

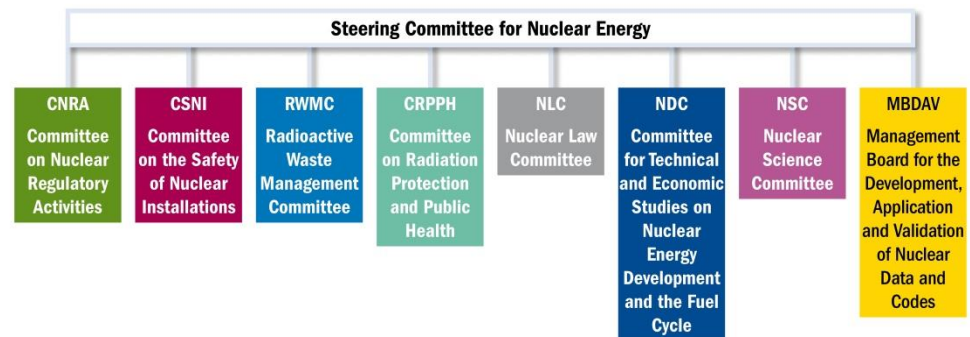
NEA Data Bank Nuclear Data Services

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NEA Data Bank

WONDER Aix-en-Provence, October 12, 2018
IAEA, Vienna

The NEA: A Forum for Co-operation

- Founded in 1958
- 33 member countries
- 7 standing technical committees
- 71+ working parties and expert groups*
- 22 international joint projects*



*As of January 2018

OECD members(35)

 Chile  Estonia  Israel  Latvia  New Zealand

NEA members(33)

 Australia  Canada*  Iceland  Ireland  Luxembourg
 United States*

NEADB members(27)

 Argentina**	 Austria	 Belgium	 Czech Republic
 Denmark	 Finland	 France	 Germany
 Greece	 Hungary	 Italy	 Japan
 Mexico	 Netherlands	 Norway	 Poland
 Portugal	 Romania**	 Russia**	 Slovak Republic
 Slovenia	 Spain	 Republic of Korea	 Sweden
 Switzerland	 Turkey	 United Kingdom	

* RSICC service area

** Argentina, Romania and Russia are not member countries of the OECD (2017)

Data Bank

- **Founded in 1978**, out of the merging of two historical functions of (E)NEA :
 - *Computer Programme Services at Ispra, Italy*
 - *Neutron Compilation Centre at Saclay, France*
- Still today, these two functions are embodied in the core mission of the DB, which is to provide
 - **Computer Programme Services (CPS)**
 - **Nuclear Data Services (NDS)**
- Today the **DB** has 27 participating countries, yearly budget of ~3 M EUR (Argentina and Romania joined in 2017)

Ancestry of (NEA) NDS

- DB Nuclear Data Services : A long history that goes back before the time of DB, to *CCDN : Neutron Data Compilation Centre in Saclay, France*



CCDN Staff, Saclay, 1966

What does NDS do ?

- Co-ordination of data compilation :
 - Experimental nuclear data for the **EXFOR** database
 - Needs for the nuclear data community, the **HPRL** database
 - Evaluated nuclear data for the **JEFF** nuclear data library
- Development of Visualisation, Verification tools and processes :
 - ND Visualisation tools (**JANIS**)
 - ND testing and processing capabilities (**NDEC**)
 - Integral Benchmarking aspects (ongoing)
 - Developing infrastructure for collaboration (ongoing)
 - Targeted technical support to JEFF
- Secretariat of **all Nuclear Data activities** at NEA :
 - **JEFF & Nuclear Data Weeks**,
 - **NSC/WPEC**

Working Party on International Nuclear Data Evaluation Co-operation (WPEC)

- ❑ Established in 1989 under NEANDC (became NSC in 1992)
- ❑ Forum for the exchange of information between evaluation projects and co-operative activities

