribution of computer programs. The Saclay location gave the Data Bank ready access to the Compagnie Internationale de Services en Informatique (CISI), the largest computer service bureau in Europe, which facilitated the classification, storage, and distribution of very large quantities of information in the form of numerical and bibliographic data and large computer programs. The other group continued the functions of the NDCC, providing nuclear physics data services, building an integrated database for neutron cross-section data and bibliographic information, and working with the other partners in the Four-Center network.

By the early 1990s, there was a network of about 400 registered user establishments in the participating countries, including government research institutes, industry and universities. Each computer program in the Data Bank was distributed to an average of 10 users.

Over time, the demand for exchanges of nuclear data and computer programs grew, but at the same time, the nature of the needs met by the Data Bank changed somewhat. In particular, the early impetus for the Computer Program Library and the Data Bank was the effective and efficient use of the large, costly computers required to run the large programs needed for nuclear calculations. In the years following the establishment of these activities, computing power increased by orders of magnitude and the costs of running large computer programs tumbled. Nevertheless, developing and maintaining large, complex computer codes is still costly, so the countries in the Data Bank still benefit from sharing the costs associated with these efforts.

The Data Bank currently has 22 members. These are: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Republic of Korea, Mexico, the Netherlands, Norway, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey and the United Kingdom. In addition, it continues to maintain an agreement with the IAEA for a computer program service that covers both Data Bank countries and member states of the IAEA. Separate agreements cover nuclear data and computer program exchanges with the US and Canada.

Main areas of effort/accomplishments

The Data Bank's computer program service plays a critical role in the collection, validation and dissemination of computer codes and associated application data libraries used by scientists and engineers working on nuclear technology in its member countries, as well as in countries with which the Data Bank has cooperative agreements. The computer program service has grown to include some 2000 computer codes covering a broad range of areas, including reactor design, dynamics, safety, radiation shielding, material behavior and waste applications.

In a recent typical year, the Data Bank responded to requests for nearly 1800 programs a year, about 6 or 7% of them from authorized users in non-NEA countries. In addition, they responded to requests for nearly 3800 sets of data from integral experiments in support of computer code validation, about 16% of them from non-NEA countries.

As part of the computer program services, the Data Bank conducts a number of training courses each year on the use of some of its computer programs. As has been noted previously, the NEA sponsors education and training activities only on an exceptional basis to meet a need that cannot readily be satisfied by other means. In this case, since the NEA maintains the computer programs, they sponsor or co-sponsor training for the most widely used programs. In a recent typical year, the NEA sponsored two such courses and cosponsored six.

Another significant area of effort of the Data Bank has been its work on integral experimental data. Working closely with the Nuclear Science Committee, the Data Bank has compiled, documented, verified, evaluated, and disseminated a large body of data from integral experiments in the areas of reactor physics, fuel behavior, radiation shielding, and criticality safety. Some of the most recognized products of the Data Bank in this area include:

- IFPE (integral fuel performance experiments) database;
- SINBAD (database of shielding and dosimetry benchmark experiments); and
- IRPhE (international handbook of evaluated reactor physics benchmark experiments).

The Data Bank also maintains large online databases that are widely used by scientists and engineers in member countries. The databases contain bibliographic (CINDA), experimental (EXFOR) and evaluated (EVA) nuclear data, and are maintained in close

cooperation with other nuclear data centers. They cover most types of data needed in nuclear energy applications. The number of retrievals from the NEA website averages around 1200 per month for the bibliographic and experimental databases, and an equal number for the evaluated data libraries. In addition, the NEA website makes available nuclear data display software (JANIS) that allows the manipulation of nuclear data. Users of this software access the NEA online databases about 25,000 times per month, often for use in university courses.

One of the evaluated data libraries, the Joint Evaluated Fission and Fusion (JEFF) library, is a radioactive decay data library. The NEA Data Bank has implemented a mechanism to validate the library by having users provide feedback to a dedicated webpage. Updated, evaluated files are posted to the website following review. A processed library based on the latest version of the JEFF library can be used with a Monte Carlo code for application calculations.

The NEA Data Bank also provides a framework for international cooperative activities between participating evaluated nuclear data libraries in Japan (JENDL), the United States (ENDF), Western Europe (JEFF), Russia (BROND), China (CENDL), and the IAEA (FENDL). The inclusion of both OECD member countries and non-OECD countries in this activity allows both OECD members and non-members access to a broader base of libraries.

As has been noted, the Data Bank also supports the work of other NEA committees. One project of note is the Thermochemical Database (TDB) project, performed as a Joint Project (and described in the appendix) and under the scientific guidance of the NEA Radioactive Waste Management Committee.

Relationships with other entities

Relationships with other NEA STCs

The Data Bank works closely with other parts of the NEA to provide services and support where large computer programs or data compilations are involved.

The Data Bank works particularly closely with the NEA Nuclear Science Division, especially in the field of international computer code comparisons and integral experiments. Results from international benchmark comparisons are incorporated in the Data Bank's documentation of the computer programs and nuclear data concerned. The Data Bank also stores information about experimental data used in validating different types of computer programs. Databases are currently held for radiation shielding experiments (SINBAD), criticality safety benchmark experiments (ICSBEP), fuel performance experiments, and atmospheric dispersion tracer experiments.

