IAEA
International Atomic Energy Agency
Atoms for Peace and Development

IAEA status report 2022-2024

Paraskevi (Vivian) Dimitriou

Nuclear Data Section, Division of Physical and Chemical Sciences, International Atomic Energy Agency

Nuclear Data Section

Section Head
Nuclear Data Section
Arjan Koning
A2319, ext. 21709

J-C Sublet retired

Team Assistant/ Front office
Charisse Monfero
A2318, ext. 21710

Unit Head
Nuclear Data Services
Vacant
A2335, ext. 21717

Deputy Section Head
Unit Head
Nuclear Data Development
Roberto Capote-Boy
A2315, ext. 21713

Unit Head
Atomic and Molecular Data
Christian Hill
A2339, ext. 21731

Nuclear Data Physicist
Naohiko Otsuka
A2322, ext. 21715

Associate Nuclear Data Physicist
Shin Okumura
A2323, ext. 21727

Software Engineer (Nuclear Data)
Vacant
A23xx, ext. xxxx

Nuclear Data Service Assistant
Lidija Vrapcenjak
A2324, ext. 21725

Team Assistant
Szende Elias
A2324, ext. 21716

Nuclear Data Physicist
Paraskevi "Vivian" Dimitriou
A2316, ext. 21712

Nuclear Physicist (Code Development)
Georg Schnabel
A2314, ext. 21708

Team Assistant
Kira Nathani
A2317, ext. 21711

Viktor Zerkin retired

Atomic Physicist
Kalle Heinola
A2338, ext. 21729

Scientific Data Manager
Ludmila Marian
A2336, ext. 21724

Nuclear Data Analyst/ Programmer
Marco Verpelli
A2337, ext. 21723

Consultant
Khadidja Benyahia
A2326

Status

- IAEA NSDD website – continuously updated
- Financial support
- Training / meetings
- International effort
- Horizontal evaluations/compilations
  - Nuclear moments (Nick Stone's talk)
  - Beta-delayed neutrons
- Webtools and dissemination tools
  - LiveChart/Nubase interactive chart (Marco Verpelli's talk)
  - MyEnsdf Webtools, X4-NSR pdf database, DOI links
- Decay Data for Monitoring Applications (Filip Kondev's talk)

INTERNATIONAL NETWORK OF NUCLEAR STRUCTURE AND DECAY DATA EVALUATORS (NSDD)

In Memoriam

Balraj Singh (1941 - 2023)

Our dear colleague, mentor, teacher, and friend, Balraj Sing, passed away on 9 October 2023.

Balraj completed his PhD at the University of Toronto in 1971 with Dr. Harry Taylor. The title of his thesis was "Directional Correlation and Multipole Mixing of Gamma Transitions in ^{134}
He then held post-doctoral fellowships at McMaster University (1971-1974), University of Toronto (1974-1976), and McGill University (1976-1978). He was a Research Scientist at Kuv
for Scientific Research (KISR) from 1978 to 1984. In 1985 he moved back to Canada to start the Nuclear Data Program with Jon Cameron at McMaster University in Hamilton, Ontario
at McMaster University until his retirement in 2013. From the mid 80s to early 90s he spent some time in Lawrence Berkeley National Laboratory where he worked with some of the n
giants of the time, Virginia Shirley, C.M. Lederer, and Eddie Browne. After his retirement, he continued working for Brookhaven National Laboratory (US Nuclear Data program) until 2

In reality, Balraj never retired. For almost five decades he worked tirelessly on mass chain evaluations and other horizontal evaluation projects. As a nuclear data evaluator, Balraj was
most prolific evaluator in the history of Nuclear Data Sheets and ENSDF, and one of the longest-serving members of the international network of Nuclear Structure and Decay Data ev
(NSDD). A total of 80 published mass chains out of 300 in ENSDF have his name on them. That is 27% of all the mass chains: a feat only Balraj could accomplish.

