ENDF Status

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USNDP Meeting, Virtual Nuclear Data Week 2020

3 Dec. 2020

BROOKHAVEN NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY

BROOKHAVEN SCIENCE ASSOCIATES

What's going on in ENDF-space

- git.nndc.bnl.gov
- Next ENDF Release
- Next ENDF format

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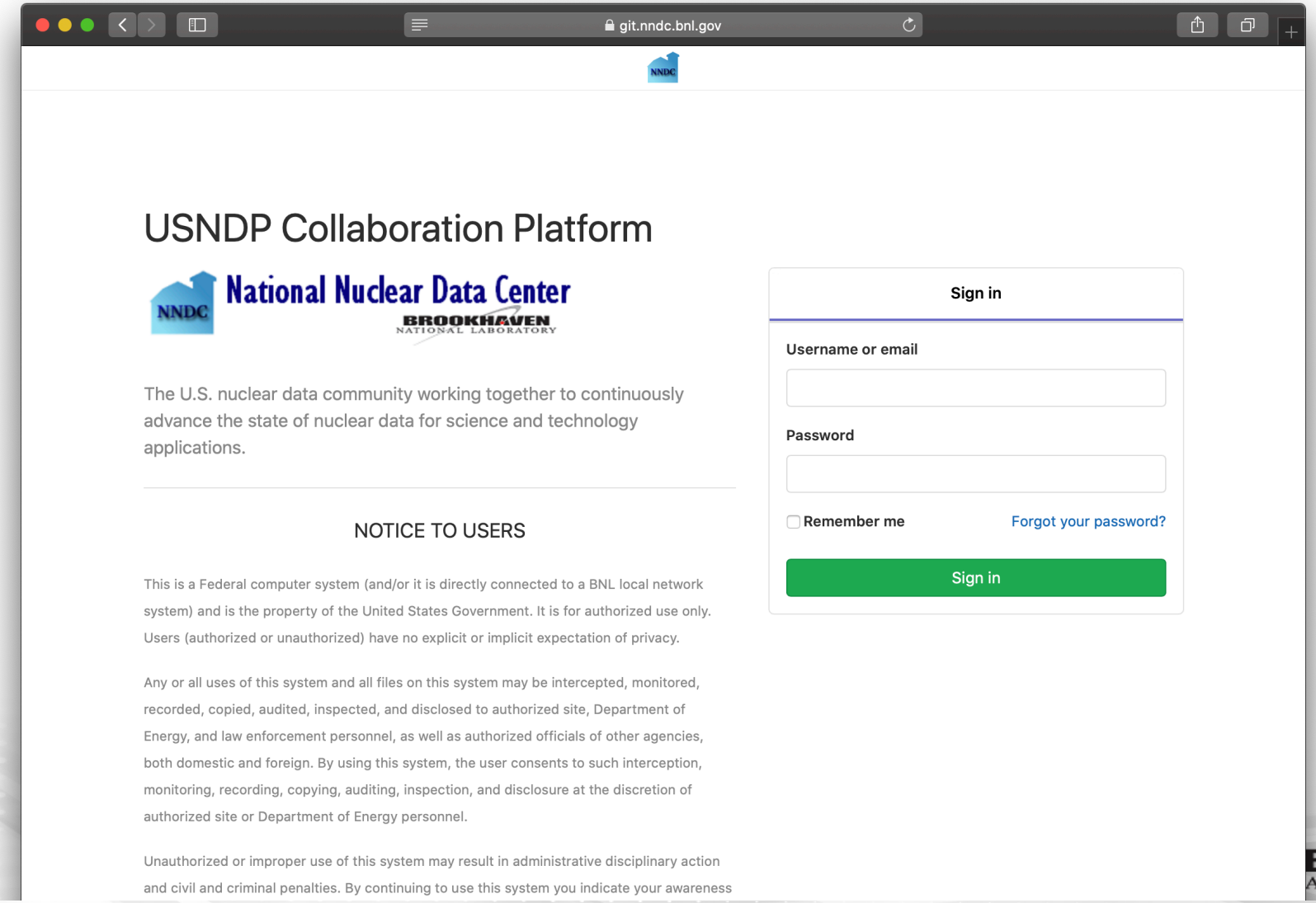