In the area of Radiation Protection and Radioactive Waste Management, the Data Bank has been involved in a major effort to develop a thermochemical database (TDB) on the key elements required for geochemical modeling. Teams of international experts are carrying out critical reviews of bibliographic references and have set up a quality-assured database. Since 1992, reports have been prepared on different elements and materials of interest. Reports on Uranium (1992), Americium (1995), Technetium (1999), Neptunium and Plutonium (2001), Update on the previous elements (2003), Nickel (2005), Selenium (2005), Zirconium (2005), Organic Ligands (2005) and the Thermodynamics of Solid Solutions (2007) have been published. Currently, work is being conducted on Thorium, Tin and Iron.

In the area of Nuclear Safety, the Data Bank has developed a web-based reporting system for the Fuel Incident Notification and Analysis System (FINAS). A detailed set of nuclear plant design characteristics and diagrams for units in NEA member countries has also been compiled. The NEA Data Bank maintains and provides a service for an extensive

database containing CSNI Code validation matrix integral test data and separate effects test data for thermo-hydraulic transient experiments to be used in validating the large thermo-hydraulic computer codes for the safety analysis of reactor transients.

Relationships with other organizations

As noted above, the Data Bank works closely with the IAEA. The agreement for the Data Bank to share its expertise and resources with IAEA member states also allows the Data Bank to obtain information from these countries. The arrangement includes having the IAEA provide a cost-free expert to the NEA to offset the additional workload for NEA to provide assistance to non-member countries.

In addition, the Data Bank has agreements for exchanges of computer programs and data with countries having their own data banks, in particular, the United States and Canada.

Table 12.1: Chairs of the Data Bank, 1978-2008

Years	Chair	Country	Organization
1978-1980	J. Brunner	Switzerland	EIR Würenlingen
1981-1982	Bryan Patrick	United Kingdom	AERE Harwell
1983-1984	Leif Hansson	Denmark	Risoe National Laboratory
1985-1986	Heinz Küsters	Germany	Kernforschungszentrum Karlsruhe
1987-1988	Sven Linde	Sweden	Studsvik Energiteknik AB
1989-1990	Claude Philis	France	Commisariat à l'Énergie Atomique BRC
1990-1992	Hugo Ceulemans	Belgium	SCK/CEN Mol
1993-1994	Leslie Underhill	United Kingdom	AERE Risley
1995-1996	Kjell Bendiksen	Norway	Institute for Energy Technology Kjeller
1997-1999	Harm Gruppelaar	The Netherlands	NRG Petten
2000	Syed Qaim	Germany	Kernforschungsanlage Jülich
2001-	Pierre D'Hondt	Belgium	SCK/CEN Mol

XIII. JOINT PROJECTS

Joint Projects were among the earliest undertakings of the Agency. In fact, like the committees on nuclear law and on radiation protection, the initial activities associated with first Joint Project were actually started prior to the formal founding of the Agency.

Early Projects

While most of the Joint Projects today are safety-related projects, the earliest projects focused on developing new technologies for the fledgling nuclear industry.

Eurochemic Project: The Convention on the Eurochemic Company was signed on December 1957, the same month as the statute for ENEA was adopted by the OEEC Council. This made Eurochemic the first joint undertaking to be initiated under the auspices of the new ENEA. Built at Mol, Belgium, Eurochemic involved thirteen OECD countries, and its efforts helped develop the technology of recycling spent reactor fuel. Eurochemic also reprocessed fuels from its member countries' reactors in its own plant. However, given the small size of this plant (about 100 tonnes/year), and the limited reprocessing market, the plant was ultimately closed.

Halden Project: The Halden Reactor Project in southern Norway has been in operation for nearly 50 years, making it the oldest continuously operating project. The Halden Reactor is an experimental heavy water moderated and cooled boiling water reactor, originally intended to provide steam to a nearby pulp factory and to allow research to be conducted on the physics and chemistry of the reactor system. The Project was launched on 11 June 1958 by the signing of an agreement between the Norwegian Atomic Energy Institute and the ENEA, and was inaugurated in June 1959 in the presence of King Olav of Norway. Today, the reactor still provides steam for the paper mill, but over time, the technical focus has evolved. The Project now brings together an international technical network in the areas of nuclear materials and fuel reliability, integrity of reactor internals, plant control/monitoring and human factors. It is the largest NEA Joint Project, involving 18 countries and about 100 organizations in those countries, and is probably one of the world's longest-running international research collaborations.

Dragon Project: The Dragon Reactor Experiment (DRE), built in the 1960s, was the first demonstration high temperature gas-cooled reactor (HTGR). In March 1959, thirteen OECD countries agreed on the construction of an experimental reactor known as Dragon at Winfrith in the UK. The reactor went critical in October 1964 and operated successfully between 1966 and 1975. It had a thermal output of 20 MW and achieved a gas outlet temperature of 750ºC. The reactor was used for the testing alternative designs for and fuel elements at high temperatures.