INTERNATIONAL NETWORK OF NUCLEAR STRUCTURE AND DECAY DATA EVALUATORS (NSDD)

Nuclear Structure & Decay Data Network

Data Centres

Data Centre	Mass Chain Responsibility/Activity
National Nuclear Data Center [link] Brookhaven National Laboratory ***Contact:*** *Dave Brown*	**A-Chain Evaluations:** 1,45-50,64,68,70,82,84-89,94-100,113-116,136-145 (ex. 140-141), 149-165 (ex. 153,155,157,158,160),175,180-183,185,188-190,194,230-240,>249 Data Dissemination Maintenance of the Evaluated Nuclear Structure Data File (ENSDF) and editorship of the Nuclear Data Sheets journal
Nuclear Data Group [link] Oak Ridge National Laboratory ***Contact:*** *Michael Smith*	**A-Chain Evaluations:** 69,241-249
Bay Area Nuclear Data Group [link] Lawrence Berkeley National Laboratory and University of California Berkeley ***Contact:*** *Lee Bernstein*	**A-Chain Evaluations:** 21-30,81,83,90-93,166-171,184-193 (ex. 185,188-190),210-214
Nuclear Data Evaluation Project [link] Triangle Universities Nuclear Laboratory ***Contact:*** *John H. Kelley*	**A-Chain Evaluations:** 2-20 Data Dissemination
Argonne National Laboratory [link] Physics Division ***Contact:*** *Filip G. Kondev*	**A-Chain Evaluations:** 109,110,176-179,199-209
FRIB at Michigan State University [link] ***Contact:*** *Jun Chen*	**A-Chain Evaluations:** 31-44,60-80 (ex. 62,67-70)

NSDD Meetings
25th Meeting 2024
24th Meeting 2022
23rd Meeting 2019
22nd Meeting 2017
21st Meeting 2015
20th Meeting 2013
19th Meeting 2011
18th Meeting 2009
17th Meeting 2007
16th Meeting 2005
15th Meeting 2003
14th Meeting 2000

Workshops on NSDD: Theory and Evaluation
IAEA-ICTP 2022
IAEA-ICTP 2018
IAEA-ICTP 2016
IAEA-ICTP 2014
IAEA-ICTP 2012
IAEA-ICTP 2010
IAEA-ICTP 2008
IAEA-ICTP 2006
IAEA-ICTP 2005
IAEA-ICTP 2003-part 2
IAEA-ICTP 2003-part 1
IAEA Workshop 2002

Financial support

- Contracts for mass chain evaluations:
  - *Anagha Chakraborty (IND): 2023 – 2026*
  - *Sushi Kumar (IND): 2024 - 2027*
- Contracts for horizontal evaluations:

  Nick Stone (2018-2023):

  – Evaluation of Magnetic Dipole Moments for Long-lived states: INDC(NDS)-0794 (2019)

  – Evaluation of Magnetic Dipole Moments for Short-Lived states: INDC(NDS)-0816 (2020)

  – Tables of recommended Electric Quadrupole Moments: INDC(NDS)-0833 (2021)

  – *Updated Compilation Tables of Nuclear Moments: completed*

Meetings (2023 – present)

- Technical Meeting on Nuclear Data for Antineutrino Spectra Calculations, 16-20 January 2023
- CM on Needs for a Comprehensive European Plan to acquire and curate Nuclear Data, 25 -27 April 2023
- Technical Meeting on Nuclear Data Needs for Medical Applications, 28 -31 Aug 2023 (PO: R. Capote)
- Technical Meeting on Decay Data for Monitor Applications, 23-25 October 2023 – *see Filip Kondev talk*
- Technical Meeting on Thermal Capture and Gamma Emission, 23-25 October 2023 (PO: R. Capote) – *see Roberto Capote talk*

- *Consultants' Meeting on International Nuclear Data Evaluation Network – Light Elements (INDEN-LE), 29 Aug – 1 Sep 2023*
- *Consultants' Meeting on Evaluation of Photon Strength Functions, 9-10 October 2023*
- *Technical Meeting on (alpha,n) reaction data needs, 27 Nov – 1 Dec 2023*

2nd IAEA Technical Meeting on Reactor Antineutrino spectra and applications, 16 – 20 January 2023

- Participants: 56 registered; 18 in person
- Countries: China, France, Germany, Korea, Poland, Spain, Russia, US
- Report: in preparation

32 presentations covering:

- Reactor antineutrino measurements for basic science (SM and beyond SM) and applications (nonproliferation)
- Conversion vs Summation calculations
- Nuclear data (decay and fission) – Reactor data

https://conferences.iaea.org/event/337/

2nd IAEA Technical Meeting on Reactor Antineutrino spectra and applications, cont'd

Highlights:

- Sterile neutrino phase space have been narrowed down – not entirely ruled out
- ILL beta spectra measurements could be root cause of Reactor Anomaly – supported by Daya Bay fuel evolution measurements
- Spectral distortion is not yet understood
- Double CHOOZ: clear observation of residual antineutrinos (spent fuel)
- NU Tools report (sponsored by US NNSA): utility of actual uses cases in the US
- Mobile reactor antineutrino detectors: detector technology and protoypes exist
- Reactor antineutrino flux: conversion and summation calculations agree
- New beta spectra measurements needed to confirm ILL
- High energy part of the antineutrino spectrum requires new decay data
- JUNO/TAO: beta-delayed neutron spectra become relevant

2nd IAEA Technical Meeting on Reactor Antineutrino spectra and applications, cont'd

Recommendations

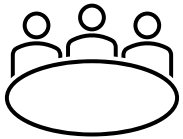
- Coordination and collaboration btw different experiments and joint analyses (see DB/PROSPECT; PROSPECT/STEREO)
- Correlated HEU/LEU measurements
- More R&D on demonstrating technology
- Measurements in different reactors (for basic science, for nuclear data, for operations) AND different detector at same reactor to understand systematics
- New and improved input data (fission yields with covariances)
- Inter-comparison of summation models
- Theoretical predictions (microscopic models) and improved beta shapes
- Integral beta measurements - new measurements to compare with ILL
- Individual beta spectra measurements
- TAGS measurements complemented by High-Resolution measurements for high-energy spectrum
- Isomers identification

Final recommendation

- Basic science goals: high precision data - almost there
- Applications: identify use cases – R&D needed – resources
- Modeling: improve nuclear theory – open computational tools
- Nuclear data: improve nuclear data – uncertainties – beta spectra
- Data preservation and dissemination: standardisation – sharing of data following FAIR principles

Progress limited by available resources – coordination is needed

Recommendation: form a Working Group under the auspices of the IAEA



Technical Meeting on Nuclear Data for Medical Applications, 28 -31 Aug 2023

- 21 participants incl. IAEA
- 14 presentations
- Summary report: INDC(NDS)-0884

Topics

- Charged particle-induced reactions
  - Insufficient measured data
  - Reactions producing radioisotope impurities
  - Validation of reaction data
- Neutral particle-induced reactions
- Theoretical models
- Measurements and evaluations of decay data
- External beam therapy (proton; carbon; ^{4}He)

	Tibor	KIBEDI	Australian National University	tibor.kibedi@anu.edu.au
	Alex	HERMANNE	Vrije Universiteit Brussel	aherman@vub.be
	Ondrej	LEBEDA	Nuclear Physics Institute of the CAS	lebeda@ujf.cas.cz
🎧	Marco	PINTO	Ludwig-Maximilians-University of Munich	marco.pinto@physik.uni-muenchen.de
	Syed	QAIM	Forschungszentrum Jülich GmbH	s.m.qaim@fz-juelich.de
	Ferenc	TARKANYI	Institute of Nuclear Research ATOMKI	tarkanyi@atomki.hu
	Luciano	CANTON	Istituto Nazionale di Fisica Nucleare (INFN)	luciano.canton@pd.infn.it
	Liliana	MOU	Istituto Nazionale di Fisica Nucleare (INFN)	liliana.mou@lnl.infn.it
	Gaia	PUPILLO	Istituto Nazionale di Fisica Nucleare (INFN)	gaia.pupillo@lnl.infn.it
	Yasuki	NAGAI	Japan Atomic Energy Agency (JAEA)	nagai@rcnp.osaka-u.ac.jp
🎧	Anatoly	IGNATYUK	private	ignatyuk-anatoly@yandex.ru
🎧	Carlos	GUERRERO SANCHEZ	Universidad de Sevilla	cguerrero4@us.es
🎧	Jose	QUESADA	Universidad de Sevilla	quesada@us.es
🎧	Alan	NICHOLS	University of Surrey	alanl.nichols@btinternet.com
	Filip	KONDEV	Argonne National Laboratory	kondev@anl.gov
🎧	Elisabeth	RICARD-McCUTCHAN	Brookhaven National Laboratory	mccutchan@bnl.gov
🎧	Lee	BERNSTEIN	Lawrence Berkeley National Laboratory	labernstein@lbl.gov
🎧	Andrew	VOYLES	Lawrence Berkeley National Laboratory	asvoyles@lbl.gov
	Jonathan	ENGLE	University of Wisconsin	jwengle@wisc.edu
	Roberto	CAPOTE NOY	International Atomic Energy Agency (IAEA)	roberto.capotenoy@iaea.org
	Arjan	KONING	International Atomic Energy Agency (IAEA)	a.koning@iaea.org