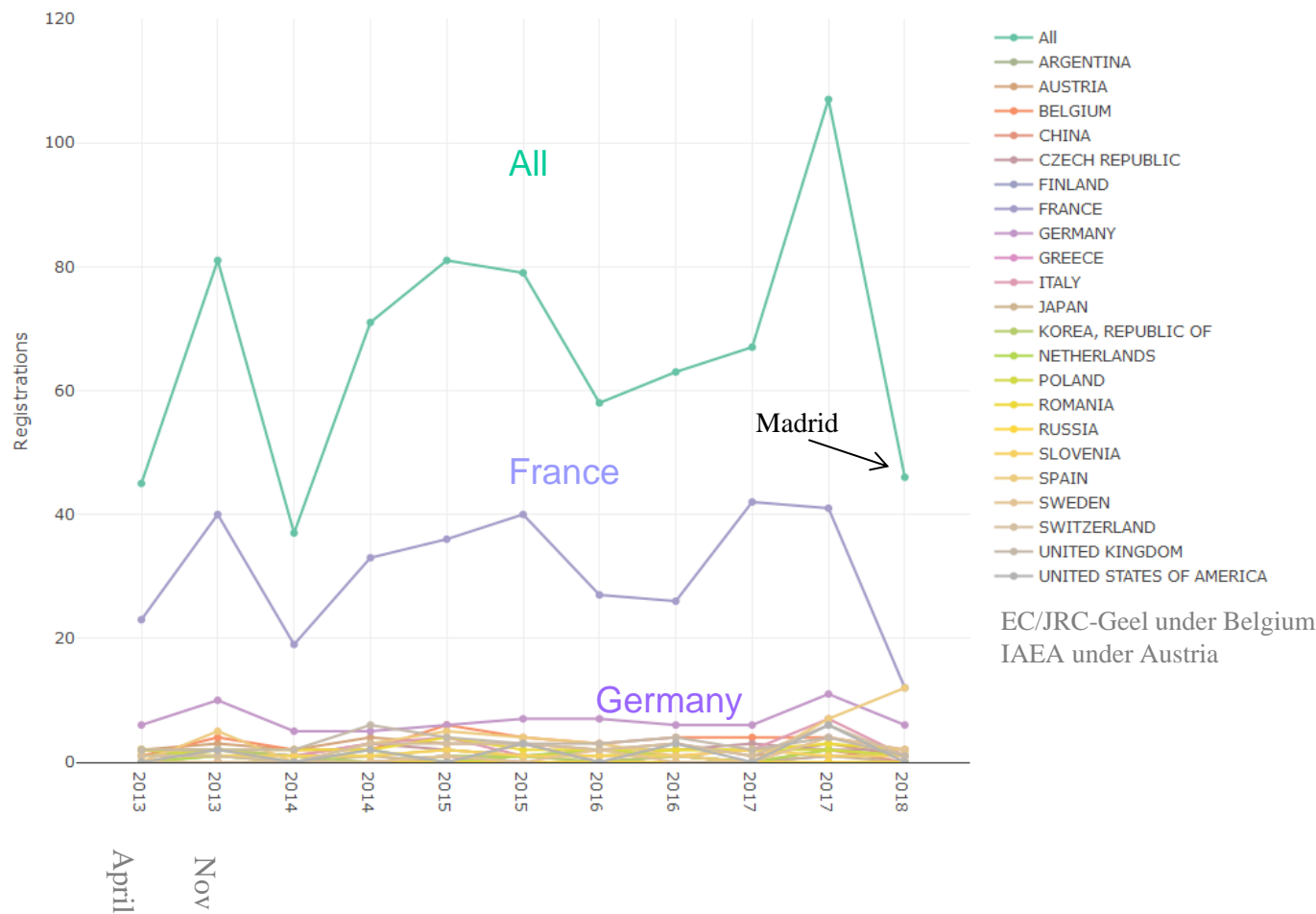
Objectives:

- Promote exchange of methods, experimental data, theory and validation related to nuclear data;
- Identify common nuclear data issues and establish subgroups (SG) to address these issues, with ~2 year deliverables;