The Evolution of Joint Projects

For a variety of reasons, although Eurochemic and Dragon achieved many of its research initiatives, they did not lead to the kind of commercial success that had been envisioned, and were eventually shut down. That experience, coupled with emerging needs for safety-related research in support of the growing number of reactors being built and operated, resulted in a shift of Joint Project work towards safety issues. The operating model for Joint Projects established by these early collaborations was successful, and has effectively been used for all projects since that time.

The success of the Joint Project concept is evidenced by the fact that there are 23 active projects currently active at this time, and a number of new projects have been initiated in recent years. Of these projects, the great majority (18) are safety-related, while four are in the area of radioactive waste and one is in the area of radiation protection. In addition,

several international collaborative activities, including the Generation IV International Forum (GIF) and the Multinational Design Evaluation Program (MDEP), have adopted many of the administrative and financial features of Joint Projects. Likewise, in the 50 years since the establishment of the first Joint Project, the Agency has successfully conducted and completed a number of additional projects, of which we have been able to identify 16 below.

It is also noteworthy that the Joint Projects include a variety of types of activities. The first projects were all designed to facilitate the sharing of a single research facility. The benefits of sharing an expensive research facility are still among the most compelling reasons for countries to enter into Joint Projects. However, the Joint Projects have value beyond the sharing of facilities, and later projects have sometimes involved collaborations conducted at several facilities, or even collaborations that don't involve a facility at all. Thus, in addition to experimental projects, a number of Joint Projects have been initiated to develop and share databases.

Table 13.1 lists all known Joint Projects that have been completed, while Table 13.2 lists all Joint Projects that are currently underway at this time. Each table is ordered according to the starting date of the project. As no compilation of all projects done in the past exists, the list of projects in Table 13.1 should not, at present, be regarded as comprehensive, although it is believed that all the larger and more significant projects have been identified. Table 13.2 does include all ongoing projects. Budget information is provided only for current projects. Detailed descriptions of all current projects and of projects completed in the last few years are available on the NEA website (http://www.nea.fr/html/jointproj/welcome.html). Dates used represent dates that the activity operated as an NEA Joint Project. Some Joint Projects may have started earlier as national projects, conferences, etc. These earlier activities are not reflected in the table.

Joint Project Operating Model

Each project is undertaken as a separate entity, with a separate membership and a separate agreement describing how it will operate. Thus, there are differences from project to project, including the participants in the project, how the project is funded, the duration of the project, and other details. Nevertheless, they all have several features in common, and generally operate according to the following principles:

- NEA serves as the Secretariat for all the projects;
- All projects are multinational, so involve the participation of more than two countries;
- The members of the project include only those countries with an interest in that particular effort, so not all NEA members participate in any given project;
- Furthermore, membership in Joint Projects may include countries that are not NEA members (and non-member countries may even host projects);
- Depending on the project, one or more institutions from each participating country may participate in the project, and, as appropriate, the institutions may include non-government organizations as well as government organizations;
- The member countries contribute to the funding of the project according to an agreed formula;
- NEA is compensated for its staff and other expenses incurred in conjunction with serving as the Secretariat of the project (there are several different ways in which this compensation is structured);

- In the case of projects involving research facilities, there is a host country, and that country usually contributes a higher portion of the cost of the project than other participating countries;

- Representatives of the participating countries, operating by consensus, establish the research goals and objectives, and oversee the progress of the work;

- Projects operate for a fixed duration, or, for longer-term projects, operate under three-year renewable mandates.

There is no maximum period of operation of a project, although of course the longer-term projects evolve over the course of time, and both membership and research activities may change. The Halden project, the longest of the NEA Joint Projects, has been in existence for 50 years, but its focus has changed as different needs have been identified. Other projects have been designed with fixed durations; follow-on phases are subject to new agreements.

As has previously been noted, the NEA has run many projects over the years that are international in nature and involve a subset of member countries of the NEA. Under some conditions, including when the shared operation of a country's facilities are involved, when separate funding is required for the activity, when non-NEA countries are involved, a formal agreement is developed and the project operates as a formal Joint Project. In other cases however, such as when no separate funding is necessary, the project may exist simply as an activity of a working group of an NEA Standing Technical Committee. In some cases, written descriptions of the activity may sound similar to a description of a Joint Project. For purposes of the tables in this section, only projects that are known to have formally operated as Joint Projects are included.