Technical Meeting on Nuclear Data for Medical Applications, cont'd

Recommendations for the next 5-10 yrs and beyond

- New measurements of specific clinical radionuclides:
  - $^{226}Ra(p,2n)^{225}Ac$ reaction: to resolve observed discrepancies in the quantification of the gamma-ray emissions of daughters at equilibrium.
  - ^{64}Cu: positron and 1345.77-keV gamma-ray intensities to resolve discrepancies.
  - ^{86}Y: positron intensity to resolve discrepancies.
  - ^{124}I: positron intensity to resolve discrepancies.
  - ^{99m}Tc: decay data requires new evaluation as support for Auger-electron calculations.
  - $^{72,74}As$ and ^{152}Tb: new measurements and evaluation of reaction and decay data.
  - ^{51}Mn: re-assessment of reaction and decay data
  - ^{161}Tb: Auger yield and multiplicity, X-ray and conversion-electron data require assessment to determine the need for further measurements and evaluation.
  - $^{149,152,155}Tb$: new measurements or evaluations of decay data depending on potential usage.

Technical Meeting on Nuclear Data for Medical Applications, cont'd

- Reactions producing problematic radioisotope impurities
  - Prioritize in current and future measurements and evaluations
  - Incorporate these evaluations into the IAEA Medical Portal
  - Priority list of such radionuclides was produced
- Validation of current and future cross-section measurements with measurements of integral target yields
- International meeting on nuclear reaction and decay data that are required in microdosimetry and Monte-Carlo calculations to characterize Auger-electron emissions
- Engage leading users in these fields - the Society for Nuclear Medicine and Molecular Imaging, the European Association of Nuclear Medicine and Molecular Imaging, and the Society for Radiopharmaceutical Science - to emphasize the importance of nuclear data to application-orientated work
- Enhance support for training workshops and schools to maintain and develop highly necessary nuclear data expertise

Coordinated Research Projects

- CRP on RIPL Fission Cross Sections
  - Improve input parameters for fission cross-section calculations (masses, fission barriers, fission paths)
  - 4th RCM in 2024; Deliverables agreed; Final CRP publication in EPJA (2025)
- CRP on Updating Fission Yield Data for Applications
  - Started: 2020
  - Compilation of all available FY data; modelling of FYs; new evaluations of FYs of major actinides; validation of new evaluated FY files
  - 3rd RCM in 2024
- New CRP: Updating and improving Nuclear Level Densities for Applications; approved; to begin in October 2024 (contracts and agreements in preparation)

Upcoming projects

- Compilation and evaluation of charged radii
  - Update of Tables of Angeli & Marinova 2013
  - Technical Meeting of experts in January 2025
  - Discuss new measurement techniques, evaluation methods, and plan the updating of the tables
- Dissemination online and via publication

NUCLEAR ELECTROMAGNETIC MOMENTS

The present compilation includes experimental information on nuclear magnetic dipole and electric quadrupole moments found in print compilations (such as INDC(NDS)-0650, INDC(NDS)-0658 etc), the ENSDF nuclear database, peer-reviewed journals, international conferences and other resources. The online interface was created by Theo J. Mertzimekis under the IAEA auspices.

New: Recommended magnetic dipole moments for long-lived states (INDC(NDS)-0794) and short-lived states (INDC(NDS)-0816), and recommended electric quadrupole moments (INDC(NDS)-0833) are available on the database. The recommended tables have been produced by N.J. Stone. Detailed discussion with Karel Jackowski (diamagnetism), Pekka Pyykko (electric field gradient computation data) and Andrew Stuchbery (transient field calibration) is gratefully acknowledged.