JEFF & NDW participation

2013-2018

Number of received registrations per country per meeting in NEA system



ND verification, processing and testing

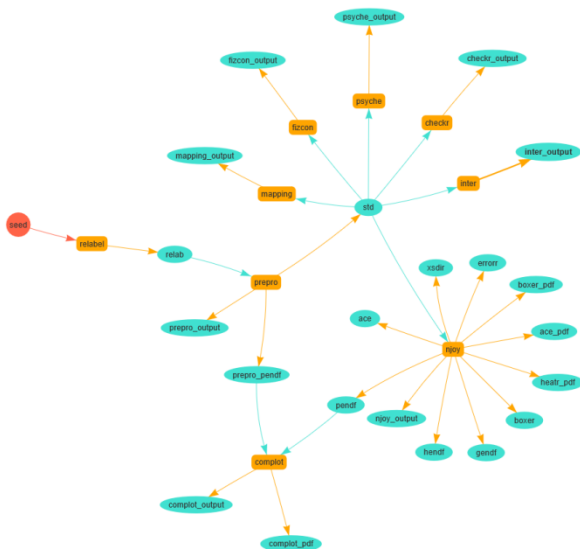
NDS Objectives in this area :

- ☐ Automate processing, with different codes, based on best practices (JEFF PV&BV group);
- ☐ Help rapidly identify potential problems in files and track down where
- ☐ Provide organized online access to process outputs;
- ☐ Streamline links to existing NEA tools (JANIS, others in future);

- ☐ **Provide a reproducible, standardized process for verification, testing and processing aimed at streamlining nuclear data benchmarking**
- ☐ **Distribute processed libraries**

NDEC (Nuclear Data Evaluation Cycle)

Keywords: *modular, flexible, parallel ... and online (soon)*



Content (562 seeds)						
Z-A-State	Seed	Upload	njoy_pendf	mcnp_sphere	serpent_sphere	njoy_ace
1-1-0	1-H-1g.Jeff33 (.gz)	2018-08-28 23:10:10	<input type="checkbox"/> njoy_pendf_input (.gz) <input type="checkbox"/> njoy_pendf_output (.gz) <input type="checkbox"/> njoy_pendf (.gz) <input type="checkbox"/> njoy_pendf_OK (.gz) <input type="checkbox"/> njoy_pendf-stdout (.gz)	<input type="checkbox"/> mcnp_sphere_input (.gz) <input type="checkbox"/> mcnp_sphere_output (.gz) <input type="checkbox"/> mcnp_sphere-stdout (.gz)	<input type="checkbox"/> serpent_sphere_input (.gz) <input type="checkbox"/> serpent_sphere_output (.gz) <input type="checkbox"/> serpent_sphere-stdout (.gz)	<input type="checkbox"/> njoy_ace_input (.gz) <input type="checkbox"/> njoy_ace_output (.gz) <input type="checkbox"/> njoy_ace-stdout (.gz)
1-2-0	1-H-2g.Jeff33 (.gz)	2018-08-28 23:10:10	<input type="checkbox"/> njoy_pendf_input (.gz) <input type="checkbox"/> njoy_pendf_output (.gz) <input type="checkbox"/> njoy_pendf (.gz) <input type="checkbox"/> njoy_pendf_OK (.gz) <input type="checkbox"/> njoy_pendf-stdout (.gz)	<input type="checkbox"/> mcnp_sphere_input (.gz) <input type="checkbox"/> mcnp_sphere_output (.gz) <input type="checkbox"/> mcnp_sphere-stdout (.gz)	<input type="checkbox"/> serpent_sphere_input (.gz) <input type="checkbox"/> serpent_sphere_output (.gz) <input type="checkbox"/> serpent_sphere-stdout (.gz)	<input type="checkbox"/> njoy_ace_input (.gz) <input type="checkbox"/> njoy_ace_output (.gz) <input type="checkbox"/> njoy_ace-stdout (.gz)
1-3-0	1-H-3g.Jeff33 (.gz)	2018-08-28 23:10:10	<input type="checkbox"/> njoy_pendf_input (.gz) <input type="checkbox"/> njoy_pendf_output (.gz) <input type="checkbox"/> njoy_pendf (.gz) <input type="checkbox"/> njoy_pendf_OK (.gz) <input type="checkbox"/> njoy_pendf-stdout (.gz)	<input type="checkbox"/> mcnp_sphere_input (.gz) <input type="checkbox"/> mcnp_sphere_output (.gz) <input type="checkbox"/> mcnp_sphere-stdout (.gz)	<input type="checkbox"/> serpent_sphere_input (.gz) <input type="checkbox"/> serpent_sphere_output (.gz) <input type="checkbox"/> serpent_sphere-stdout (.gz)	<input type="checkbox"/> njoy_ace_input (.gz) <input type="checkbox"/> njoy_ace_output (.gz) <input type="checkbox"/> njoy_ace-stdout (.gz)

