

## 菊池康之氏記事

「NEA 科学プログラムの再編成 (No.41, p.37 (1992))」の英訳

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### Re-structuring of the Scientific Program of the NEA

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#### 1. Background

NEA Committee on Reactor Physics (NEACRP) and NEA Nuclear Data Committee (NEANDC) have been in charge of the scientific program of the OECD Nuclear Energy Agency, and the NEA Data Bank is the actual working force of these committees. NEACRP and NEANDC have been existing as EACRP and EANDC (EA means European-American) respectively from the era of ENEA (European Nuclear Energy Agency) before Japan joined the NEA. This means both committees have more than 30 year history. They consist of the researchers in these research fields and the discussion in these committees was very academic oriented one.

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<sup>1</sup> The late Dr. Yasuyuki Kikuchi (1941-1996) was the general manager of the nuclear data center of JAERI (1989-1996).

\*: see remarks in the last page.

However, due to the maturity of the nuclear technology and the stagnation of the nuclear program in a few NEA member countries, the center of the activities by NEA has been shifted to more practical one such as “safety”, “treatment and disposal of radioactive waste”, “nuclear fuel cycle”, “radiation protection”, and “public health.” This fact results in the setting up of relevant committees such as CSNI\*, RWMC\*, FCC\*, and CRPPH\*. These are policy making committees and they have very different atmosphere from NEACRP and NEANDC, which are the places of the technical discussion among the researchers.

Under these circumstances, criticism has been mounting over the scientific program of the NEA, in the safety related committees such as CSNI and also in the steering committee. This comes from following reasons,

- 1) There is no place to discuss whole scientific program of the NEA.
- 2) It seems that the reactor physics and the nuclear data are matured to certain extent and archived the success to fulfill the requirement to design the nuclear reactor. There was doubt on needs to continue these activities in the NEA.
- 3) The reactor physics and the nuclear data are not a center of the scientific programs of the NEA. We must have weight in other scientific areas in future.
- 4) NEACRP and NEANDC are research committees. Not equivalent to other committees in the NEA.

On the other hand, NEA Data Bank was setup in Saclay (France) in 1979 by merging two bodies, i.e., CCDN (Centre de Compilation de Données Nucléaires) in Saclay and CPC (Computer Programme Centre) in Ispra (Italy). These main functions are to collect and disseminate nuclear data and computer programmes respectively. Especially for the nuclear data, the Data Bank is one of the four international centres and is responsible for the services of CINDA and EXFOR in the area of NEA member counties.

The NEA Data Bank has been operated by the fund from seventeen countries, which is different from that for the main body of the NEA. There are non-Data Bank members (US, Canada, Australia etc) in twenty-three member countries of the NEA. However, there have been increasing demands to utilize the activities of the Data Bank for the main body of the NEA because the Data Bank is the only scientific executing body in the NEA.

## 2. Reform by the Director-General Mr. Uematsu

In October 1988, Mr. Kunihiko Uematsu (Japanese Citizen) was appointed as the Director General

of the NEA. Based on the current situation mentioned above, he decided to reform the scientific programme of the NEA.

Concerning the NEA Data Bank, in 1989, it was decided to revise its mandate in order to make enable the Data Bank to devote their effort, which is less than one-thirds of the activities of the Data Bank, to the main body of the NEA by the contribution from the NEA, in addition to the computer program and the nuclear data services by the contribution from the Data Bank member countries as in the past. Following this decision, non-members of the Data Bank such as US became possible to participate in the management committee of the Data Bank as the observer.

Also in 1989, the mid-term plan of the NEA was established and all standing technical committees submitted mandates. NEACRP and NEANDC also submitted their mandates. Their main programs have been approved by shifting their themes from the nuclear reactor to the new areas such as nuclear fuel cycle, criticality safety, nuclear fusion, and transmutation of TRU waste etc.