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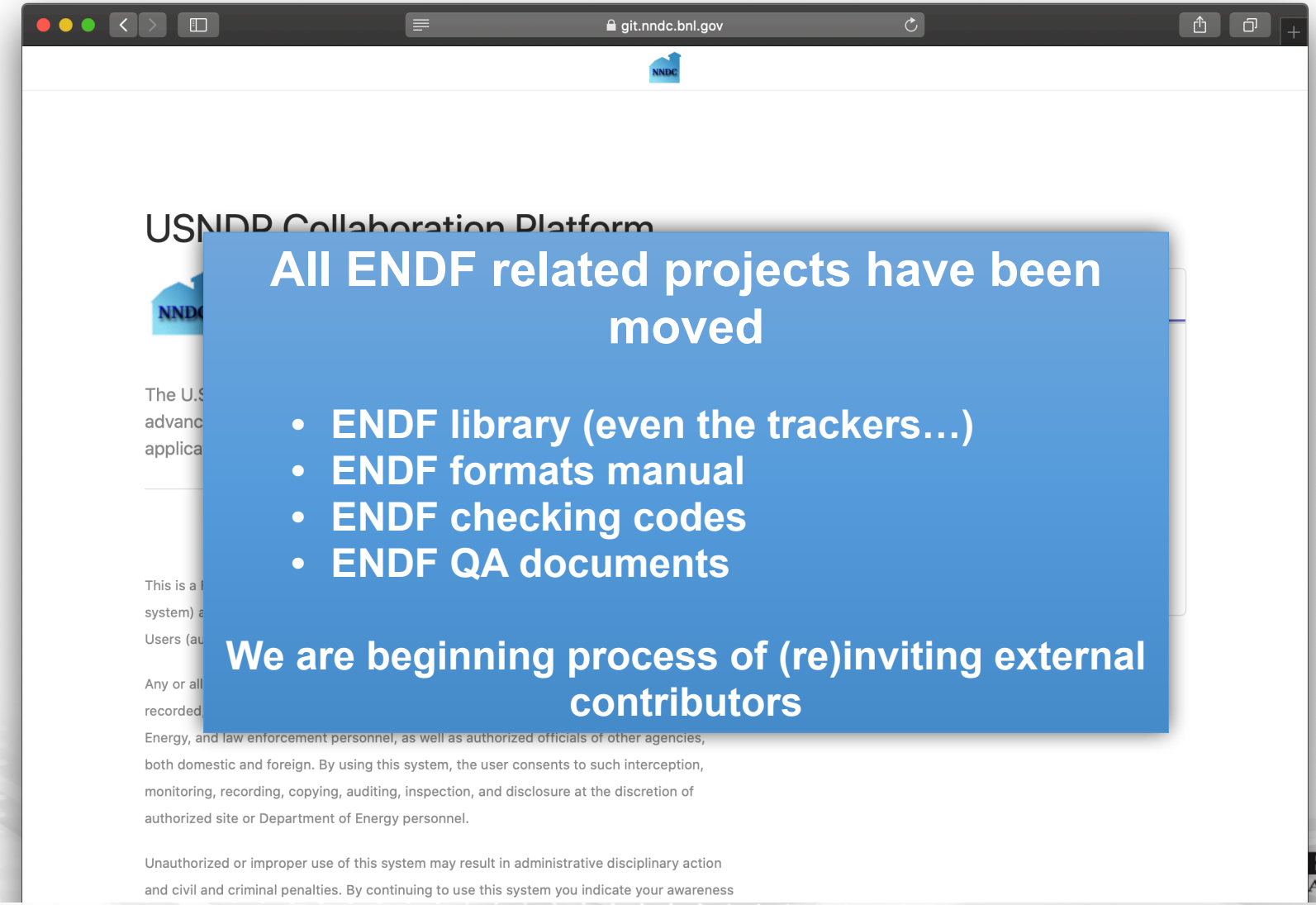