● ENDF-6 seed

mapping NDEC module

xmdir NDEC input/output

NDEC modules:

- NJOY-2016, PREPRO-2017
- C&U tools
- MCNP/SERPENT tests
- NEA split and map

NDEC - Verification and testing of Evaluated Nuclear data

Provides a systematic and automated process of ND libraries

NDEC Modules

NDEC modules that are independent are run in parallel. NDEC modules that need the output of another module as their own input are launched automatically when the needed file becomes available.

List of modules integrated in the current version of NDEC.

C&U	NJOY-2016	PREPRO-2017	NEA
checkr	moder	endf2c	relabel
psyche	reconr	linear	libcontent
fizcon	broadr	recent	splitting
inter	unresr	sigma1	mapping
	heatr	legend	benchmarking
	gaspr	activate	
	thermr	merger	
	purr	fixup	
	acer	dictin	
	groupr		
	errorr		
	covr		

NEA DB – “QA” of Evaluated Nuclear data

- ❑ NDEC output is available online, currently for the JEFF-3.3 neutron library release
- ❑ In the medium term, NDEC will process all major libraries











Short url : bit.ly/db_ndec

NDEC Access

Browse NDEC Output for JEFF-3.3 neutron data

Show entries

Search:

Z ▲	A ▲	State ▲	File ▲	C&U ▲	NJOY-2016 ▲	PREPRO-2017 ▲	ENDF-6 ▲	ACE ▲
1	1	0	1-H-1g.jeff33	1 err	12 warn	79 warn		
1	2	0	1-H-2g.jeff33	1 warn / 6 err	5 warn	402 warn		
1	3	0	1-H-3g.jeff33	0 msg	5 warn	153 warn		
2	3	0	2-He-3g.jeff33	0 msg	3 warn	7 warn		
2	4	0	2-He-4g.jeff33	0 msg	3 warn	199 warn		

Browse output of NDEC for all JEFF-3.3 files (562 files)

NDEC library content analysis (What has changed?)

JEFF-3.3

Released in 2017

U-235-g

Neutron File

203

Sections in file

152

Updated

11

New

40

Unchanged

1

Erased

Updated sections in JEFF-3.3 file, with respect to reference : JEFF-3.2

Show entries

Search:

MF TYPE

MT TYPE

MF

MT

JEFF-3.3 matching

JEFF-3.2 matching

All

All

All

All

All

All

General information	descriptive data and directory	1	451	JEFF-3.3	JEFF-3.2
General information	total neutrons released per fission	1	452	JEFF-3.3	JEFF-3.2
General information	delayed neutrons released per fission	1	455	JEFF-3.1.1	JEFF-3.2
General information	prompt neutrons released per fission	1	456	JEFF-3.3	JEFF-3.2
General information	components of energy release due to fission	1	458	JEFF-3.3	ENDFB-7.0
Resonance parameter data	resonance parameters	2	151	JEFF-3.3	JEFF-3.1.1
Reaction cross sections	total	3	1	JEFF-3.3	JEFF-3.2
Reaction cross sections	elastic scattering	3	2	JEFF-3.3	JEFF-3.2
Reaction cross sections	total inelastic scattering	3	4	JEFF-3.3	JEFF-3.2
Reaction cross sections	anything	3	5	JEFF-3.3	JEFF-3.2

NDEC isotope files “mapping”