In 1990, Mr. Uematsu decided to reform the scientific program of the NEA. Concerning this, he contacted unofficially Japan and France, which have been active to promote nuclear energy. In Japan, JAERI organized an ad-hoc meeting to discuss it and replied to Mr. Uematsu. The main points from Japan were;

- 1) To setup committees which could discuss the scientific program of the NEA besides the reactor physics and the nuclear data. NEACRP and NEANDC would be its sub-committees.
- 2) A part of activities of NEACRP and NEANDC need continuity. Especially, the scientific program of the Data Bank should be continued.
- 3) For efficient discussion on the service to the main body of the NEA by the Data Bank, the management committee of the Data Bank should be restructured and optimized.

To this reply from Japan, there was no direct reaction from Mr. Uematsu.

In January 1991, a think-tank meeting on this issue was organized in Paris. From Japan, Mr. T. Fuketa, a vice-president of JAERI participated in the meeting. The future scientific program of the NEA was freely discussed and it became an input to the NEA secretariat.

Combining these ideas, a proposal to reform the scientific program of the NEA was submitted in the steering committee in April 1991. It was a drastic one than we expected and followings are main points.

- 1) To discontinue NEACRP and NEANDC and to setup NEANSC (Nuclear Science Committee).
- 2) NEANSC is the forum for policy making. It would consist of the generalists who have the responsibility on the scientific policy of the member countries.
- 3) To setup the Executive Group in NEANSC in order to discuss the management of the Data Bank
- 4) Technical Tasks under NEACRP and NEANDC would be carried out in Working Groups under NEANSC.
- 5) Not limited to the scientific program, all tasks under NEA should be carried out within three years. If the extension is required, check and review should be done.
- 6) Current activities would be continued. This restructuring is evolution, not revolution.

The steering committee accepted this proposal and recommended to prepare the mandate by autumn. An ad-hoc meeting was organized in May 1991 by gathering a few people representing the steering committee, NEACRP, NEANDC and NEA Data Bank management committee. The final draft of the mandate of the NSC was prepared based on the conclusion of the ad-hoc meeting and by adding comments from NEACRP and NEANDC. In October 1991, the steering committee approved the final draft. The NEACRP, NEANDC and the Data Bank management committee were abolished and the NEANSC was setup.

Besides the scientific program, Mr. Uematsu decided to gather three office branches of the NEA into a building at Issy-les-Moulineaux by April 1992. The NEA Data Bank will be moved from Saclay site.

### 3. Responses from three committees

Because the reform plan of the scientific program of the NEA included closedown of NEACRP and NEANDC, as a matter of course, there was objection from both committees. However, they recognized the current situation and in the last committee meetings in autumn 1991, they discussed the tasks to be taken over to NEANSC, and issued statements.

#### 3.1 NEACRP

The 34<sup>th</sup> meeting of NEACRP was organized in PSI, Switzerland, from 3<sup>rd</sup> to 5<sup>th</sup> of September 1991. Following was recommended.

- Current tasks to be carried out in NSC
  - Nuclear Data

- ✧ International Evaluation Cooperation (Japan-US-Europe)
  - ✧ Joint Evaluated File (JEF)
  - ✧ Delayed neutron benchmark experiments
- Computer code validation
  - ✧ LWR pin power distribution benchmark
  - ✧ Three dimensional kinetic benchmark for LWR and LMFBR
  - ✧ C/E trend benchmark for horizontal direction for large LMFBR
- Shielding and Criticality
  - ✧ Shielding experiments database
  - ✧ Verification of burnup credit
- Fusion neutronics
  - ✧ Tritium generation benchmark
- Future tasks
  - On-line inspection technology for nuclear energy facility (signal analyses and processing from plant diagnostics)
  - Evaluation of new reactors
  - Physics on plutonium recycle and high burnup fuel in LWR and HWR
  - Transmutation of TRU and FP using the nuclear reactor or the accelerator
  - Fusion technology (radiation transport in shielding and IC fusion)
  - Physics and shielding of the accelerator and the target
  - Physics and shielding issue of the irradiation facility

The committee also recommended NEANSC to publish past benchmark reports from NEANSC and to include specialists of each technical area who work actually as well as the policy makers in the meeting of NEANSC.