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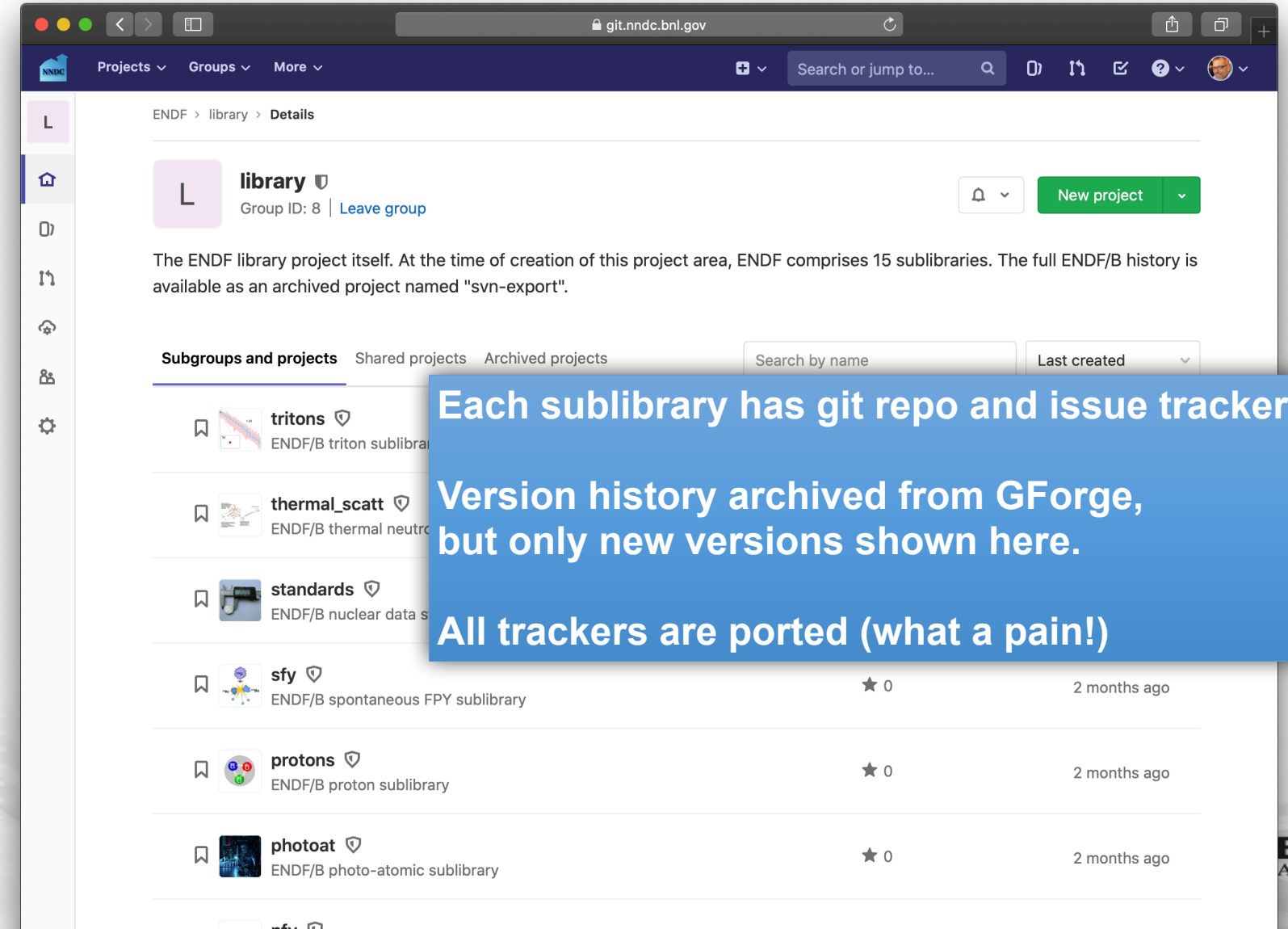

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We are aiming for the release of ENDF/B-VIII.1 in February 2023

Motivations:

- It's been nearly 3 years since the release of ENDF/B-VIII.0
- There is a need for intermediate fixes (Fe, many others)
- INDEN evaluations on longer time scale, but many evaluations will be ready to go (Fe, Cr, Si)
- Sponsors (NCSP & NA-22 & others) would like to see results

Why a minor release?