Table 13.1: Summary of Completed ENEA/NEA Joint Projects, 1957-2008

Project Title	Start Date	End Date	Facility/ Location	Countries (#)	Project Type
Eurochemic (First ENEA Project)	1957	1975	Mol, Belgium	13	Technology
Dragon Reactor Experiment (DRE)	1959	1975	Winfrith, UK	13	Technology
Food Irradiation	1971	1978*	Unknown	23	Applications
Program for the Inspection of Steel Components (PISC) Project	1974	1986	European Communities Joint Research Center (Ispra)	Unknown	Safety
Multilateral Consultation & Surveillance Mechanism for Sea Dumping of Radioactive Waste	1977*	Unknown	Unknown	Unknown	Radioactive Waste
Stripa Project	1980	1991	Stripa, Sweden	5	Radioactive Waste
CRESP (Coordinated Research and Environmental Surveillance Program)	1981	1995	Unknown	Unknown	Radioactive Waste
Loss of Fluid Test (LOFT) Facility Project	~1982	~1989	Idaho National Energy Laboratory (INEL), US	Unknown	Safety
TMI-2 Examination Results	1986*	1992	Unknown	Unknown	Safety
ARAP (Alligator River Analogue Project)	1987	1990	Alligator River, Australia	4	Radioactive Waste
ASARR (Analogue Study in the Alligator River Region Project)	1995	1998	Alligator River, Australia	3	Radioactive Waste
Plant Safety Monitoring and Assessment (PLASMA) Project	1994	2000	Multiple	Unknown	Safety
SCORPIO Project	1996	1998	Halden Research Rx, Norway; Dukovany	Unknown	Safety
Bubbler Condenser Project	1998	2002	Electrogorsk Res. Center (EREC), Russia	8	Safety
Sandia Lower Head Failure Project	1998	2002	Sandia National Lab, US	8	Safety
RASPLAV	*	2000	Kurchatov Institute, Russia	17	Safety
MASCA-1 Project (Material Scaling for In-Vessel Core Melt)	2000	2003	Multiple	17	Safety
SESAR Thermal-Hydraulics (SETH) Project	2001	2006	Paul Scherrer Institute (PSI) PANDA & PKL, Erlangen in Switzerland & Germany	15	Safety
MASCA-2 Project	2003	2006	Kurchatov Institute, Russia	14	Safety

* Exact date unknown or approximate.

Table 13.2: Summary of Current ENEA/NEA Joint Projects, 1958-2008

Project Title	Start Date	Facility/ Location	Countries (#)	Budget	Project Type
Halden Reactor Project	1958	Halden Res Rx, Norway	18	360M Norwegian kroner/US$45M	Safety (originally Technology)
Thermochemical Database (TDB) Project	1984	N/A	15	~Euro 400K/yr	Radioactive Waste
International Cooperative Program on Decommissioning (CPD)	1985	PKL, Erlangen, Germany, & PSI, Zurich, Switzerland	12	Euro 44K/yr	Radioactive Waste
Information System on Occupational Exposure (ISOE)	1990	N/A	29	Euro 360K/yr	Radiation Protection
International Common-Cause Data Exchange (ICDE) Project	1994	N/A	11	US$150K/yr	Safety
Sorption Project	2000*	N/A	12	Euro 430K	Radioactive Waste
Cabri Water Loop Project	2000	Cadarache, France	13	Euro 73.8M/ US$77.5M	Safety
Melt Coolability and Concrete Interaction (MCCI) Project	2002	Argonne National Laboratory, US	13	US$1.2M/yr	Safety
OECD Piping Failure Data Exchange (OPDE) Project	2002	N/A	12	US$72K/yr	Safety
Fire Incidents Records Exchange (FIRE)	2003	N/A	12	Euro 75K/yr	Safety
PSB-VVER Project	2003	Electrogorsk Research & Engineering Center, Russia	7	US$1.25M	Safety
PKL-2 Project (PWR safety issues)	2004	PKL Facility, Erlangen, Germany	14	US$1.2M/yr (50% funded by Germany)	Safety
Studsvik Cladding Integrity Project (SCIP)	2004	Studsvik, Sweden	10	12M Swedish krona (~US$1.8M) (50% funded by Sweden)	Safety
COMPSIS Project	2005	N/A	10	Euro 100K/yr	Safety
Rig of Safety Assessment (ROSA) Project	2005	ROSA Facility, Japan	13	US$1.0M/yr	Safety
PRISME Project (fire propagation)	2006	Cadarache, France	10	Euro 7M	Safety
Stress Corrosion Cracking and Cable Aging Project (SCAP)	2006	N/A	14	Euro 480K/yr (funded by Japan)	Safety
Steam Explosion Resolution for Nuclear Applications (SERENA) Project	2007	TROI (KAERI) & KROTOS (CEA) in Korea &France	10	Euro 2.6M	Safety
SETH-2 Project	2007	Paul Scherrer	9	US$3.2M	Safety

Containment Thermal Hydraulics		Institute (PSI) PANDA & CEA MISTRA in Switzerland & France			
ThAI Project (Thermal Hydraulics, Aerosols, Iodine)	2007	Becker Technologies, Frankfurt	8	Euro 2.8M	Safety
Behavior of Iodine Project (BIP)	2007	AECL, Canada	13	Can$1.5M per yr	Safety

*Phase 1 started in 1996 as a conference. It became a Joint Project in 2000.

XIV. CONCLUSIONS

The descriptions provided in this document of the activities of the NEA over the last 50 years provide a compelling image of how integrally the NEA has been involved with many of the major activities and issues of the period, and how much it has contributed to the nuclear field in its member countries and around the world. Although NEA is a small agency, the volume and quality of its work have allowed it to have an impact far beyond its size.