### 3.2 NEANDC

The 29<sup>th</sup> meeting of NEANDC was organized in Karlsruhe, Germany, from 21<sup>st</sup> to 25<sup>th</sup> of October 1991. Following was recommended to NSC.

- New area to which nuclear data would be applied
  - Fission reactor
    - ✧ Many problems were solved but still we have numerous open problems such as neutron absorption by structure materials and inelastic scattering of minor actinides etc.
  - Low activation material

- ◇ Required especially for fusion reactor materials. It needs huge amount of nuclear data.
- Transmutation
  - ◇ Nuclear data for TRU and long life FP are required. Nuclear data and calculation codes for designing the accelerator are also required.
- New reactors
  - ◇ To design the safe and economic reactor requires new nuclear data
- Others
  - ◇ High energy data from 20MeV to 1GeV for RI generation, shielding of the accelerator, space development and spallation neutron source.
  - ◇ Nuclear data for non-energy sector such as exploring of the natural resource and detection of explosive materials would be important.
- Tasks to be carried out in NSC
  - International Evaluation Cooperation
    - ◇ Eleven sub-groups are carrying out the re-evaluation of the unsolved nuclear data. This is on-going under international cooperation of three forces, Japan, and Europe.
  - Coordination of experimental activity
    - ◇ International coordination is necessary to carry out experiments in order to respond to high level experimental needs and to continue effectively experiments without any waste.
  - Information exchange such as research on the resource, publication of monogram, and organizing specialist meeting.
    - ◇ Task for construction of the infrastructure of the nuclear data actively

### 3.3 Data Bank Management Committee

In the meeting in 18-19 April 1991, following activities of 1992 were already decided anticipating this re-organization.

- Applied nuclear physics
  - Exchange of nuclear data (CINDA , EXFOR)
  - Nuclear data evaluation (JEF)
  - International Evaluation Cooperation
  - Nuclear data of intermediate energy
  - Service to users
- Software for nuclear energy
  - Exchange of software

- Service to users
- Improvement of quality and reliability of software
- Applied nuclear science for nuclear energy
  - Nuclear reactor system
    - ✧ Reactors for TRU transmutation, transmutation by accelerator
    - ✧ New reactors and fast reactors
    - ✧ Fusion reactors and shielding of accelerator, blanket
    - ✧ Three dimensional on-line monitor and kinetics analyses of LWR
    - ✧ Pu recycling using LWR
    - ✧ Transport Cask of nuclear fuel
  - Accelerator(TRU transmutation, medical, irradiation damage)
  - Fusion (inertial confinement)
- Expertise to all NEA
  - Safety
    - ✧ CSNI code validation matrix (CCVM)
    - ✧ Sequenced Event Coding Tree (SECT)
  - Waste
    - ✧ Thermochemical database (TDB)
    - ✧ Probabilistic System Assessment Group (PSAG)
    - ✧ HYDROCOIN and INTERVAL Project
  - Nuclear Development
    - ✧ Computer code relevant to nuclear fuel cycle
- Expert group and workshop
  - NEANDC Expert Group on FP nuclear data (Tokai, 1992)
  - NEANDC Expert Group on covariance data (ORNL, 1992)
  - NJOY-91 Workshop
  - Monte Carlo Code, MCNP, TRIPOLI Workshop
  - TDB Training Course

#### 4. First meeting of NEANSC

The first meeting of NEANSC was held on 18-19 December 1991 in OECD headquarters, Paris. The delegation from Japan was Mr. Asaoka, executive director of JAERI, accompanied by Mr. Kikuchi. Mr. Bouchard from France was elected as the chairman and Mr. Asaoka became the vice-chairman.

