Panelist Remarks

We MUST do,
We CAN do, how?

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The University of Tokyo

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PAGES (Program for Advanced Graduate Education system for nuclear science and engineering with Social scientific literacy)
Summer School

- Nuclear energy is essential in Japan, also in the world.
  - 30-40% or more by nuclear also after 2030 (AEC 2005)
  - 15% (2005) of CO2 in 2020, more 9 NPPs, 81% capacity factor (June 2009 by Cabinet)
    (-25% by Democratic Party of Japan)

- Recycling is basic policy (AEC 2005)
  - Pu utilization in LWR (10-16 NPPs)
  - RRP in 2009?

- Commercial FBR in 2050 (AEC 2005)
HLW (vitrified waste) disposal is strongly related to nuclear power plant operation

- Public acceptance of nuclear energy
  (We must show the disposal method and schedule?)
- Operation of RRP, agreement by local government
  (also influences SF storage capacity limit)
- R&D of FBR (Monju, Facts, 2nd RP)

HLW waste MUST be safely disposed in Japan with public understanding.
Importance of social-science literacy

Current Situation in JAPAN

1) The Selection Process for HLW

2) Status of open solicitation

3) Reinforced plan of approach by government
   → Addition of proposal method
1) The Selection Process for HLW

Selection of PIAs
- Investigation areas: Volunteer areas and their surroundings
- Investigation methods: Literature Surveys

Selection of DIA
- Investigation areas: PIAs
- Investigation methods: Borehole survey, geophysical prospecting, etc. (Preliminary Investigations)

Selection of RS
- Investigation areas: DIAs
- Investigation methods: Detailed surface explorations, measurements and tests in underground investigation facilities (Detailed Investigations)

Organizations and Roles in HLW and TRU Waste Disposal Program

Implementer R&D
- NUMO, JNFL
  - Implementation of work
  - R&D required for implementation

Fundamental R&D
- Coordination Council for R&D on Geological Disposal
  - JAEA
  - R&D Projects Funded by ANRE
  - Universities

External Organizations
- NSC, AEC, NISA
  - Fundamental Policy
  - Guidelines, etc.

Supervisory
- METI & ANRE
  - Plan, Output

Information
- Information Exchange, Joint Research
- Foreign Implementers (NAGRA, SKB, POSIVA, etc.)
  - R&D as producers of radioactive waste
  - Radioactive waste disposal, R&D

Utilities
- Implementer R&D
  - Output

Coordination
- Implementer R&D
  - Fundamental R&D
Framework of Coordination Council for R&D on Geological Disposal

1. Establishment of overall R&D framework
   - Recommendations by experts such as professors

2. Coordination of R&D co-operation plan
   - NISA
   - JNES
   - JAEA (NSRC) etc.

3. Coordination of R&D integrated results
   - Regulatory Research

R&D Projects funded by ANRE
- RWMC
- CRIEPI
- AIST
- NIRS, etc

JAEA

Fundamental R&D in Japan

2) Status of the Open Solicitation

Dec. 2002 Start of Open Solicitation

Some municipalities examining the application appeared in the newspapers

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Prefecture</th>
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<tbody>
<tr>
<td>Apr.</td>
<td>Izumi-mura, Fukui</td>
<td>Pref.</td>
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<tr>
<td>Dec.</td>
<td>Saga-cho, Kouchi</td>
<td>Pref.</td>
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<tr>
<td>Apr.</td>
<td>Goshoura-cho, Kumamoto</td>
<td>Pref.</td>
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<tr>
<td>Jan.</td>
<td>Kasasa-cho, Kagoshima</td>
<td>Pref.</td>
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<tr>
<td>Jul.</td>
<td>Shinkamigoto-cho, Nagasaki</td>
<td>Pref.</td>
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<tr>
<td>Oct.</td>
<td>Yogo-cho, Shiga</td>
<td>Pref.</td>
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<tr>
<td>Aug.</td>
<td>Toyo-cho, Kouchi</td>
<td>Pref.</td>
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<tr>
<td>Sep.</td>
<td>Tsuno-cho, Kouchi</td>
<td>Pref.</td>
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- Some municipalities such as Toyo-cho, Kouchi Pref., have interested in the final disposal project, however has not led to literature surveys.
Learnt lessons from Toyo-Town (1)

【Events】
1. Opposition activists
2. Direct petition from local residents to establish an ordinance to refuse the bringing in of the nuclear wastes
3. Former town mayor
4. Opposing mayor candidate
5. Kochi Governor
6. Mass media

【Consequences】
1) Hasty decision-making only 4 months after the exposition of the issue
   ・Stream of local residents’ opinion became to be Negative
2) The return election held 9 months after with the vote 761 in favor and 1821 opposed (Voting rate 89.26%)
3) Action taken after the returned election
   ・New town mayor withdrew the application immediately.