NEA has worked at the forefront of many issues, gathering the leading experts around the world to explore technical and policy problems, getting ahead of the curve in addressing nuclear liability issues, developing new tools to track radiation exposures and to learn from nuclear incidents, pioneering new ways of dealing with stakeholders, instituting mechanisms to facilitate multinational research collaboration, and working cooperatively with a variety of organizations around the world.

It is not an exaggeration to say that NEA's work has contributed significantly to nuclear developments in many ways, including through the legal work that gave industries the confidence to begin nuclear programs, the research that has contributed to the safe operation of nuclear plants, and the extensive scientific work, the peer reviews, and the numerous economic and other studies that have contributed to sound technical and policy decisions.

The NEA continues to hold an important place in the nuclear community as it heads into its second 50 years. The need for further improvements in the understanding of existing reactors to assure their continued safe and efficient operation, the on-going efforts in several countries to develop and implement plans to dispose of high-level waste, and the emerging interest in a new generation of reactor technology and in the expansion of the use of nuclear power around the globe all pose new challenges for the entire nuclear community. NEA's experience in these areas and its track record of working efficiently and effectively will enable it to help its member countries and others address new issues as they emerge.

Further, NEA's recent outreach to non-member countries with significant nuclear programs and its long-standing cooperation with other international nuclear organizations are likely to make its contributions even broader and more far-reaching. NEA's involvement in several of the new international initiatives associated with advanced reactor development and with licensing new designs reinforce the fact that the nuclear community turns to the Agency for assistance on demanding new issues, and that NEA is likely to make major contributions to new developments in these areas.

It is clear that the vision put forward more than 50 years ago for the NEA has achieved its goals many times over, and that it promises to continue to do so in the future.

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APPENDIX

Appendix 1: NEA—The First 50 Years

Note: Most of the information in this table has already been documented in other tables in this document. This compilation is provided here as a convenience to the reader, as well as to reflect (and update) a table that appeared in *Nuclear News,* February 2008, "The OECD Nuclear Energy Agency at 50," by Gail H. Marcus, pp. 27-33, and with slight modifications, on the OECD/NEA website at:
http://www.nea.fr/general/history/timeline.html

Events in the evolution of the NEA prior to 1958, which are also reflected in the *Nuclear News* article and on the NEA website, are covered in Table 2.1 of this document.

1958	**1 February**	**European Nuclear Energy Agency (ENEA) Statute enters into force** (all 17 OEEC members join ENEA: *Austria, Belgium, Denmark, France, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, UK, West Germany*); Canada and the US are associate members
		Pierre Huet, France, appointed Director-General
	21 February	Health and Safety Committee (HSC) established
	11 June	Halden Reactor Project established
1959	July	High Temperature Gas-Cooled Reactor Project (Dragon) launched
	20 July	Spain becomes a full member of the OEEC and therefore, also of the ENEA
1960	29 July	Paris Convention on Third Party Liability in the Field of Nuclear Energy adopted by OEEC Council
	30 September	Agreement for cooperation signed between the ENEA and the International Atomic Energy Agency (IAEA)
	14 December	Convention establishing the Organization for Economic Cooperation and Development signed in Paris, France
1961		**OEEC becomes Organization for Economic Cooperation and Development (OECD)**
	Autumn	Prof. J.M. Otero y de Navascues, Spain, elected Chair of Steering Committee
1962		
1963	31 January	Brussels Convention Supplementary to the Paris Convention adopted
1964		Einar Saeland, Norway, appointed Director-General
	January	ENEA common services created (Computer Program Library at

		Ispra, Italy, and Neutron Data Compilation Center at Saclay, France
	July	Prof. U.W. Hochstrasser, Switzerland, elected Chair of Steering Committee
	November	Study Group on Long-Term Role of Nuclear Energy (NELT) established
1965	23 February	Japan joins ENEA as associate member
	June	Committee on Reactor Safety Technology (CREST) established
1966		
1967	June	H.H. Koch, Denmark elected Chair of Steering Committee
1968		
1969	April	Prof. Carlo Salvatti, Italy elected Chair of Steering Committee
1970		
1971		
1972	20 April	Japan becomes a member
	20 April	**Name changed to Nuclear Energy Agency (NEA)**
	May	Reinhard Loosch, Germany, elected Chair of Steering Committee
1973	1 February	*Committee on Safety of Nuclear Installations (CSNI) established,* replacing CREST and taking on the regulatory functions of the HSC
	1 February	*Committee on Radiation Protection and Public Health (CRPPH) established,* replacing the HSC
	1 October	Australia becomes a member
1974		
1975	1 April	Canada becomes a member
	23 June	*Radioactive Waste Management Committee established*
1976	1 January	Finland becomes a member
	31 March	Dragon project concluded
	April	Dr. Bo Aler, Sweden, elected Chair of Steering Committee
	1 October	United States becomes a member
1977		I. Williams, UK, appointed Director-General