- There won't be a Standards in 2-4 years.
- Want new FPY evaluation too, but will take time

Other issues

- New TSL evaluations break ENDF-6 & processing codes
- Looking at delay of few years so that processing codes can do GNDS.
- Staging the testing will be a problem given the changes to some files/libraries

Color coding for new/planned evaluations

- Committed to phase1
- Soon to be committed to phase1
- Planned contribution
- CONFLICT 😈 angry words!
  (Validation committee to sort out)

Once again, TSL sublibrary undergoing major revisions

- **New evaluations:**
  - FLiBe, HF, paraffinic oil (NCSU)
  - UH_3, Be_2C, ^7LiD, ^7LiH, ZrH_2 (ε-phase) (NNL)
  - Si, Mg, Toluene, Mesitylene (phase II) (JEFF-3.3/CAB?)
- **Revised evaluations:**
  - YH_2 (NNL), conflict with RPI/ORNL?
- **New, but conflicting, evaluations:**
  - Sapphire (NCSU vs. JEFF-3.3)
  - Polyethylene (NCSU vs. RPI/ORNL)
  - Light water ice I_h (NCSU vs. RPI/ORNL vs. JEFF-3.3)
  - Light H_2O (CAB vs. NCSU)
  - Lucite (NCSU vs. RPI/ORNL)
  - ZrH (δ-phase) (NNL vs. JEFF-3.3)
  - CaH2 (NCSU vs. JEFF-3.3)

Mass(ive) sublibrary changes

- EPICS2017 tweak — atom_relax, electrons, photoat revision from Red Cullen (uploaded by G. Nobre last week)
- SFY fixes (A. Mattera, BNL, September 2020)
- NFY fixes (A. Mattera, BNL, September 2020)
- Decay changes (R. Lorek, BNL, April 2020)
- 2019 IAEA Photonuclear (G. Nobre uploading next week ☺️, working through formatting issues)

Charged particle evaluations

- p+^{4}He (LANL)
- d+^{4}He (LANL)
- ^{4}He+^{4}He, ^{4}He+^{6}Li (LANL)
- ^{4}He+^{9}Be, ^{4}He+^{17}O, ^{4}He+^{18}O (NNL+IAEA)

INDEN Evaluations

- ^{56}Fe fixes (IAEA)
- ^{55}Mn thermal capture spectrum (IAEA)
- $^{50,52\text{-}54}$Cr
- ^{235}U, ^{239}Pu
- $^{28\text{-}30}$Si (ORNL)
- ^{233}U (ORNL)
- ^{16,18}O

Non-INDEN neutron sublibrary

- $^{155,158,160\text{-}164}$Dy (ORNL)
- ^{234,236}U (LANL)
- ^{181}Ta (LANL/NNL/RPI)
- ^{35}Cl (LANL)
- Hf (RQW, BNL assist)
- ^{63,65}Cu (ORNL)
- ^{140,143}Ce (ORNL)
- Pb (RPI+LANL)
- Np (LLNL)
- Minor actinide nubars (RQW, BNL assist)
- (x,CP) (LANL+KAERI)
- $^{106,108,110\text{-}112,114,116}$Cd (LANL fix)
- ^{86}Kr (BNL)
- ^{170}Tm (BNL fix)
- ^{171}Tm (BNL fix)