JEFF-3.3

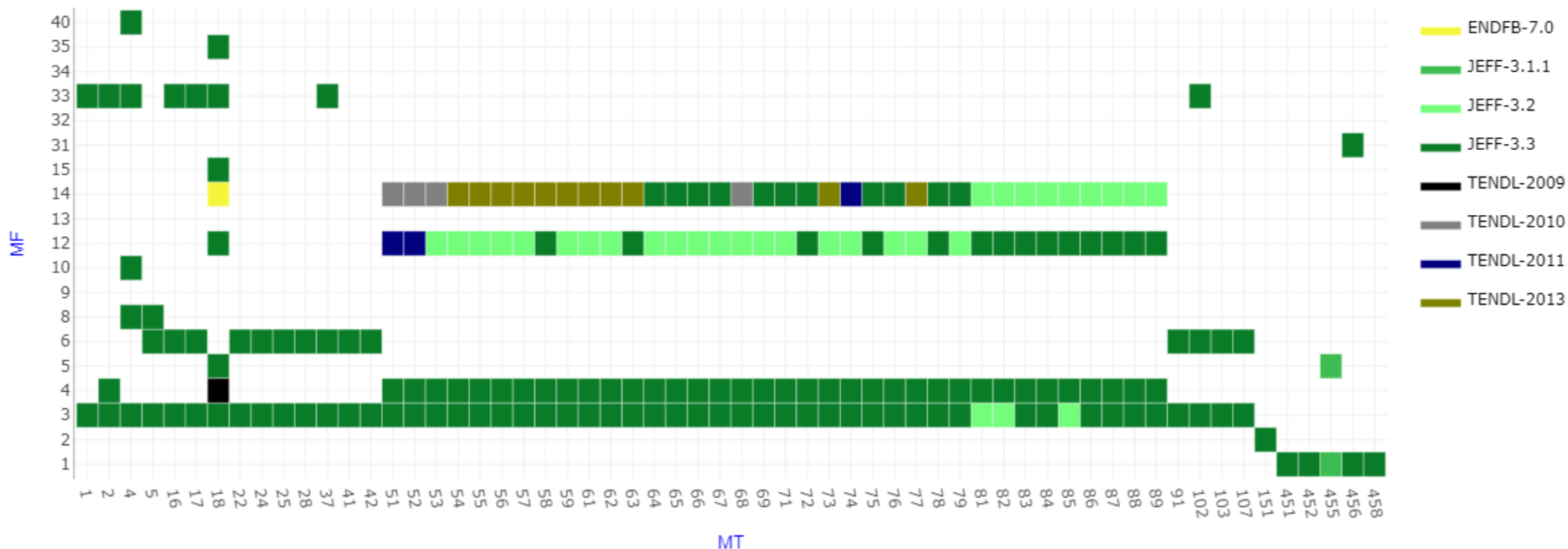
Released in 2017

U-235-g

Neutron File