	26 October	*Committee for Technical and Economic Studies on Nuclear Energy Development and the Fuel Cycle (NDC) established,* replacing NELT
1978	January	Data Bank established in Saclay, France
1979	April	Hiroshi Murata, Japan, elected Chair of Steering Committee
1980	January	Incident Reporting System (IRS) established by CSNI for the exchange of information on incidents in reactor operations
1981		
1982		Howard Shapar, US, appointed Director-General
	April	Ivor Manley, UK, elected Chair of Steering Committee
1983		
1984	October	Joint NEA/IAEA Uranium Group established
1985		Eurochemic plant ceases operation (work continues on site to develop decommissioning techniques)
	April	Ambassador Richard Kennedy, US, elected Chair of Steering Committee
1986		
1987	March	Report *The Radiological Impact of the Chernobyl Accident in OECD Countries* published
1988		Kunehiko Uematsu, Japan, appointed Director-General
1989	3 October	*Committee on Nuclear Regulatory Activities (CNRA) established,* splitting off regulatory activities from CSNI
1990	March	International Nuclear Event Scale (INES) established by NEA and IAEA to standardize reporting of nuclear incidents and accidents to the public
1991	April	Dr. Robert Morrisson, Canada, elected Chair of Steering Committee
	18 November	*Nuclear Science Committee (NSC) established*
	18 November	Information System on Occupational Exposure (ISOE) established
1992	March	Fuel Incident Notification and Analysis System (FINAS) created
1993	March-May	First International Nuclear Emergency Exercise (INEX) conducted
	24 May	South Korea becomes a member
1994	18 May	Mexico becomes a member
		NEA moves from boulevard Suchet to Issy-les-Moulineaux

	October	Dr. Jorg Hermann Gosele, Germany, elected Chair of Steering Committee
1995		Sam Thompson, US, becomes Acting Director-General
1996	27 June	Czech Republic and Hungary become members
	October	Christian Prettre, France, elected Chair of Steering Committee
1997		Luis Echavarri, Spain, appointed Director-General
	3 May ck	High-level advisory group established by Secretary-General to review the NEA
1998	29 January	Report of the high-level advisory group completed
	October	Lars Hogberg, Sweden, elected Chair of Steering Committee
1999	3 January	First NEA Strategic Plan published
2000	12 October	*Nuclear Law Committee (NLC) established*, replacing Group of Governmental Experts on Third Party Liability in the Field of Nuclear Energy
2001		NEA, IAEA, and WANO agree to develop joint Nuclear Events Web Based Systems (NEWS) to transmit information on nuclear Incidents (originally for one-year trial)
	27 August	International School of Nuclear Law (ISNL) established jointly with the University of Montpellier I, Montpellier, France
2002	March	NEA, IAEA, and WANO agree to continue Nuclear Events Web Based Systems (NEWS) beyond trial period
	13 June	Slovak Republic becomes a member
2003	October	William Magwood, US, elected Chair of Steering Committee
2004	27 January	NEA becomes Technical Secretariat for the Generation IV International Forum (GIF)
2005	14-15 June	First NEA Safety and Regulation Forum (SRF) on Multilateral Cooperation in Nuclear Safety Research and Regulation conducted
	April	Jussi Manninen, Finland, elected Acting Chair of Steering Committee
	October	Jussi Manninen, Finland, elected Chair of Steering Committee
2006	22 September	NEA becomes Technical Secretariat for Stage 2 of the Multinational Design Evaluation Program (MDEP)
	April	Richard Stratford, US, elected Chair of Steering Committee
2007		Agreement for cooperation with Russia signed
2008	1 February	50th Anniversary of NEA

Appendix 2: Brief Background Sketches of Directors-General

Peter Huet (1958-1964)

Citizenship: French
Education: Not available

Limited information is available on Mr. Huet. Prior to being appointed as the first Director-General of the ENEA, he was General Counsel of the OEEC. In that capacity, he played a major role in the development and implementation of the ENEA.

Einar Saeland (1964-1977)

Citizenship: Norwegian
Education: Degree in Physical Chemistry from Oslo University
Post graduate nuclear research at College du France

Spent the early part of his career as a research scientist for several organizations, including Norsk Hydro, the Norwegian Defense Research Establishment, the Norwegian Institute for Atomic Energy, and the Dutch-Norwegian Joint Establishment for Nuclear Energy Research (JENER). Last position at JENER was as Director of the Isotope Division. Joined the ENEA shortly after its founding, first as Deputy Director, later as Deputy Director-General.

Ian G.K. Willams (1977-1982)

Citizenship: British
Education: B. Sc. in Economics, 1951

Joined the U.K. Atomic Energy Authority in 1955 and participated in reviews of the organization following the Windscale accident of October 1957. In January 1958, formed a new Health and Safety Branch in the Authority's London Office, later merged into the Authority Health and Safety Branch established in July 1959. Was responsible for the Authority's external relations on health and safety matters, with a particular interest in the international aspects. Also headed the Authority's Secretariat Branch.

Was appointed Deputy Director-General of the European Nuclear Energy Agency September 1966.

