NEMEA-7/CIELO Workshop
International Collaboration on Nuclear Data
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## Round table discussion on CIELO and international collaboration

# Perspective from JENDL Project

*Tokio Fukahori*
*Japan Atomic Energy Agency*
fukahori.tokio@jaea.go.jp

# Current Interest in Japan



- ✓ Additional to the General Purpose File

## *After Fukushima Accident*

- ✓ Safety for "*Down-stream*" Part of the Nuclear Fuel Cycle
- ✓ Waste Treatment: Activation Cross Section, FPY
- ✓ Decay Heat: Decay Data
- ✓ Criticality and Transportation: (a, n)
- ✓ For new regulations ...

## *HLW Management (Transmutation)*

- ✓ Nuclear Data for FP, MA and Coolant (LBE)
- ✓ As well as structural materials for both reactor and accelerator

# Personal Opinion for CIELO



## *Difference from Previous SGs*

| | Previous SGs | CIELO (SG40) |
|---|---|---|
| purpose | To solve the specific interests | To produce evaluated files with validations |
| # of members | 10-20 | huge |
| methodology | To obtain common models | Gathering lots of knowledge (differential and integral exp., models, benchmarks, etc.) |
| goal | Achieved within the period | Pilot project and expecting to be expanded |

WPEC Objective: 1) to promote the exchange of information concerning nuclear data evaluation, validation and related topics, 2) to provide a framework for cooperative activities, 3) the long-term aim

NEACRP/NEANDC Task Force on Evaluation Cooperation (6 Oct. 1989) and following the 1st WGEG mtg.

# Perspective on CIELO



## *Observation*

- ✓ Going well, however we have to discuss more what we can obtain as CIELO-result files.
- ✓ Contributions from JENDL Project (evaluations, validations, etc.)
- ✓ It is necessary to demonstrate the performance of CIELO-result files.
- ✓ The adoption of CIELO results must be decided by each library project.

## *Expected …*

1. To define task goals with consensus (already listed?)
2. To select suitable benchmarks having sensitivities for target nuclides
3. To select base-line file(s)
4. To determine target application(s) for 2.

# Thank you for your attention!


## is your good choice.

# Nuclear Data Needs (for safety)



## *For safety researches*

### Frontend (Nuclear Fuel Supply)

ex. JCO Accident (1999.9.30)

- Criticality Safety for
  Handling of Resources, Processing, Storage & Transport of Fuel, etc.

### Reactor (Core Characteristics)

- Safely Operation by Grasping
  Power Distribution, Control Rod Worth, Reactivity Coefficients, etc.

ex. Chernobyl (1986.4.26) & TMI Accident (1979.3.28)

- Prediction of Burn-up Characteristics
- Evaluation of Delayed Neutron Effect

### Down-stream of Nuclear Fuel Cycle (Spent Fuel Treatment)

- Criticality Safety for Storage, Transport, Reprocessing
- Shielding
- Decay Heat

### Backend (Nuclear Waste Management)

- Evaluation of Long-term Radio-toxicity (HLW)
- Clearance (LLW)

***down-stream***

→ JENDL General Purpose File
JENDL Activation File (RI productions, FPY)

# Nuclear Data Needs (for safety)



## *Down-stream* → Spent Fuel & Cask

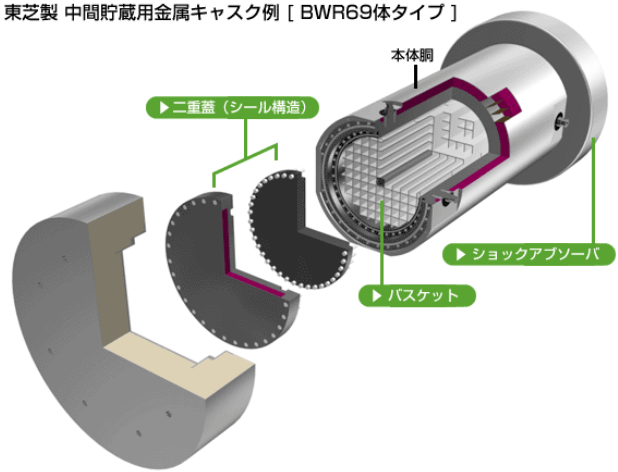
### Criticality Safety of Current Spent Fuel Casks

- Subcritical when immersed in water
- Subcritical when piled up in numbers
- Neutron Absorber :
  - -B-SUS, B-Al, B-Resin, Cd-Alloy etc.

◆ Unirradiated Fuel
with Initial $^{235}$U enrichment

◆ *keff* ≤ 0.95 (usu.)