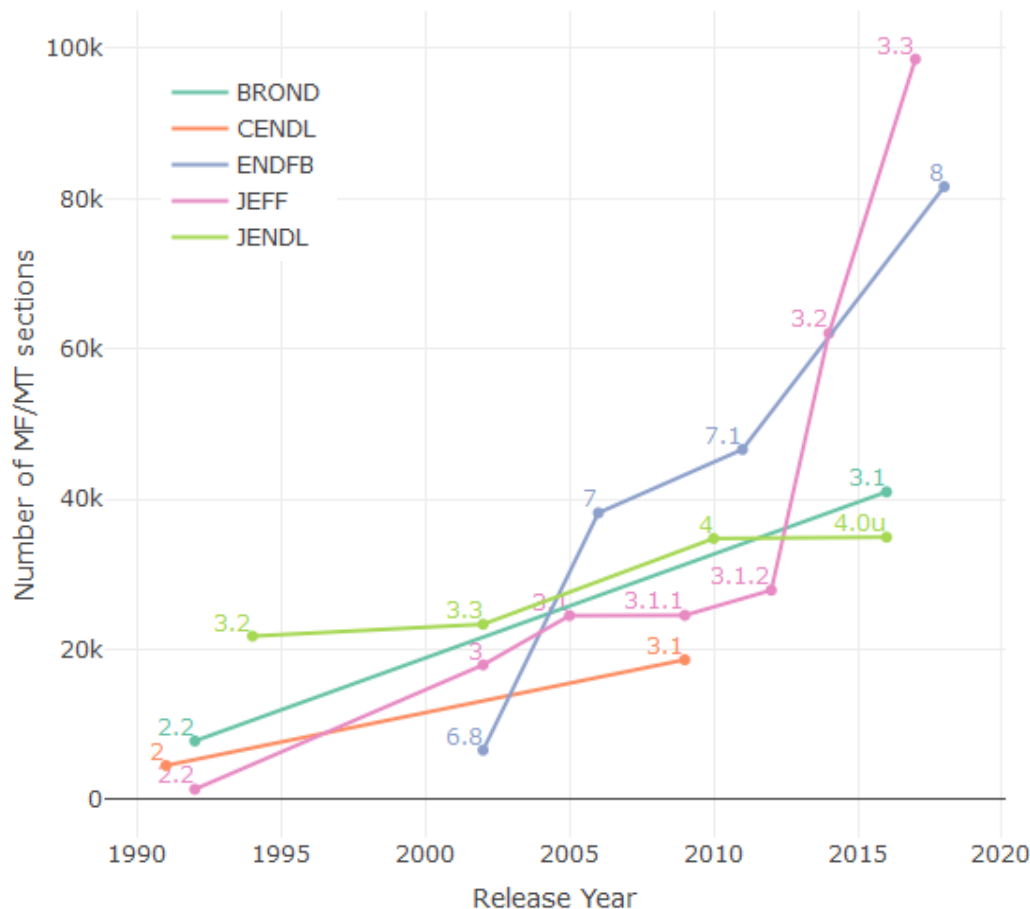
203

Sections in file



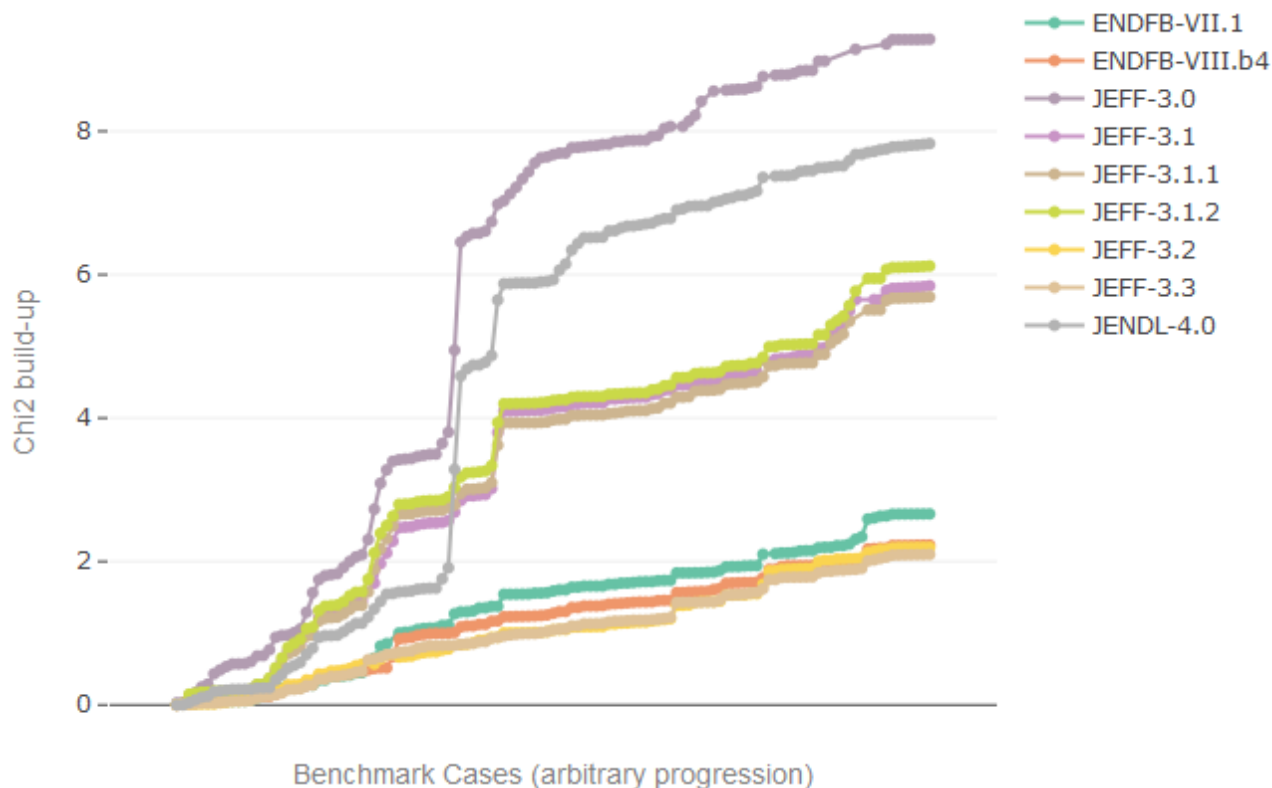
Nuclear Data deluge ?

