

ADVANCE: *Automated Data Verification and Assurance for Nuclear Calculations Enhancement*

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BROOKHAVEN
NATIONAL LABORATORY

a passion for discovery



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Every evaluation needs to be checked and we humans can't seem to do it right



- **The Problem:**
 - No evaluator remembers to run basic checks (CHECKR, FIZCON) on the evaluations
 - We should not have rely on users to tell us if NJOY barfed...
- **A Solution:** “continuous integration”, a common practice in software development. Every commit or every hour (you pick), retest any evaluation that changed.
- As a result, bugs are discovered ***as soon as data is committed***

**ADVANCE: Online Data Verification System
(Automated *Data Verification and Assurance*
for Nuclear Calculations *Enhancement*)**

Visit <http://www.nndc.bnl.gov/endl/b7.dev/qa/>



www.nndc.bnl.gov/endl/b7... index.html

www.nndc.bnl.gov/endl/b7.dev/qa/neutrons/reports/neutrons-periodic-table.html

National Nuclear Data Center
ADVANCE: The ENDF Continuous Integration System

MAIN LIBRARY PERIODIC TABLE VIEW LIST VIEW ABOUT ADVANCE

Neutrons Sublibrary

ENDF/B Development Library

- General information:
 - ENDF sublib designator: 10
- Revision Number: 592
- Last Modified Revision: 532:592
- Build Status:
 - Build status: **FAILURE**
 - Build time: 2012-10-24 13:52:00.314153
 - Listfile: [neutrons.list](#)
 - Release Notes: [neutrons-releaseNotes.pdf](#)
- GForge Links:
 - Browse [SVN](#)
 - Browse sublibrary [tracker](#)

1	H	?																2	He																
3	Li	4	Be											5	B	6	C	7	N	8	O	9	F	10	Ne										
11	Na	12	Mg											13	Al	14	Si	15	P	16	S	17	Cl	18	Ar										
19	K	20	Ca	21	Sc	22	Ti	23	V	24	Cr	25	Mn	26	Fe	27	Co	28	Ni	29	Cu	30	Zn	31	Ga	32	Ge	33	As	34	Se	35	Br	36	Kr
37	Rb	38	Sr	39	Y	40	Zr	41	Nb	42	Mo	43	Tc	44	Ru	45	Rh	46	Pd	47	Ag	48	Cd	49	In	50	Sn	51	Sb	52	Te	53	I	54	Xe
55	Cs	56	Ba	*	72	Hf	73	Ta	74	W	75	Re	76	Os	77	Ir	78	Pt	79	Au	80	Hg	81	Tl	82	Pb	83	Bi	84	Po	85	At	86	Rn	
87	Fr	88	Ra	**	104	Rf	105	Db	106	Sg	107	Bh	108	Hs	109	Mt	110	Ds	111	Rg	112	Cn	113	Uut	114	Fl	115	Uup	116	Lv	117	Uus	118	Uuo	
* Lanthanides (Lanthanoids)					57	La	58	Ce	59	Pr	60	Nd	61	Pm	62	Sm	63	Eu	64	Gd	65	Tb	66	Dy	67	Ho	68	Er	69	Tm	70	Yb	71	Lu	
** Actinides (Actinoids)					89	Ac	90	Th	91	Pa	92	U	93	Np	94	Pu	95	Am	96	Cm	97	Bk	98	Cf	99	Es	100	Fm	101	Md	102	No	103	Lr	

Symbol Legend

- FAILURE: At least one evaluation in the element/sublibrary was so badly done that it coredumped a checker code or the checking code has a serious bug
- ERROR: The evaluation/sublibrary DOES NOT pass all checks
- WARNING: The evaluation/sublibrary passed all checks, but there were warnings
- PASS: All checks passed

www.nndc.bnl.gov/endl/b7... index.html

www.nndc.bnl.gov/endl/b7.dev/qa/neutrons/n-002_He_003/n-002_He_003.html

National Nuclear Data Center
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MAIN LIBRARY PERIODIC TABLE VIEW LIST VIEW ABOUT ADVANCE

³He

Neutrons Sublibrary

- General information:
 - ENDF MAT designator: 225
 - Evaluated date: MAY90
 - Evaluation lab: LANL
 - Evaluation authors: G.Hale, D.Dodder, P.Young
 - Natural abundance: 0.000137 +/- 3e-06 %
 - Check out Wikipedia's entry for [helium](#)
- Revision Number: 592
- Last Modified Revision: 532:592
- Build Status:
 - Build status: **ERROR** ([Submit tracker item](#))
 - Build time: 2012-10-24 13:50:20.874937
- GForge Links:
 - Browse [SVN](#)
 - View current [revision](#)
 - Download current [revision](#)