To 【 Learnt Lessons 】

Lessons learned from Toyo-Town (2)

【Matters for reflection】

a. Vanishingly limited chances for explanation and dialog to the local residents by the Government and/or NUMO
b. Lack of understanding of the residents to:
   1) The meaning of HLW and how it works
   2) How the invitation of public participation system works?
   3) What is the opposing object?
c. The Kochi governor had different thinking
   A) The government should be out in front.
   B) The promotion for mutual understanding shall be strengthened to the public through regional PR activities.
   C) The invitation system may be revised to lighten mayors responsibility
   D) Regional development program should be enhanced
   E) Enforcement of R&D and international cooperation to enhance public understanding
3) Reinforced plan of approach by government → Addition of proposal method

Acceptance to proposal of government

When each stage is selected, the nation listen to governor and mayor of municipality's opinions. The location is not advanced for the dissenting opinion.

GCOE: Nuclear Education and Research Initiative

Systematic Education and Research including Nuclear Energy Sociology First in the World

Nuclear Energy Sociology
What is Technology for Society?
In collaboration with people outside Univ.

Nuclear Energy
Technology Innovation
Through comprehensive and interdisciplinary approach

Radiation Application
Therapy, diagnosis, biology, etc.
Spread in interdisciplinary fields: medicine, agriculture and so on

“We prepare next generation researchers to grasp the perspectives of complicated and divergent fields of nuclear energy.” - Dr. Yoshiaki OKA, Prof. UT, Program Leader -
Nuclear Fuel Cycle & Radioactive Waste Disposal

Collaborative efforts with geoscience and nuclear sociology

Basis for R&D

Actinide Chemistry
Radiochemistry
Nuclear Fuel & Nuclear Material
Criticality Safety Study
Radiation Safety Science
Analytical Chemistry
Risk Theory
Environmentology

Fundamental Science for Nuclear Technology

International Politics
Political Science
Ethics
Civilization History

Geoscience
Geology
Lithology
Civil Engineering
Collaboration
Seismology
Earthquake Engineering
Probability Statistics

Uncertainty Science

Deepening

Radioactive Waste Disposal
Nuclear Power Plant – Next Generation Reactor
Uranium Enrichment & Fuel Fabrication
Uranium Mine

「核燃料サイクル社会工学」寄付講座
Nuclear Fuel Cycle and Society Lab.
Department of Nuclear Engineering and Management
The University of Tokyo

Satoru Tanaka, Susan Pickett, Yuji Yamashita

-Social and International Acceptance of HLW Disposal and Fuel Cycle
-Nonproliferation and Nuclear Security of Nuclear Fuel Cycle
Social acceptance model

1) Socio-Engineering for nuclear waste

2) The global image of a social acceptance model

① Direct approach aiming at better intelligibility for the different resident layers

② Deductive approach by technical essence for specialist on other technical field

1) Socio-Engineering for Nuclear waste

Solution of the substantial subject towards location reservation of the HLW disposal site.

a. The cause of defeat of Toyo-cho is investigated.
   ⇒ Analyzing for the cause phenomenon and the numerical basis
b. Considering from the viewpoint of social psychology and STS.
c. Examining for the social acceptance process model.

【The proposal of solution】 STS : Science and Technology Studies.

1. Before subject actualizes
   Conveying fundamental knowledge, by public relations etc.

2. After subject actualizes
   Having a dialog carefully by the STS assessment technique over sufficient time.
   ① Consensus meeting
   ② Scenario workshop etc.

3. A mutual understanding corresponds according to each class. ⇒ 2 routes
   ① Lay stakeholder
      Direct approach according to each class by a dialog tool
      ⇒ A dialog is started from that in which familiar or interest also shines.
   ② Expert stakeholder
      Deductive approach by technical essence
      ⇒ The dialog between the specialists by the society and symposium.
2) The global image of a social acceptance model

Broader-based public relations
- Media PR
- Open symposium
- Citizen lecture, etc.