How is all this data validated?



NDS – criticality benchmarking

123 ICSBEP cases consistent comparison of performance



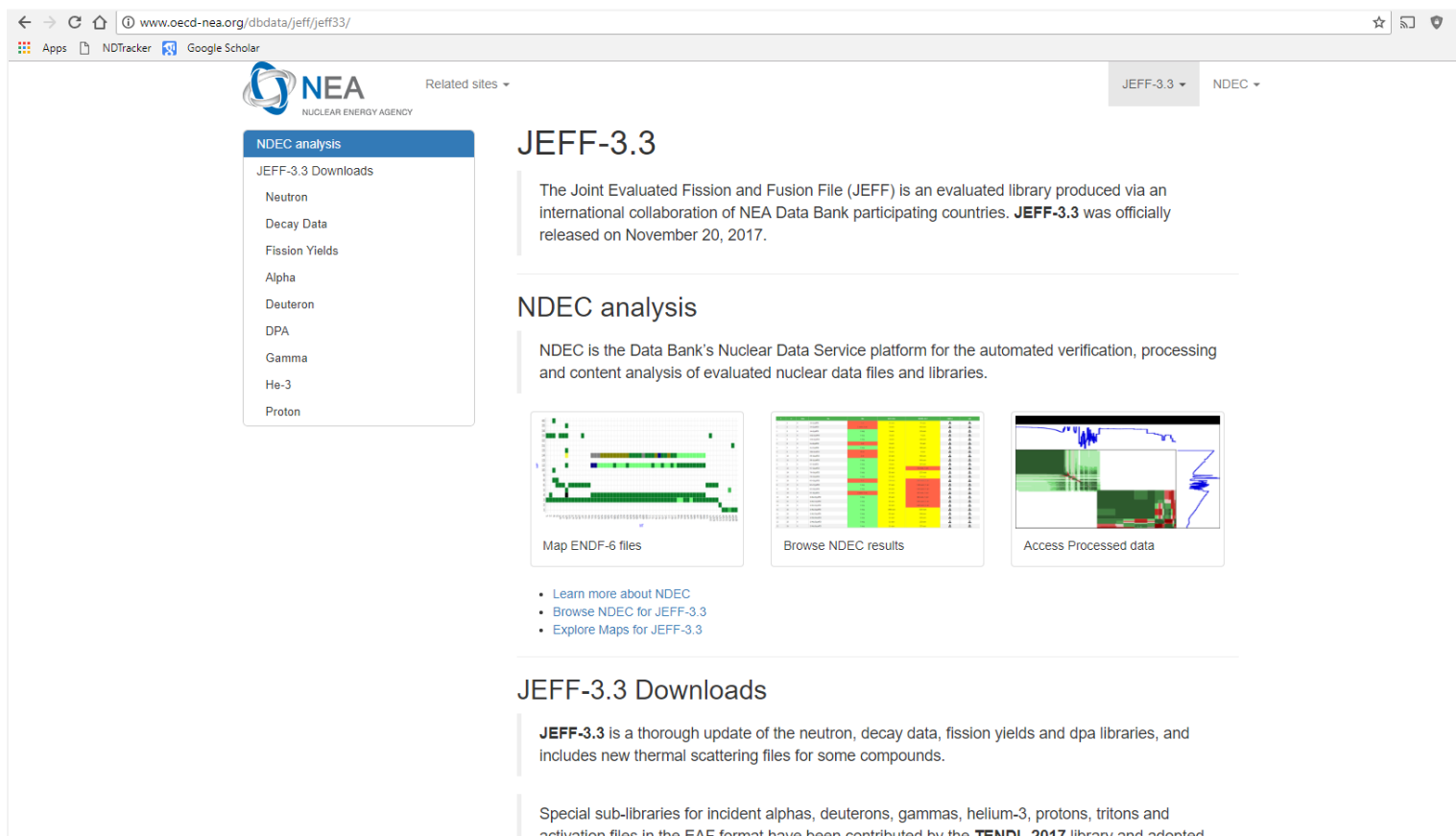
Major NDLs agreement on IE seems to be converging.