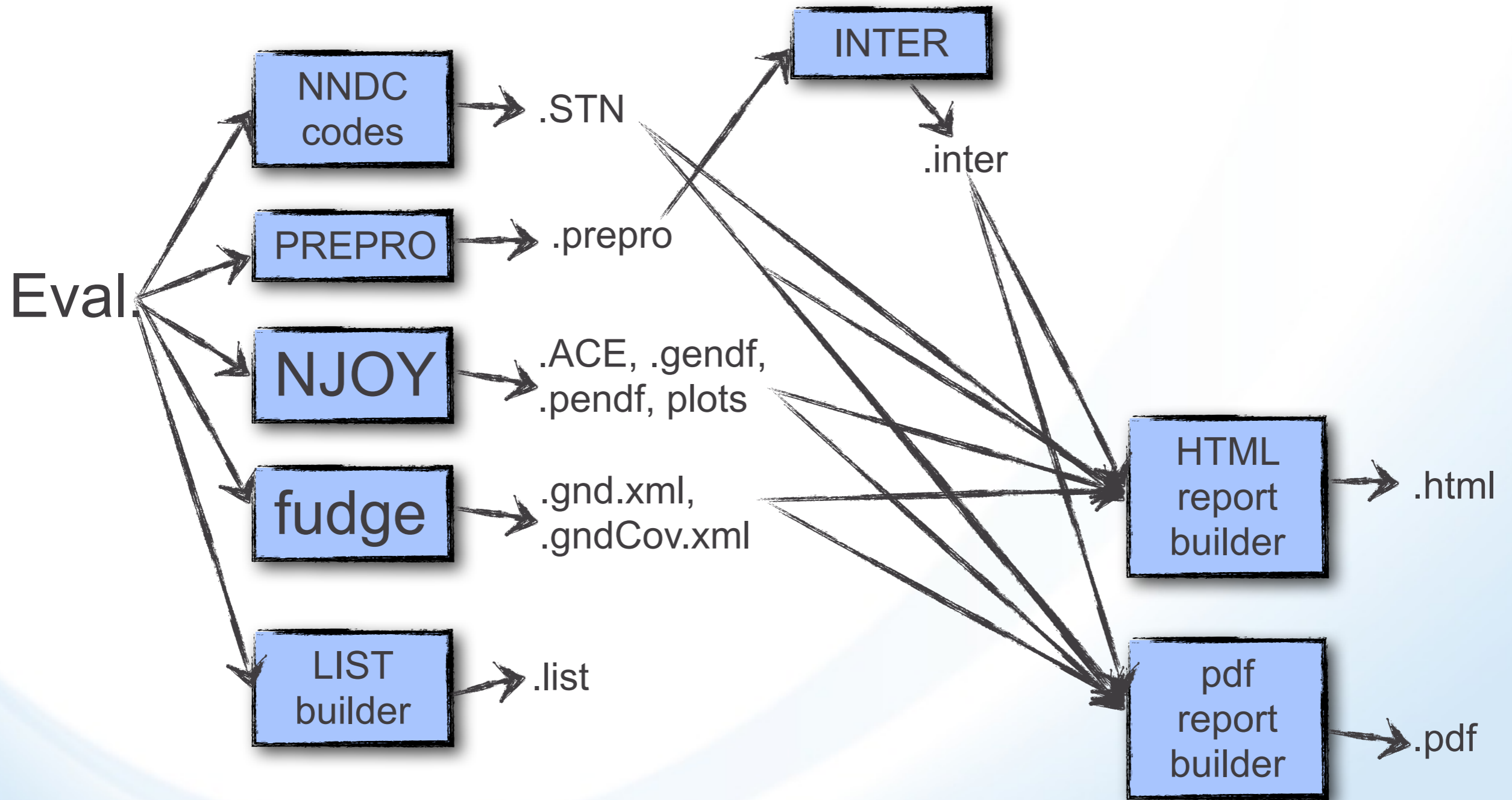
Status	Code	# Tests	# Failures	# Errors	Run time (sec)	Files
	STAN	0	0	0	0.003	STN.File
	STANEF	0	0	0	0.026	
	CHECKR	8	0	0	0.012	
	FIZCON	8	0	0	0.012	
	PSYCHE	16	0	0	0.013	
	PREPRO	2	0	0	0.041	prepro.File
	INTER	1	0	0	0.018	inter.File
	FUDGE-2.0	4	0	4	0.614	Log.gnd.xml.File
	NJOY99	3	0	0	6.786	ace.File, -acer.ps.File, -heatr.ps.File, -heatr.chk.File, gendt.File, xsdir.File, -amor.cov.File

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Updated every hour!

Current ADVANCE build workflow





And now for Ramon...