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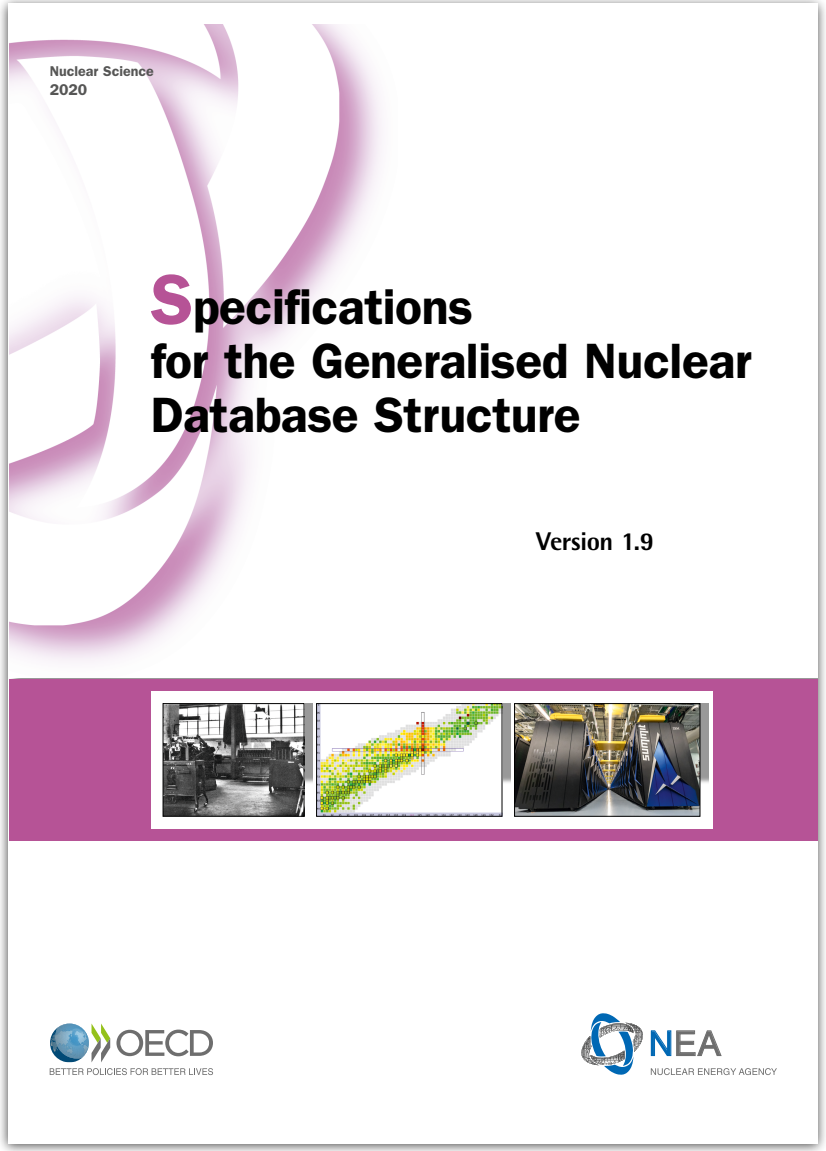
GNDS-1.9 specifications published Summer 2020

- Specifications: https://oecd-nea.org/download/wpec/documents/7519-GNDS.pdf
- XML Schema for GNDS-1.9: https://www.oecd-nea.org/download/wpec/gnds/gnds.xsd
- GNDS Webinar: https://www.youtube.com/watch?v=h9Byrkxr8LE&feature=youtu.be