東芝製 中間貯蔵用金属キャスク例［BWR69体タイプ］




### Challenge for Burn-up Credit

Selected Important Nuclides :

6FPs (CEA-France at early stage)
$^{149}$Sm, $^{103}$Rh, $^{155}$Gd, $^{143}$Nd, $^{133}$Cs, $^{152}$Sm

12FPs (JAERI-Tech 2001-055)
+ $^{99}$Tc, $^{153}$Eu, $^{145}$Nd, $^{147}$Sm, $^{95}$Mo, $^{150}$Sm

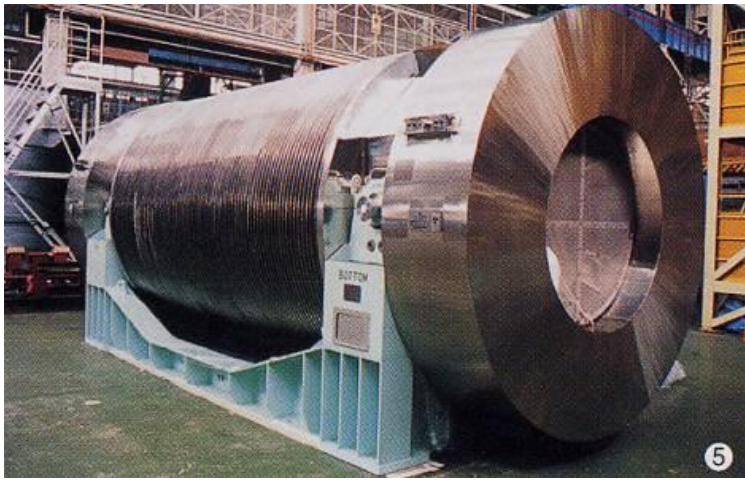
15FPs (OECD BUC W.G.)
+ $^{151}$Sm, $^{109}$Ag, $^{101}$Ru

13FPs (SAND87-0151) for Casks
$^{99}$Tc, $^{103}$Rh, $^{131}$Xe, $^{133}$Cs, $^{143}$Nd, $^{145}$Nd, $^{147}$Pm,
$^{147}$Sm, $^{149}$Sm, $^{151}$Sm, $^{152}$Sm, $^{153}$Eu, $^{155}$Gd

## *for Neutron and Gamma-ray Productions*

For the shielding calculation for fuel casks, neutron and gamma-ray emission spectra from assemblies are important. Especially for neutron source, not only the inventory estimation for spontaneous fission of minor actinide (MA) nuclides but also consideration of (alpha, n) reactions is necessary.

**JENDL/AN-2005**: 17 Nuclides
Li-6,7, Be-9, B-10,11, C-12,13, N-14,15, O-17,18, F-19, Na-23, Al-27, Si-28,29,30



# Nuclear Data Needs (for safety)



## *Backend* → Clearance (= radioactive nuclide productions)

### Nuclides Listed in Table 2 of IAEA Safety Guideline RS-G-1.7

H-3, Be-7, C-14, F-18, Na-22,24, Si-31, P-32,33, S-35, Cl-36,38, K-42,43, Ca-45,47,
Sc-46,47,48, V-48, Cr-51, Mn-51,52,52m,53,54,56, Fe-52,55,59,
Co-55,56,57,58,58m,60,60m,61,62m, Ni-59,63,65, Cu-64, Zn-65,69,69m, Ga-72, Ge-71,
As-73,74,76,77, Se-75, Br-82, Rb-86, Sr-85,85m,87m,89,90,91,92, Y-90,91,91m,92,93,
Zr-93,95,97, Nb-93m,94,95,97,98, Mo-90,93,99,101, Tc-96,96m,97,97m,99,99m,
Ru-97,103,105,106, Rh-103m,105, Pd-103,109, Ag-105,110m,111, Cd-109,115,115m,
In-111,113m,114m,115m, Sn-113,125, Sb-122,124,125,
Te-123m,125m,127,127m,129,129m,131,131m,132,133 ,133m,134,
I-123,125,126,129,130,131,132,133,134,135 , Cs-129 ,131,132,134,134m,135,136 ,137,138,
Ba-131,140, La-140, Ce-139,141,143,144, Pr-142,143,Nd-147,149, Pm-147,149,
Sm-151,153, Eu-152,152m,154,155 , Gd-153,159, Tb-160, Dy-165,166, Ho-166, Er-169,171,
Tm-170,171, Yb-175, Lu-177, Hf-181, Ta-182, W-181,185,187,
Re-186,188, Os-185,191,191m,193, Ir-190,192,194, Pt-191,193m,197,197m, Au-198,199,
Hg-197,197m,203, Tl-200,201,202,204, Pb-203, Bi-206,207, Po-203,205,207, At-211,
Ra-225,227, Th-226,229, Pa-230,233, U-230,231,232,233,236,237,239,240,
Np-237,239,240, Pu-234,235,236,237,238,239,240,241,242,243,244,
Am-241,242,242m,243, Cm-242,243,244,245,246,247,248, Bk-249,
Cf-246,248,249,250,251,252,253,254, Es-253,254,254m, Fm-254,255

Red: Nuclides considered in Japanese Clearance Regulation
(+ Ca-41, Ti-44, V-49, Ga-67, Ge-68, Rb-81, Ag-108m, Ba-133, Yb-169, W-188, Au-195)