To do



■ More reports:

- Cross section plots vs. EXFOR
- Plots of integral quantities (MACS, RI, Cf spectrum ave.)
- Better energy balance report
- Covariance QA report
- The ENDF documentation

■ ACE quality control w/ ACELST, COMPLIT

■ Full library tarballs (ACE, gnd, gendf)

■ More

processing codes:

- AMPX/PUFF
- coggen (is that what it's called?)
- PREPRO/sigma1, sixpack
- CALENDF

■ Comments page

■ Database of errors:

- processing code error mining
- regressions

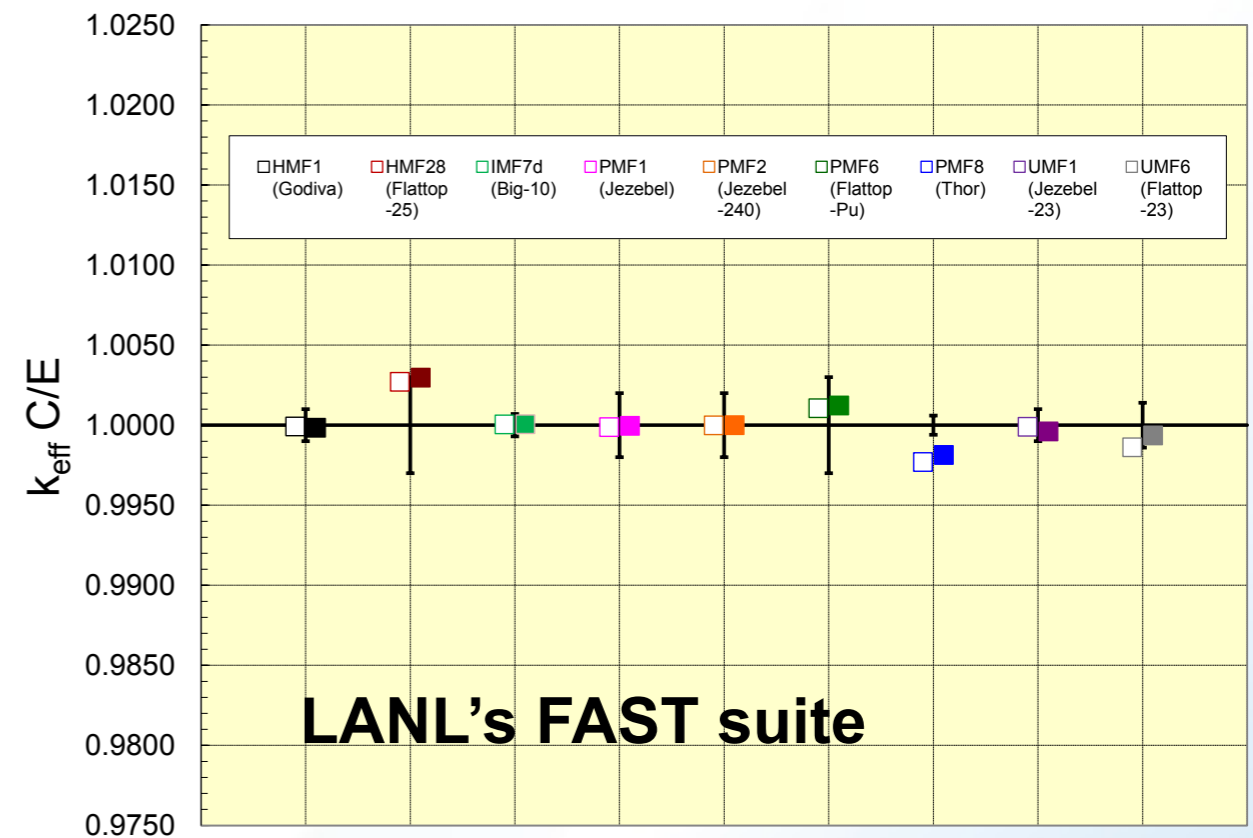
■ Benchmarking....

What else would you like added?

Next logical step: automate simulation of critical assemblies and other benchmarks



- Criticality benchmarks are already the core of our data testing regimen
- Many other tests check things of importance to NCSP
 - Reaction rates in irradiated foils target individual reactions
 - SINBAD shielding benchmarks can be used to benchmark decay/activation data



Current testing is human-driven and ad-hoc:

- We often test outdated libraries (ENDF/B-V??)
- We rerun same tests (do we need to run JEZEBEL again?)
- We often don't run tests because of lack of resources: models, codes computing and/or manpower

Proposed tiers of benchmark participation



Full <ul style="list-style-type: none">• automatic run• automatic report	Client runs on your machine. NNDC server pushes jobs to your machine, you run your tests and report results to NNDC for automatic collation.
Voluntary <ul style="list-style-type: none">• automatic run• voluntary report	Client runs on your machine. Client polls svn and runs your tests. It is then up to you what results you report back to NNDC.
Ad-hoc <ul style="list-style-type: none">• voluntary run• voluntary report	ControlTier server sends you an email. You control the client by hand and decide if you want to run. If you do, you report back what you want to NNDC.