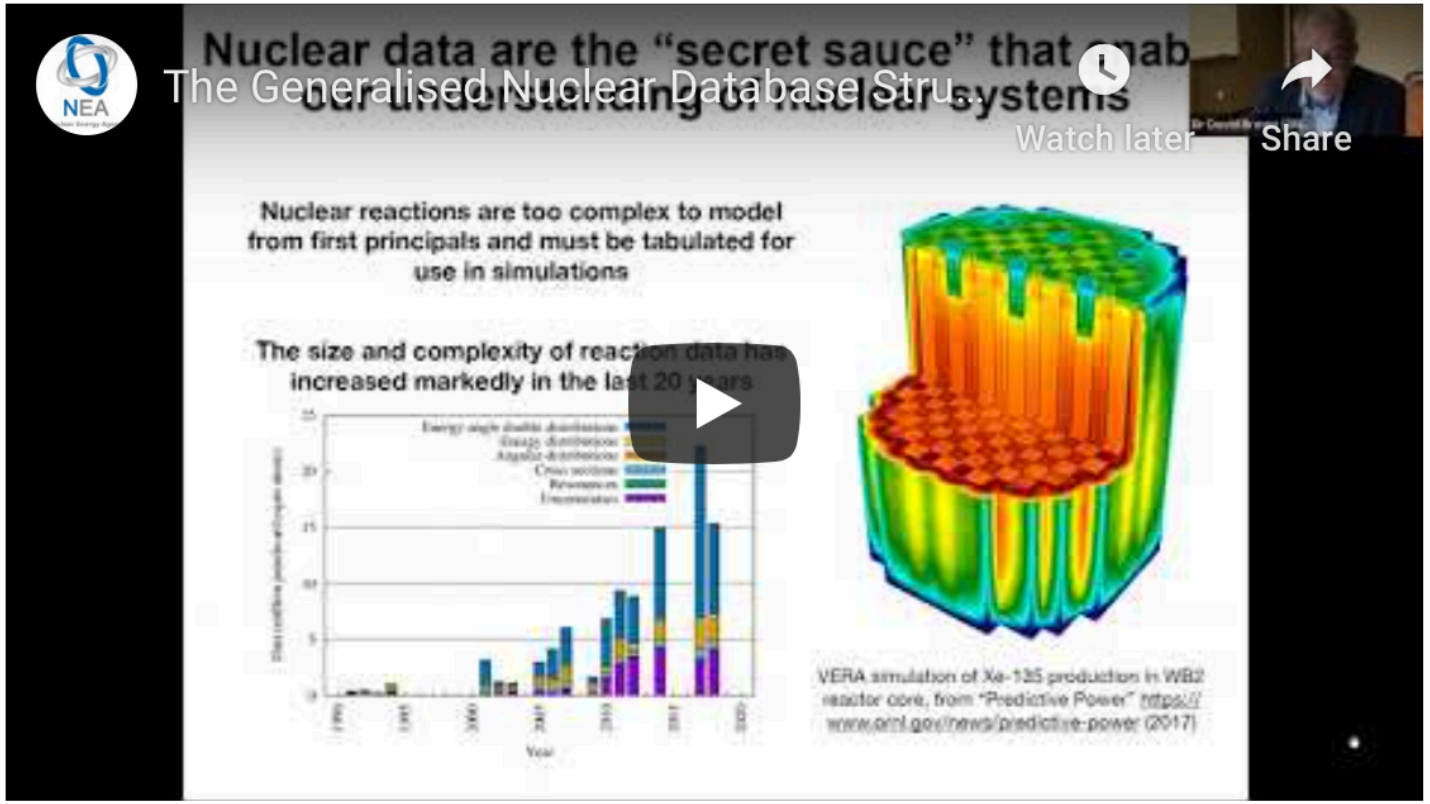


Thank you webinar participants

https://www.youtube.com/watch?v=h9Byrkxr8LE&feature=youtu.be

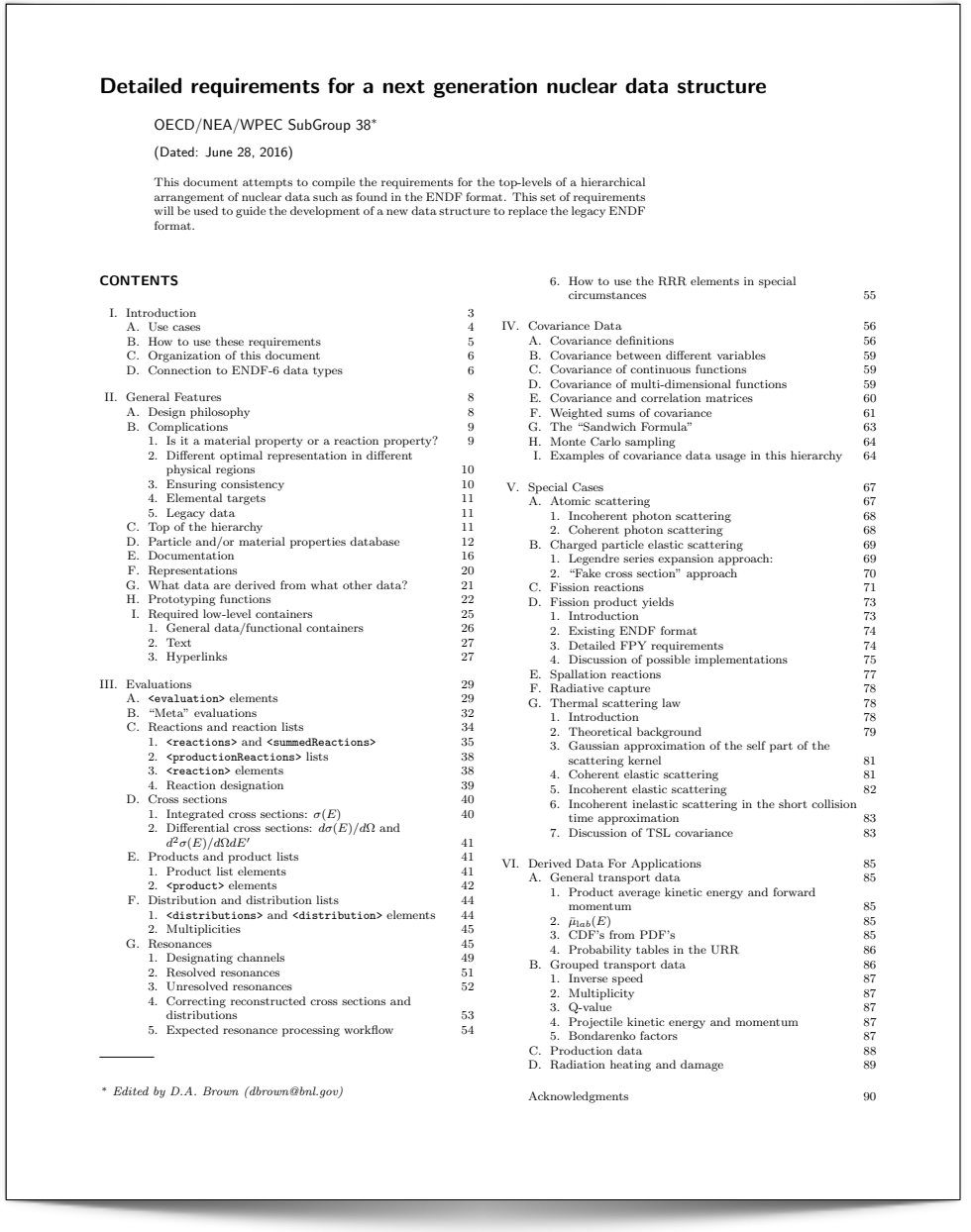
The NEA hosted an expert roundtable webinar on GNDS on 8 July 2020. The discussion was be moderated by William D. Magwood, IV, NEA Director-General and Dr David Brown (BNL), Chair of the NEA Expert Group on the Recommended Definition of a General Nuclear Database Structure (GNDS). The panellists included:

- Dr Osamu Iwamoto (JAEA)
- Dr Jean-Christophe Sublet (IAEA)
- Dr Dorothea Wiarda (ORNL)
- Dr Caleb Mattoon (LLNL)
- Dr Fausto Malvagi (CEA)



GNDS-2.0 Goals

- **Satisfy remaining SG-38 goals**
  - `<map>` format
  - `<documentation>` format (handled in May)
  - Major TNSL rewrite (handled in May)
- **Ensure "forwards compatibility" with ENDF-6**
- **Respond to user needs**
  - TNSL Covariance



Detailed requirements for a next generation nuclear data structure

OECD/NEA/WPEC SubGroup 38*

(Dated: June 28, 2016)

This document attempts to compile the requirements for the top-levels of a hierarchical arrangement of nuclear data such as found in the ENDF format. This set of requirements will be used to guide the development of a new data structure to replace the legacy ENDF format.