Group	1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	1 n																		
Period 1	1 H																		2 He
2	3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	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
5	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
6	55 Cs	56 Ba	*	71 Lu	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
7	87 Fr	88 Ra	**	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

Z: Search

A: Reset

*Lanthanides	*	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
**Actinides	**	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

Chromium (Z=24)

^{49}Cr ^{50}Cr ^{51}Cr ^{52}Cr ^{53}Cr ^{54}Cr

Recommended† magnetic dipole moments

Isotope	Energy [keV]	$t_{1/2}$	Spin/Parity	μ [nm]	Method	Recommended Tables
^{52}Cr	1434	0.783 ps	2+	+2.4(4)	TF	INDC(NDS)-0816

Recommended† electric quadrupole moments

Isotope	Energy [keV]	$t_{1/2}$	Spin/Parity	Q [b]	Method	Recommended Tables
^{52}Cr	1434	0.783 ps	2+	-0.08(2)	ES	INDC(NDS)-0833

Compiled tables have been updated
To be uploaded soon

Compiled‡ magnetic dipole and electric quadrupole moments from published articles

Isotope	Energy [keV]	$t_{1/2}$	Spin/Parity	μ [nm]	Q [b]	Ref. Std	Method	NSR keyword	doi
^{52}Cr	1434.	0.707 ps	2^+	+2.41(13)			TF	2000ER06	10.1103/PhysRevC.62.024305
				+3.0(5)		[^{56}Fe 847.]	TF	1987ST07	10.1007/BF02396850
				+3.2(22)			TF	1987PA28	10.1103/PhysRevC.36.2088
					-0.08(2)		ES	1989RA17 2013STZZ	10.1016/0092-640X(89)90008-9

† Recommended magnetic moments are for the bare nucleus with published results corrected consistently for diamagnetism (including error estimate).
Where appropriate published results are also adjusted to the most recent adopted half-life for the state.
Recommended quadrupole moments are adjusted using the best electric field gradient calculation for the system concerned.
For details see the Reports referenced.

‡ In this listing published results are given without adjustment or correction.

International Atomic Energy Agency
Nuclear Data Services
Секция Ядерных Данных МАГАТЭ

IAEA

Reference Database for Beta-Delayed Neutron Emission

Produced by IAEA Coordinated Research Project (2013-2018): CRP Publication

Microscopic Database

Contains compiled experimental beta-decay half-lives, beta-delayed neutron emission probabilities and beta-delayed neutron emission spectra for individual precursors. Provides recommended values, and results from systematics and global models.

Individual Precursors

Publication on Z ≤ 28
Publication on Z > 28

Macroscopic Database

Contains compiled and evaluated total delayed neutron yields (nubar), composite delayed neutron spectra, compiled and recommended 6- and 8-group parameters.

Total Delayed Neutron Yields | Group Spectra

Delayed Neutron Spectra | Group Parameters

Publication on integral delayed neutron spectra
Publication on new total delayed-neutron yields

Documents and Links

INDC reports	CRPs/DDPs webpages
INDC(NDS)-0735	Reference Database for Beta-Delayed Neutron Emission (2013-2018)
INDC(NDS)-0683	Total Absorption Gamma-ray Spectroscopy Meeting 2018
INDC(NDS)-0643	Fission Product Yields Meeting 2016
INDC(NDS)-0599	Total Absorption Gamma-ray Spectroscopy Meeting 2014
INDC(NDS)-0107/G	CRP on Updating the fission yield data for applications (Ongoing)

Beta-delayed neutron microscopic database: update Feb. 2022

- Z>28 data from Liang et al. 2020 (2020Li32)
- Z>28 new published data in period Aug. 2020 – Jan. 2022 (B. Singh):
  - PRL, PRC, PL-B, EPJ-A, NP-A, JP-G, ARI
  - Revised $T_{1/2}$, P_n values for 56 bDN emitters

1. 2021Ha19: O. Hall et al., Phys. Lett. B **816**, 136266 (2021): B-RIKEN: 115,116Tc, 116-121Ru, 118-124Rh, 121-128Pd, 124-129Ag, 127-130Cd: 33 nuclides: half-lives and Pn.
2. 2021Su01: T. Sumikama et al., Phys. Rev. C **103**, 014614 (2021): RIKEN: 101Br, 102Kr, 105,106Rb, 108Sr, 110,111Y, 114Zr, 117Nb: nine new neutron-rich nuclides identified, no half-lives available, expected to be B-n emitters.
3. 2021Mi07: A.J. Mitchell et al, Phys. Rev. C **103**, 024323 (2021): CARIBU-ANL: 106Nb: T1/2.
4. 2021Mo10: B. Moon et al., Phys. Rev. C **103**, 034320 (2021): RIKEN: 137,138Sb: half-lives, Pn and P2n.
5. 2021Ga10: F.H. Garcia et al., Phys. Rev. C **103**, 024310 (2021): TRIUMF: 129In: g.s. and three isomers: half-lives of all the four activities; B-n decay mode seen but no Pn value extracted
6. 2021Pi11: M. Piersa-Silkowska et al., Phys. Rev. C **104**, 044328 (2021): ISOLDE-CERN: 134,135In: half-lives, Pn, P2n, possible observation of B-3n for 135In decay.
7. 2021Ba34: J.C. Batchelder et al., Phys. Rev. C **104**, 024308 (2021): ORNL: 125,125mAg: half-life, Pn.
8. 2021Wa49: H. Watanabe et al., Phys. Lett. B **823**, 136766 (2021): RIKEN: 127mAg: half-life.
9. 2021Te02: D.A. Testov et al., Eur. Phys. Jour. A 57, 59 (2021): TETRA-ALTO: 123Ag: half-life, Pn.
10. 2020Ju02: A. Jungclaus et al., Phys. Rev. C **102**, 034324 (2020): RIKEN: 136,137,138Sn: half-lives, Pn.
11. 2020Wh02: K. Whitmore et al., Phys. Rev. C **102**, 024327 (2020): TRIUMF: 132In: half-life, Pn.