What about other metrics ?
Other aspects ?

➤ Extended benchmarking for *General Purpose* libraries is needed

JEFF : towards JEFF-4

☐ JEFF-3.3 library released December 2017



The screenshot shows the website for the JEFF-3.3 library. The browser address bar displays www.oecd-neia.org/dbdata/jeff/jeff33/. The page features the NEA logo and a navigation menu on the left under "NDEC analysis" with links to "JEFF-3.3 Downloads", "Neutron", "Decay Data", "Fission Yields", "Alpha", "Deuteron", "DPA", "Gamma", "He-3", and "Proton". The main content area is titled "JEFF-3.3" and includes a description: "The Joint Evaluated Fission and Fusion File (JEFF) is an evaluated library produced via an international collaboration of NEA Data Bank participating countries. **JEFF-3.3** was officially released on November 20, 2017." Below this is a section for "NDEC analysis" explaining it as a platform for automated verification and content analysis. Three interactive boxes are provided: "Map ENDF-6 files" (showing a grid of data), "Browse NDEC results" (showing a table of results), and "Access Processed data" (showing a plot of data). A list of links includes "Learn more about NDEC", "Browse NDEC for JEFF-3.3", and "Explore Maps for JEFF-3.3". The "JEFF-3.3 Downloads" section states that JEFF-3.3 is a thorough update of neutron, decay data, fission yields, and dpa libraries, and includes new thermal scattering files. It also mentions that special sub-libraries for incident alphas, deuterons, gammas, helium-3, protons, tritons, and activation files in the FAF format have been contributed by the **TENDL-2017** library and adopted.

JEFF-4 development (2018-2021)

OECD official Mandate for the JEFF Co-ordination Group
Approved September 2018

- Definition of a system for generation of a **complete** nuclear data library combining best available scientific and technical knowhow in a **reproducible process**; produce a test library to demonstrate feasibility.
- Definition of an **enlarged suite of benchmarks** covering physics interests of the community.
- Specifications for the **quality assurance** system that is desired for the new library.

Nuclear Data Services : looking further

Nuclear Data Services at DB, **for all DB members**

- Ensure pertinence of present and future Nuclear Data Services
- How to strengthen our communication to stakeholders
 - From industry and national labs
 - From regulatory bodies and safety authorities

Ambitious long term path which has been started :

- Implementation of a **QA process** for nuclear data libraries (NDL)
- Must enlarge the scope towards an extended validation of NDL
- A trend that is of use to JEFF in particular, but of interest to all NDL projects
- **How to create the conditions for DB to play leading role**

NEA / NDS co-sponsored or supported events

- **WONDER-2018** in Aix-en-Provence, France, *8-12 October 2018*
 - International workshop for nuclear data evaluation for reactor applications
 - <https://indico.cern.ch/event/701026/>
 - Co-sponsored by NEA

- **JEFF** at the NEA Headquarters, France, *26-30 November 2018*

- **ND-2019** in Beijing, China, *19-24 May 2019*
 - International Conference on Nuclear Data for Science and Technology
 - <http://nd2019.medmeeting.org/>
 - Co-sponsored by NEA

- Next **WPEC** will be held at the NEA Headquarters, *24-28 June 2019*

NEA DB –Training

❑ **DB : 11 training courses organized in 2017**

<http://www.oecd-nea.org/databank/training-courses/>

❑ **NJOY-2016 now open source**

- 1st NJOY-2016 training took place in December 2017
- 2nd NJOY-2016 training scheduled for October 29-31, 2018

Registration : www.oecd-nea.org/dbdata/trainings/

NDS – Central to the ND community
db-nds@oecd-nea.org

Thank you for your attention

Spare slides

Who we are

CPS

Alice
Dufresne



Head of CPS

Elena
Poplavskaia



Cristina
Lebunetelle



Catherine
Rocher-
Thomas



IAEA
Liaison
Officer

NDS

Kenya
Suyama



Head of DB

Veronique
Le Marchand



Assistant

Franco
Michel-
Sendis



Head of NDS

Luca Fiorito



Michael
Fleming



TDB

Maria Eleni
Ragoussi



Jesus
Gonzalez



(as of October 2018)