Howard Shapar (1982-1988)

Citizenship: American
Education: Degree in Law, Yale Law School, 1950

Joined the U.S. Atomic Energy Commission (AEC) in 1950, and was Assistant General Counsel for Licensing and Regulation at the AEC at the time of the establishment of the U. S. Nuclear Regulatory Commission (NRC) and the transfer of the licensing and regulatory functions to that agency. Was the Executive Legal Director of the NRC before taking up his NEA post. In this capacity, provided legal and policy advice to the NRC on a wide variety of activities including licensing and regulation of nuclear power reactors and nuclear materials, enforcement, nuclear exports and imports, international agreements, and nuclear insurance and indemnity.

He was also President of the International Nuclear Law Association.

Kunihiko Uematsu (1988-95)

Citizenship: Japanese
Education: Undergraduate Degree, Kyoto University
Graduate Degree, School of Engineering, Kyoto University
Sc.D., MIT (US), 1961

Taught at several Japanese universities. Joined the Power Reactor and Nuclear Fuel Development Corporation (PNC) of Japan in 1968 as Head of Fuel and Materials Development for the Fast Breeder Reactor Project, became Executive Managing Director of the Fuel Development Division in 1982, and was named Executive Director of PNC in 1983. Was responsible for development activities related to plutonium fuel, waste management and advanced technology.

Samuel Thompson (1995 -1997, Acting Director-General)

Citizenship: American
Education: BA, Harvard College
MA, Fletcher School of Law and Diplomacy

Joined the U.S. Atomic Energy Commission (AEC) in 1966, and later became head of the Arms Control office at the U.S. Department of Energy (DOE). Served as special assistant in the Department of Safeguards in 1977-78. Joined the U.S. Department of State (DOS) in 1984 as Special Assistant to the Ambassador-at-large for Nuclear Non-Proliferation and Nuclear Energy Affairs. In this position, was responsible for the development of nuclear co-operation and non-proliferation positions for the US Government.

Luis Echavarri (1997-)

Citizenship: Spanish
Education: Degree in Industrial Engineering (including applied nuclear physics), Madrid University
Master's degree in Information Sciences, Madrid University

Began his career as a project manager at the Madrid Westinghouse Electric nuclear office, and was subsequently appointed Plant Manager of the Lemoniz, Sayago and Almaraz nuclear power plants. Later served as Technical Director, then Commissioner, of the Consejo de Seguridad Nuclear, the Spanish nuclear regulatory commission. Just prior to joining the NEA, was Director General of the Spanish Nuclear Industry Forum.

Appendix 3: Brief Background Sketches of Steering Committee Chairs

Biographies not available for:

Leander Nicolaidis (1956-60), Greece
J.M. Otero y de Navasues (1961-63), Spain
U.W. Hochstrasser (1964-66), Switzerland
H.H. Koch (1967-68), Denmark
Carlo Salvatti (1969-72), Italy
Reinhardt Loosch (1973-75), Germany
Bo Aler (1976-78), Sweden
Ivor Manley (1982-85),

Hiroshi Murata (1979-84)

Citizenship: Japan
Education: Ryojun (Port Arthur) Institute of Technology

Career has included positions as First Secretary at the Embassy of Japan in the United Kingdom (1958), several leadership positions in the Japanese Science and Technology Agency, including Director General of its Atomic Energy Bureau (1964). In 1967, became Executive Director, Power Reactor and Nuclear Development Corporation (PNC). In 1978, became President of the Japan Atomic Energy Research Institute (JAERI). During chairmanship of NEA Steering Committee, became President of the Nuclear Safety Research Association (1981).

Richard Kennedy(1985-90)

Citizenship: US
Education: Unknown

After a 30-year career in the US Army, retired as a colonel in 1971. Served as deputy assistant to the President for national security planning. Nominated by President Ford as a Commissioner to the Nuclear Regulatory Commission, serving in that post from 1975-80. Served as Under Secretary of State for Management from 1981-82. Was named Ambassador at Large for Nuclear Affairs by President Reagan in 1982. Simultaneously served as special advisor to the Secretary of State of nonproliferation policy and nuclear energy affairs.

Robert Morrison (1991-94)

Citizenship: Canadian
Education: Degree in Engineering Physics, McGill University
Doctorat du Troisieme Cycle in Particle Physics, University of Paris

After serving as a Research Associate at the Stanford Linear Accelerator Center in California and as a Visiting Professor at the National University of Engineering in Lima, Peru, Dr. Morrison joined the Physics Department at Carleton University, where he pursued research on charged-particle detectors and high-voltage pulse systems between 1968 and 1080. Between 1980 and 1997, he served as Director-General of the Uranium and Nuclear Energy Branch in Canada's Department of National Resources. From 1990 to 1995, he was also responsible for federal policy on electricity.

Horg Hermann Gosele (1994-95), Germany

M. Christian Prettre (1996-97)

Citizenship: French
Education: Agrege d'Histoire, Ecole Nationale d'Administration, 1967

Served in a number of government posts in France and abroad, including as Ambassador to Oslo from 1989-1992. Upon return from Oslo, became Minister Plenipotentiary and Director, International Affairs, Atomic Energy Commission. Holds French Legion of Honor.