CONTENTS

I. Introduction 3
A. Use cases 4
B. How to use these requirements 5
C. Organization of this document 6
D. Connection to ENDF-6 data types 6

II. General Features 8
A. Design philosophy 8
B. Complications 9
1. Is it a material property or a reaction property? 9
2. Different optimal representation in different physical regions 10
3. Ensuring consistency 10
4. Elemental targets 11
5. Legacy data 11
C. Top of the hierarchy 11
D. Particle and/or material properties database 12
E. Documentation 16
F. Representations 20
G. What data are derived from what other data? 21
H. Prototyping functions 22
I. Required low-level containers 25
1. General data/functional containers 26
2. Text 27
3. Hyperlinks 27

III. Evaluations 29
A. <evaluation> elements 29
B. "Meta" evaluations 32
C. Reactions and reaction lists 34
1. <reactions> and <summedReactions> 35
2. <productionReactions> lists 38
3. <reaction> elements 38
4. Reaction designation 39
D. Cross sections 40
1. Integrated cross sections: $\sigma(E)$ 40
2. Differential cross sections: $d\sigma(E)/d\Omega$ and $d^2\sigma(E)/d\Omega dE'$ 41
E. Products and product lists 41
1. Product list elements 41
2. <product> elements 42
F. Distribution and distribution lists 44
1. <distributions> and <distribution> elements 44
2. Multiplicities 45
G. Resonances 45
1. Designating channels 49
2. Resolved resonances 51
3. Unresolved resonances 52
4. Correcting reconstructed cross sections and distributions 53
5. Expected resonance processing workflow 54
6. How to use the RRR elements in special circumstances 55

IV. Covariance Data 56
A. Covariance definitions 56
B. Covariance between different variables 59
C. Covariance of continuous functions 59
D. Covariance of multi-dimensional functions 59
E. Covariance and correlation matrices 60
F. Weighted sums of covariance 61
G. The "Sandwich Formula" 63
H. Monte Carlo sampling 64
I. Examples of covariance data usage in this hierarchy 64

V. Special Cases 67
A. Atomic scattering 67
1. Incoherent photon scattering 68
2. Coherent photon scattering 68
B. Charged particle elastic scattering 69
1. Legendre series expansion approach: 69
2. "Fake cross section" approach 70
C. Fission reactions 71
D. Fission product yields 73
1. Introduction 73
2. Existing ENDF format 74
3. Detailed FPY requirements 74
4. Discussion of possible implementations 75
E. Spallation reactions 77
F. Radiative capture 78
G. Thermal scattering law 78
1. Introduction 78
2. Theoretical background 79
3. Gaussian approximation of the self part of the scattering kernel 81
4. Coherent elastic scattering 81
5. Incoherent elastic scattering 82
6. Incoherent inelastic scattering in the short collision time approximation 83
7. Discussion of TSL covariance 83

VI. Derived Data For Applications 85
A. General transport data 85
1. Product average kinetic energy and forward momentum 85
2. $\bar{\mu}_{lab}(E)$ 85
3. CDF's from PDF's 85
4. Probability tables in the URR 86
B. Grouped transport data 86
1. Inverse speed 87
2. Multiplicity 87
3. Q-value 87
4. Projectile kinetic energy and momentum 87
5. Bondarenko factors 87
C. Production data 88
D. Radiation heating and damage 89

Acknowledgments 90

* Edited by D.A. Brown (dbrown@bnl.gov)

What's next

- **Expect major format changes post-GNDS-2.0:**
  - Synchronize nuclear structure formats with ENSDF as part of ENSDF modernization
  - Revamp uncertainty/covariance to make more ML friendly
  - Atomic data additions
  - FPY formats per FIRE collaboration/CSEWG recommendations

- **ENDF to GNDS transition:**
  - ENDF/B-VIII.0 released in GNDS-1.9
  - Expect at least next release to be in both ENDF-6 and GNDS formats
  - Transition is slow; we must walk together and we can only go as fast as the slowest among us