Technology assessment research
- Focus group interview
- Consensus meeting
- Scenario workshop

Social acceptance research

Facilitate forum

Dialog forum

Communication

STS Science and Technology Studies

Interest already acquired layer (Opposite layer)

Interest a non-risen layer (Middle layer)

Interest already acquired layer (Agreeing layer)

Opinion poll

Future generation

Indifferent layer

Fringe route processing

Pros/cons

Central route processing

Deductive approach by technical essence

The dialog by technology

Nuclear field specialist
- Academy cosponsorship
- Technical symposium
- Virtual disposal site

Dialog tool (ORCAT etc.)

LAN in the hall ⇒ web relay

Direct approach aiming at better intelligibility for the different resident layers

Intelligible explanation and a dialog

Congress meeting

Scenario workshop

Technology assessment research
- Media PR
- Open symposium
- Citizen lecture, etc.

Focus group interview

Scene workshop

Dialog forum

Science cafe

Broader-based public relations

A direct mutual understanding by dedicating to each layer

Agreeing layer

Opposite layer

Housewife
- A child's future, environmental protection, a household economy

Self-employment
- Trade, rumor, social capital

White-collar
- Education, environmental activity, philanthropy

Interest already acquired layer

Interest a non-risen layer (Middle layer)

Indifferent layer, and future generation and senior layer are future subjects

Realization of a dialog with the middle class by class correspondence

Large number channels according to the interest of each class

Various Facilitate

Intelligible explanation and a dialog

The interest to Nuclear energy and HLW disposal is raised by having a dialog by the theme of the high domain of the concern of each class.
**② Deductive approach by technical essence**

**A deductive mutual understanding by conducting dialogue in technical essence**

Ex. The result of
- Performance Assessment study
- Natural Analog study
- Easy understanding Statement
- Reflection of a result

**Nuclear field specialist**
- Academy cosponsor ship
- Technical symposium
- Virtual disposal site

In this approach, it expects to understand and get the safety of HLW disposal from as many public as possible by the deductive technique.

**PROCESS**

a) The dialog by technology is performed by methods, such as academy cosponsor ship and technical symposium, for engineer layer and scientist layer.

b) The result of a dialog is reflected in technical explanation method and research program.

c) After fully understanding the contents, the attitude of the pros and cons is itself determined and got from engineer layer and scientist layer of will.

d) The result of decision making is told and got from a housewife layer and a white-collar worker layer.

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**Current Topics**

Study on concrete illustration for “② deductive approach by technical essence”

**Imitated round-table discussion**
Plan of Imitated round-table discussion

1. Object
   • "② Deductive approach by technological essence " starts from the understanding of another field specialist of safety and the economy of HLW.
   • It is necessary to explain plainly by using the explanatory material that can be understood in a short time for that.
   • Imitated round-table discussion is held by using current explanatory materials that exist in NUMO and JAEA here. It aims to analyze, to evaluate the comment on the hall, to improve the explanatory material, and to create a more comprehensible how to explain.

2. Method
   a. 3 times in all-holding
   b. Nuclear field specialist gathers.
      ➢ Parties concerned outside the school participate (Ex. public office, entrepreneur, Utilities).
      ➢ The social scientist in school participates.
   c. All members hold HLW Imitated round-table discussion.
   d. The main member holds the evaluation meeting.
   e. The secretariat proposes the improvement idea of the explanatory material.
   f. Parties concerned discuss it.

Holding plan of Imitated round-table discussion

<table>
<thead>
<tr>
<th>No</th>
<th>Outline</th>
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| 1st | Sponsoring of local society of commerce and industry.  
• The chamber of commerce and industry examines the HLW attracting.  
• The problems are safety and rumor to the fishery.  
• The forum of the HLW safety is held. | (5/12E) |
| 2nd | Sponsoring of local doctor association.  
• The mayor requested the judgment from old friend's chairman of the local doctor association.  
• The briefing of the HLW safety is held the local doctor.  
• It is judged it is unquestionable for the radiation level after it closes →The mayor thinks distrust. | around Sep. (plan) |
| 3rd | Sponsoring of risk system society.  
• The mayor consults acquaintance's person related to the univ.  
• He recommends a risk system society.  
• The general public and the mass communication participate.  
• A specialist promotion/opposite fights. | around Feb. (plan) |
1st Environmental setting of Imitated round-table discussion

Object region: SIM City

- 100,000 people (The population is a decreasing tendency).
- City along sea left from Tokyo at 1000km
- The major industry is a fishery and industry (shipbuilder of the medium-small business and the subcontract).