Lars Hogberg (1998-2002)

Citizenship: Swedish
Education: M. Sci., Plasma Physics, Uppsala University, Institute of Physics

After beginning his career in research and teaching positions at Uppsala University, held various positions at the National Defense Research Institute. In 1980, moved to Swedish Nuclear Power Inspectorate, first as Director, Office of Regulation, then from 1989-99, as Director General. From 2001-02, served as Director General in the Ministry of the Environment. In 2002, assigned as Special Advisor to the Ministry of the Environment after reaching retirement age for full-time duty.

William Magwood (2003-2005)

Citizenship: American
Education: B.S., Physics and B.A., English, Carnegie-Mellon University
M.F.A., University of Pittsburgh

Early career includes positions at the Edison Electric Institute managing electrical utility research and nuclear policy programs, and at Westinghouse Electric Corporation analyzing radiological and hazardous waste disposal, treatment and handling systems, and providing technical support to nuclear fuel marketing efforts. In 1994, joined the Office of Nuclear Energy, Science and Technology at the U.S. Department of Energy. Served as Director of the office from 1998 to 2005, managing the DOE activities in nuclear energy R&D, isotope production, uranium hexafluoride stockpiles, international nuclear collaboration, and development of power systems for deep space exploration.

Jussi Manninen (2005-06)

Citizenship: Finnish
Education: M.Sc., Engineering, Helsinki University of Technology, Department of Technical Physics, 1965
Lic. Tech., Helsinki Univerity of Technology, 1985

After teaching at the Helsinki University of Technology, joined the Ministry of Trade and Industry (MTI) in 1973, serving in a variety of position in the Energy Department through 1986, when he took a special assignment on nuclear energy matters in the Political Department and Legal Department of the Ministry for Foreign Affairs. Returned to MTI in 1988, again serving in various positions until becoming Head of the Nuclear Energy Division and Deputy Director General of the Energy Department in 1990.

Richard Stratford (2006-)

Citizenship: US
Education: B.S., Public Administration, Georgetown University, 1970
J.D., American University, 1974

After working in a private law firm, served as Special Counsel at the Nuclear Regulatory Commission from 1975-1978. From 1982 to 1987, was the Executive Assistant to the

Ambassador-at-Large and Special Adviser to the Secretary on Non-Proliferation Policy and Nuclear Energy Affairs. From 1987 to 1983, Mr. Stratford was the Deputy Assistant Secretary of State for Nuclear Energy and Energy Technology Affairs in the Bureau of Oceans and International Environmental and Scientific Affairs at the US Department of State. Serves as the U.S. Head of Delegation to the Nuclear Suppliers Group (NSG) and the NSG's Dual-Use Regime, and to the NPT Exporters Committee. Was also the U.S. Head of Delegation and chief negotiator of the Nuclear Safety Convention and the Convention on the Safe Management of Spent Fuel and Radioactive Waste.

About the Author

Dr. Gail H. Marcus is an independent consultant specializing in nuclear policy, regulation, and international cooperation. Her present work follows a distinguished career in senior management positions in the legislative branch (Congressional Research Service), the executive branch (Department of Energy), and an independent agency (Nuclear Regulatory Commission [NRC]), as well as in an intergovernmental agency (the Organization for Economic Cooperation and Development [OECD] Nuclear Energy Agency [NEA] in Paris, France.) She also worked in Tokyo, Japan twice—the first time as an NRC liaison to Japan's Ministry of International Trade and Industry (MITI, now called the Ministry of Economic Trade and Industry, METI), studying Japan's licensing of GE's Advanced Boiling Water Reactor (ABWR), and the second time as a visiting professor in the Research Laboratory for Nuclear Reactors (RLNR), Tokyo Institute of Technology.

Dr. Marcus' work in these positions has ranged from regulation and oversight of operating reactors to development of next-generation nuclear power systems, and from domestic nuclear and energy policy to international cooperation and collaboration. She has made significant contributions to nuclear regulatory policy, energy technology policy, risk assessment and management, international nuclear policy, advanced nuclear technology development, and knowledge management. She has authored more than 90 open and limited-distribution publications and made more than 180 presentations, many of them invited, on these and other topics. Her interest in the history of the OECD/NEA is an outgrowth of her work there, as well as her work on data preservation and knowledge management. For the same reasons, she has conducted extensive research on the history of nuclear power development, which has resulted in a book on the subject entitled *Nuclear Firsts: Milestones on the Road to Nuclear Power Development.*

Dr. Marcus served as president of the 11,000-member American Nuclear Society (ANS) from 2001 to 2002, and as the elected chair of the Engineering Section of the American Association for the Advancement of Science (AAAS) from 2007 to 2008. She is a Fellow of both the ANS and the AAAS. She has also participated in numerous other professional activities, including serving as a member of the National Research Council Committee on the Future Needs of Nuclear Engineering Education in 1989-1990 and serving three terms on the MIT Corporation Visiting Committee of the Nuclear Engineering Department. She worked for many years with the Washington Internships for Students of Engineering (WISE) program, and on the American Management Association's R&D Council, and has received awards recognizing her contributions to MIT alumni activities.

Dr. Marcus has an S.B. and S.M. in physics and an Sc.D. in nuclear engineering, all from MIT. She was the first woman to earn a doctorate in nuclear engineering in the United States.