Beta-delayed neutron microscopic database: update 2024

New updates 2023 (Balraj Singh):

- Z>57: publications from Aug. 2020 to April 15, 2023; 118 bDN emitters; 3 papers (2020Or03, 2020Li08, 2022Ki23)
- Z<28: publications from Aug. 2015 to April 15, 2023; 242 bDN emitters; 41 papers

To add: new RIKEN measurements, end of 2023

To be uploaded online soon.

Publication to be prepared.

International effort

- European ENSDF effort
  - Presented at NuPECC Vienna Meeting, 2 Dec 2022
  - Organised CM on Needs for a Comprehensive European Plan to acquire and curate Nuclear Data, 25-27 April 2023
  - Contributed to NuPECC Long Range Plan 2024
    - TWG 9: Open Science and Data
    - Coordinator: Antoine Lemasson (GANIL)
    - Section on Nuclear Data and Evaluation: P (Vivian) Dimitriou
  - Co-organised Side Event on Nuclear Data at 67th IAEA General Conference
  - Follow-up meetings and actions planned: goal to create European Nuclear Data Committee for high-level interventions (equivalent to NuPECC)

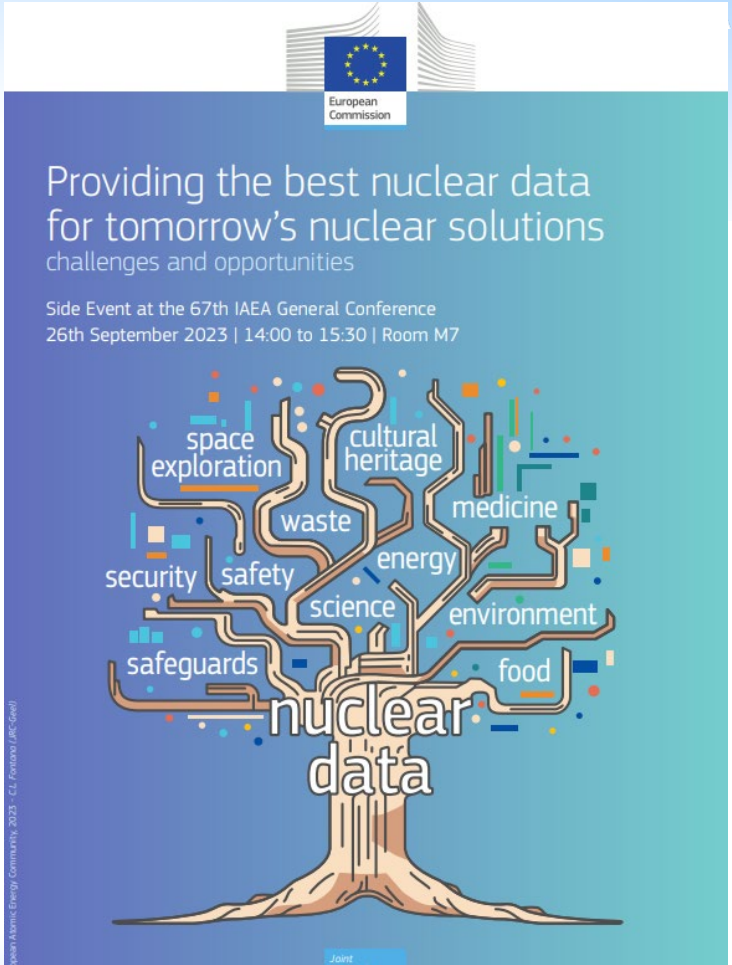
Consultants' Meeting on Needs for a Comprehensive European Plan to acquire and curate Nuclear Data