Outline

1. The chamber of commerce and industry in the city was centered and it began to examine the HLW repository site attracting. However, the rumor to safety and the fishery becomes a problem.
2. The forum was held by sponsoring the chamber of commerce and industry for the problem solution to safety.
3. The entrepreneur explained the safety of HLW.
4. Three representative questioners of the recommendation became the chairman of the society of commerce and industry and the company employee of technical with the person in local related to the university.
5. Three public advertisement people became specialist member of the incorporated nonprofit organization "Waste information course" to act reversely in the region.
6. Media such as the local TV, local newspapers, and publishers also participated.

1st Imitated round-table discussion

日時 2009年5月12日（火）
16時30分～20時00分
場所 東京大学・工学部8号館
地下1階85講義室

（質問者）
反対意見のNPO法人「廃棄物情報講座」役

（説明者）

引用）
Aテレビ画像より
1st Imitated round-table discussion for HLW safety

(2) Improvement point of explanatory material

(1) Improvement point of this explanatory material (example)
1) Specification of exclusion condition in disposal ground selection process
2) Radioactivity, calorific value of HLW, and relation of period when beginning to dispose \[\rightarrow\text{Ex.1}\]
3) 40,000 number of laying underground of vitrified waste how to show
4) How to show safety when disposing after it closes \[\rightarrow\text{Ex.2}\]
5) Presentation of both risk information

(2) Example of problem in the future that clarified it this time (more than 30 items)
1) It is worth of 30 atomic bombs a radioactivity in the vitrified waste.
2) It dies immediately at 20 seconds when it approaches the vitrified waste
3) Approach on uncertainty and maintenance side evaluation
4) Approach of malicious man on participation
5) "Transformer science" declaration by philosopher of science

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**Ex.1**

HLWの放射能・発熱量と処分開始時期の関係

放射能・発熱量が高い期間は地上で貯蔵管理 ⇒ 同 低くなってから処分施設へ
閉鎖後の処分安全性

Ex.2

放射線の量

1mSv = 1000μSv

放射線の量

人体への影響は考え
難い放射線の量

10000
1000
100
10
1
0.1
0.01
0.001
0.0001
0.00001
0.000005

10
100
1000
1万
10万
100万
1000万
処分後の時間（年）

代表ケースのピーク位置
0.005 [μSv/年]

1000
100
10
1000
10000

諸外国で示されている安全基準 (100〜300 μSv/y)

わが国の自然放射線レベル (900〜1200 μSv/y)

PAGES: Motivation for integrating nuclear science and engineering with social science

Many of current problems in nuclear engineering are inevitably combined to social aspects of nuclear energy, such as social acceptance or nuclear proliferation. Solving these problems is a key to lead the nuclear renaissance by building a new concept of nuclear technologies which serve the public good.

Therefore, as one of the core parts of GoNERI program, special emphasis is placed on integrating nuclear science and engineering with social science.

Among many other areas in the nuclear field, we recognize the particular relevance of social-scientific approaches to the nuclear fuel cycle and radioactive waste disposal.

We started to social-scientific activities in cooperation with social scientists (sociologists, historian, etc) from 2008.
One of the main purposes of our activity is to make an education program so that the new generation of nuclear engineers understand societal aspects of nuclear technologies sufficiently to serve the public good.

As we had not known the fundamentals of the social sciences (such as their domain, terminology, methodology, etc.) at all, 14 seminars were held in FY2008. By discussion in the seminars, good relationship with social scientists have been constructed.

Some discussion points from this week:

- At which levels designs or strategies must be validated to be considered as reliable?

- Role of "scientists-engineers" to contribute to social issues.

- Communication
  What to communicate?
  Which criteria can be exposed for communication?
  How to gain trust from public?

- Cost-benefit analysis of geological disposal.
  How to use it?
- The importance of trust related to acceptance.
- Media role in the nuclear waste disposal. Transparency.
- Human health as a criterion for performance assessment.
- Risk analysis, standard for limitation
- Potentiality of sharing of nuclear facilities in an international scale.
- What can sociologists/engineers can do cannot do for trust in nuclear technology?

Some important points to be discussed:
- We must do, or we can wait by some reasons?
- International collaboration, geological limit, geopolitics
- Engineering judgment is understandable?
- How to explain to the public?
- Understanding social-science literacy
  ⇒ collaboration with social science
  ⇒ “Aufheben” with social –science to conduct HLW disposal
- HLW managements and history in many countries. But they can not be applied to Japan. Functional transformation is essential although there are common important matters.
- Mistakes are useful, however we should avoid irreparable mistake.