ENDF/B-VII.1 Updates for FENDL-3

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T-2
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Items at the 2nd RCM

- H-1
  - No extension above 20MeV, but we should keep Gerry Hale's evaluation, because a new ENDF file (VII.1) contains his updated covariance data.
- Na-23
  - New evaluation from BNL not yet available.
- Ti isotopes
  - All isotopes were upgraded and made available in ENDF/B-VII.1.
    These files include new ORNL resonance parameters too, together with covariances.
  - Benchmark testing performed at LANL, improved significantly
    — talk by A. Kahler at CSEWG
  - Kunieda made new files those contain the high energy part from JENDL-HE.

Possible Upgrade with ENDF/B-VII.1, I

Light Elements

H-1	covariance added	A
H-2	covariance added	A
H-3	(n,2n) replaced by ENDF/B-VI.8, total adjusted	A
He-4	R-matrix analysis updated, covariance given	A
Li-6	new R-matrix analysis	B
Be-9	capture cross section updated, covariance added	B
O-16	capture cross section updated, MT=107 given from MT=800–803	A

A: just replace, B: re-connect with high energy part, C: complicated, D: no way!

Possible Upgrade with ENDF/B-VII.1, II

Structural Materials

Cl-35	new resonance parameters from ORNL	C^{*1}
Cl-37	new resonance parameters from ORNL	C^{*1}
Fe-54	new α-production calculation	A^{*2}
Fe-57	new α-production calculation	A^{*2}
Ni-58	new α-production below and above 20 MeV	A^{*2}
Ni-60	new resonance parameters from ORNL, new α-production	A^{*2}
Ni-61	resonance from JENDL-4	A
Ni-62	resonance parameters updated at BNL	A
Ni-64	resonance from JENDL-4	A

^{*1}need to adjust resonance boundary

^{*2}cf. Kunieda's talk

Possible Upgrade with ENDF/B-VII.1, III

Y-89	problems in the resonance region fixed, cross sections updated	B
Cd-106	new resonance parameters from Geel	B
Cd-108	new resonance parameters from Geel	B
Cd-110	new resonance parameters from Geel	B
Cd-111	new resonance parameters from Geel	B
Cd-112	new resonance parameters from Geel	B
Cd-113	new resonance parameters from BNL	B
Cd-114	new resonance parameters from Geel	B
Cd-116	new resonance parameters from Geel	B
Au-197	MF=8, 10 removed, MF=33 MT=102 added	A*3

U-235	delayed neutron yields and spectra replaced by ENDF/B-VI.8 covariances added (might be problem for MF6)	A*4
U-238	delayed neutron yields and spectra replaced by ENDF/B-VI.8 covariances added (might be problem for MF6)	A*4

*3 remove MF8 and 10 from FENDL, and add MF33 MT102

*4 replace MF1 MTthese sections by ENDF/B-VII.1 in FENDL

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Possible Replacement by ENDF/B-VII.1

He-3

- FENDL-3 = JENDL-3.3 evaluated in 1994
- Hale's new R-matrix (2011) available in ENDF/B-VII.1, including capture
- A

Ti isotopes

- FENDL-3 = JENDL-3.3 + updated resonance parameters (Oh, Kawano)
- ENDF/B-VII.1 includes new resonance parameters from ORNL
- cross sections all updated, and energy balance problem fixed
- improved benchmark testing for Ti-reflected cores
- B and done!

Zr isotopes ?

- FENDL-3 = JENDL-4
- new ENDF/B-VII.1 evaluations available
- need more careful comparisons

Possible Replacement by ENDF/B-VII.1, cont'd

K-39 and K-41

- FENDL-3 = TENDL-2010
- new resonance parameters available in ENDF/B-VII.1
- source of resonaces in TENDL unknown (maybe Atlas)
- high energy part in ENDF/B-VII.1 from JENDL-3.3
- make new files — TENLD-2010 + ENDF/B-VII.1 resonance parameters
- C or D

ENDF/I, IENDF, WENDL, ...

presentations by M.B. Chadwick at IAEA and CSEWG meetings

An International Evaluated File

- Countries want to own data, and don't want to loose control
- Perhaps developing own databases better maintains in-house expertises
- Independent databases help mitigate against a common failure
- Independence drives competition, often driving innovation
- Our customers have neutronics simulation codes calibrated to our existing database
  — we risk loosing calibrated predictive capability in the short term
- Practically, it would be a challenge to make this happen
  - the task is large: $\sim$ a decade
  - international coordination is a pain; national coordination is bad enough
  - resources
    — staffing, funding, are ambiguous & no customer is pushing for this yet

Why We Should Move to Developing an ENDF/I

We should strive for lasting impacts

- Nuclear data are physical constants — there's only one correct answer!
  - Existing ENDF, JENDL, JEFF, . . . have reached a level of maturity to enable us to contemplate this next step — they are already converging!
  - ENDF already increasingly uses international advances (FPs, MA, . . .)
- Limited resources
  - the golden age of nuclear science is over
  - the leading experts are getting older, and retiring
- Quality: new advances will benefit from being a collaborative product from the world's best experts
- Less risk of one expert making a bad evaluation decision
  — peer review from the world's experts will help prevent this
- Build on initial steps already taken
  - IAEA standards, FENDL, WPEC subgroups, ...