In the meeting, a message of the Director General, Mr. Uematsu was followed by description of the mandate of NSC, and then the NEA secretariat explained the requests from each committee

(NEACRP and NEANDC) described in the section 3.

NEA secretariat proposed following midterm prospects.

- Review on the nuclear data and its demand
  - General review on the demand of nuclear data
  - Data center network of the nuclear reaction
    - ✧ Including charged particle, high energy and radiation damage
  - Nuclear data for transmutation of waste
    - ✧ Transuranium elements
    - ✧ Accelerator
- Verification and Validation of software reliability
  - Verification and Validation of design and model code for licensing
    - ✧ Quality assurance for a selected code
  - Verification and Validation of process control
    - ✧ Workshop to hear the experience of Aeronautics and Space, utilizing the experience of Halden project
  - Computer science /technology
    - ✧ Vector, parallel and graphics workstation
    - ✧ Co-organizing the supercomputer conference in Karlsruhe in 1993
- Science of nuclear technology
  - MOX fuel data
    - ✧ Data on fuel behavior analyses of reactor fuel
    - ✧ Group constants, inventory evaluation code for actinides and fission products, decay heat library
  - Fast reactor
    - ✧ Benchmark study on Na void reactivity and burnup reactivity swing
- Chemistry and environment
  - High quality data for evaluation of the risk of waste treatment
    - ✧ Expansion of NEA TDB to non-radioactive dangerous chemicals such as Pb, Cd, Hg, Sn etc.
  - Coordination of collaborative research work to study on the mechanism of sorption process (to be started in 1992).
  - Atmospheric diffusion model of the radioactive nuclides
    - ✧ Model validation by collecting tracer experiments.

In the discussion on the activity plan, it was decided to carry out NSC activity under the newly



setup Working Parties, and the benchmarks under NEACRP are carried out in the Task Force. It was also agreed to utilize the collaboration between research institutes. It was decided as follows after discussion utilizing a check list prepared by the NEA secretariat;

- a) As for the working parties, following working parties will be setup. Review on the needs of nuclear data (1 years), evaluation cooperation (3years), latest computational technique (3years) which will start in 1992, and review on the criticality safety research (3years) which will start in 1993.
- b) In activities on nuclear data, international coordination of measurement and to obtain high energy data will be conducted under the collaboration between research institutes.
- c) In activities on code benchmarking, followings will be carried out mainly under task forces: LWR 3D kinetics, physics on Pu recycling, physics of LMFBR, shielding problem, criticality safety on burnt nuclear fuel, and tritium generation for fusion reactor.
- d) Concerning the new type of reactors, inspection/diagnostics technology of reactor system, reduction on the Na void reactivity of the fast reactor will be conducted mainly in the task force.
- e) Basic activities on partitioning and transmutation will be carried out under the task forces.

## 5. Conclusion

Mr. Uematsu's effort has come to fruition. It seems that the re-structuring of the NEA scientific program has been on track finally. However, for revitalization of the NEA scientific activities by this re-structuring, we, all the parties concerned, need further effort. I, accompanied to the first meeting of NEANSC, would like to write my personal ideas on this.

1. All tasks are requested to be finalized within 3 years perhaps because of the reaction from the experience of NEACRP and NEANDC which had been existing more than 30 years. In the activities to sustain the scientific program, there are discipline-oriented ones. We need flexibility to accept such cases.
2. In the NSC members, many of NEACP members become the member of NSC but only two members from NEANDC (from Germany and EC). Because the nuclear data activity is carried out under the equal cooperation among international three parties (Japan, Europe and US), specialists on nuclear data from Japan and US should participate in the NEANSC.

I would like to take this opportunity to ask your kind understanding and cooperation for future NEANSC activities.

(END)

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Remarks:

CSNI: Committee on the Safety of Nuclear Installations

RWMC: Radioactive Waste Management Committee

FCC: Committee for Technical and Economic Studies on Nuclear Energy Development  
and the Fuel Cycle

CRPPH: Committee on Radiation Protection and Public Health