- 25-27 April 2023, IAEA
- Guest (remote) presentation: Keith Jankowski (DoE)
- Report: INDC(NDS)-0875; https://conferences.iaea.org/event/347/
- Some key recommendations:
  - establish priorities for nuclear data measurements and evaluations for applications that will be addressed by **a comprehensive European nuclear data programme** - the priorities should be based on existing priority lists maintained by the different stakeholders
  - establish a **sustainable source of funding of measurements and data evaluation, including well-defined career paths in nuclear data** that will involve national funding agencies and the European Commission (EC) (EURATOM and all other relevant EU work programmes)
- Proposed action:
  - Consider **organizing a side event at the IAEA General Conference 2023** to highlight the importance of nuclear data programmes for basic sciences, nuclear energy development and other applications worldwide

IAEA 67th General Conference – Side Event

Providing the best nuclear data for tomorrow's nuclear solutions

- 26 September 2023, IAEA
- Lead organiser: Joint Research Center – EC (Arjan Plompen)
- Facilitated and supported by IAEA/Nuclear Data Section
- https://www-nds.iaea.org/index-meeting-crp/GC67-SideEvent/
- Innovation, research and development for tomorrows' nuclear solutions
  - Yolanda Benito (CIEMAT, Director General)
  - Heloise Goutte (CEA, Scientific Director for Energy)
  - Michael Fleming (OECD-NEA, on behalf of the DG)
- Opportunities, challenges and ways forward for nuclear data
  - Arjan Koning (IAEA) – Introducing nuclear reaction and decay data
  - Arjan Plompen (JRC-EC) – European perspective
  - Keith Jankowski (DoE) – United States perspective
  - Tokio Fukahori (JAEA) – Japanese perspective
  - Wenming Wang (CIAE) – Chinese perspective



International effort cont'd

- Japan
  - FTE=0.5 to 0.2 in 2011
  - Evaluator retired (2021) - Partial funding (following Letters of Support from IAEA, DoE)
  - RIKEN contribution:
    - H. Sakurai invited to NSDD meeting (2015;2022) and ICTP Workshop (2016)
    - started with XUNDL in 2017 (training by F. Konev); compiler left RIKEN
    - Director at NSDD 2022: not easy to use research funds for ENSDF evaluation
  - JAEA contributed to GC67 Side Event (Tokio Fukahori)
    - Wants to support one new ENSDF evaluator
    - Need to identify interested candidate
    - IAEA will help with seed funding for training
  - Outreach activity planned:
    - Satellite workshop on nuclear data at the Japan Physics Conference, 2024
      - International speakers
    - Cooperation with Otsuka (IAEA), Aikawa (Sapporo), Minato (Kyoto)

International effort cont'd

- China
  - FTE=0.4 for both DCs: CNDC and Jilin U
  - China is investing heavily in nuclear energy and nuclear research; many new NPPs and research facilities have been built in the past decade
  - Investing in nuclear data is a natural development
  - CNDC contributed to GC67 Side Event
    - Discussions held with CIAEA and CNDC managers
    - Agreement to introduce at least two new evaluators to the network (starting in 2024)
    - Training is required: at CNDC, experimental facilities in China, IAEA, and other Data Centers
    - IAEA will help by providing seed funds if needed

International effort cont'd

- India
  - Seed funding to establish ENSDF evaluation activities at different universities: *Chakraborty, Kumar*
  - Is this sustainable?
- Argentina (Bariloche)
  - Outreach activities are being planned to create awareness and attract interested scientists
  - Webinar + In-person workshop: topics will include nuclear structure and decay data, nuclear reaction data, benchmarking, codes and dissemination tools
  - Dates tbd

Other tools and news

Since Viktor Zerkin's retirement:

- X4-NSR PDF database is maintained – responsible at IAEA-NDS is Lidija Vrapcenjak
- MyEnsdf Webtools: maintenance upon demand
- JSON-Tree editor: available on GitHub and via browser to explore and test JSON files for ENSDF and NSR (V. Zerkin)
- DOI links: all IAEA reports (INDC(NDS) included) are assigned DOIs (also retroactively).

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Thank you!