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WPEC Subgroup C
HPRL
High Priority Request List for Nuclear Data

www.oecd-nea.org/dbdata/hprl

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NEA
NUCLEAR ENERGY AGENCY

Irfu

WPEC Subgroup C / HPRL

① Administrative items

② Report on activities since last meeting

③ Priority requests for medical applications

④ Role of SG-C/HPRL wrt SG46 TAR initiative

⑤ Status of deliverables

⑥ Mandate extension

⑦ Status of publications

⑧ Status of the CMS-based HPRL (and website upgrade)

1. Admin items: EG-HPRL (SG-C) membership

- Expert members: experimentalists, evaluators, and (too few) users
- Representatives of nuclear data evaluation projects or countries
  - ENDF: Y. Danon (RPI)
  - JEFF: E. Dupont (CEA), A. Plompen (EC-JRC-Geel), G. Rimpault (CEA)
  - JENDL: O. Iwamoto (JAEA), N. Iwamoto (JAEA), T. Iwasaki (Tohoku), A. Kimura (JAEA), [K. Yokoyama (JAEA)]
  - BROND: V. Pronyaev (IPPE), V. Koscheev (IPPE)
  - CENDL: Zhigang Ge (CIAE), Xichao Ruan (CIAE), Sun Weili (IAPCM), Haicheng Wu (CIAE)
  - IAEA: R. Capote, A. Koning, [A. Trkov]
  - Korea: Young-Ouk Lee (KAERI)
  - Romania: A. Negret (IFIN-HH)
  - NEA: M. Fleming

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2. Report: HPRL database, tools and website

www.oecd-nea.org/dbdata/hprl

New features implemented since June 2019

- Archiving of one more “Completed” entry: U-235(n,γ)
- Addition of justifications for all (9) HPRL entries with “Completed” status
- Improvements of the CMS-based HPRL prototype
  - Filtering fields (Type, Target, Reaction, Quantity, Status) for the list of entries;

Implementation of additional features depends on the NEA website upgrade and decision to use (or not) a CMS-based HPRL, not to mention NEA manpower.

2. Report: Entry-related list of main recent references

Updates of the list of references related to HPRL entries

- 4 updates: August, December 2019, and February, May 2020
- Addition of a total of 16 references to about as many entries plus numerous dosimetry entries
- Please use wpec-sgc@oecd-nea.org for reporting new publications

2. Report: New entries or new status

No new entries

- Update of 11G (^{239}Pu alpha ratio) is approved but not yet online

No new completed entries identified yet, just one potential useless entry

- 11G (^{239}Pu alpha ratio) pending upload of the update 11G → 11G+

Entries status from the June 2019 review

- From “Work in progress” to “Pending new evaluation or validation”:

  Pu-239 and U-235 PFGS Am-241(n,f)

  Pu-242(n,g) Na-23(n,n’)

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3. Priority requests for medical applications

Requests by Ignacio Porras in Feb. 2019

- BNCT and neutron dosimetry in hadron-therapy. Roberto Capote made a thorough technical review and updates were requested.
- I. Porras agreed with the suggestions, but never submitted any update.

IAEA CM on BNCT (Oct. 2019) with a tentative list of nuclear data needs

- Preparatory stage before perhaps further work in the framework of a CRP
- Very general requests, far from the HPRL criteria for a priority request.

IAEA TM on Nuclear Data for Medical Applications (Dec. 2018)

- https://www-nds.iaea.org/publications/indc/indc-nds-0776 (May 2019)
- There is still a significant amount of work before submitting any request
- See talk by Roberto Capote

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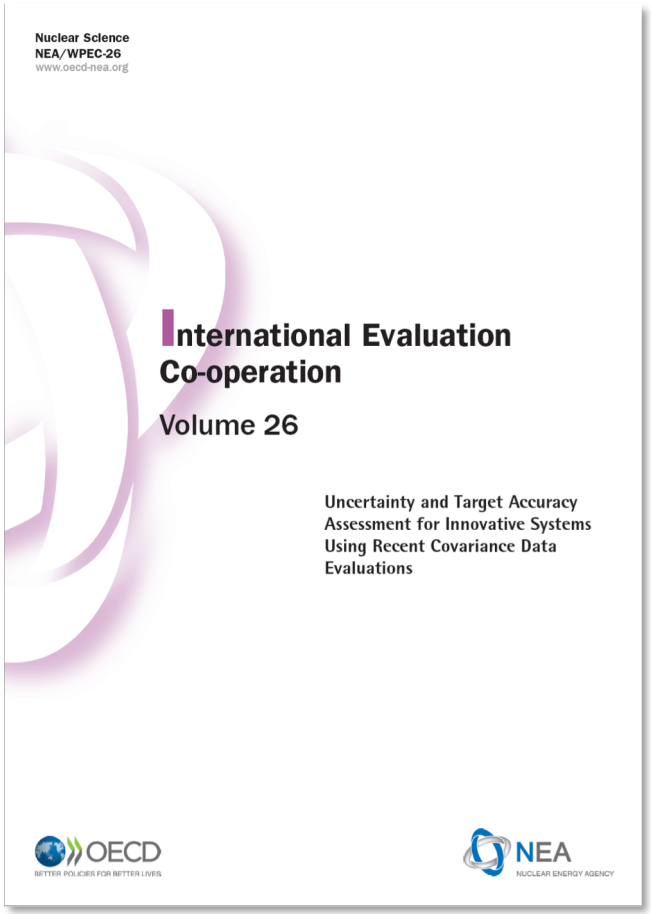
4. Role of SG-C/HPRL wrt SG46 TAR initiative

The SG46 TAR proposal is an update of the work performed by SG26 in ~2005 under the coordination of G. Palmiotti and M. Salvatores.



- TAR for Gen-IV reactors and waste transmutation
- Essentially based on BOLNA covariances

More than 20 entries in HPRL, essentially,

- (n,γ) of major actinides (Big-3: U-235,238, Pu-239, plus Pu-241,242, and Am-241)
- (n,f) of minor actinides (Pu, Am, Cm)
- (n,n') of U-238, structures, coolant (Na, Pb)

4. Role of SG-C/HPRL wrt SG46 TAR initiative

See email/memo distributed on 27 January 2020: *"The WPEC EG-HPRL should be strongly associated to this activity, in order to provide the link with evaluators and experimentalists. In this last case, the TAR exercise impact will be consolidated by the experimentalists' judgement on realistic accuracies that can be obtained with advanced experimental techniques."*

SG46 meeting, NEA HQ,
25 November 2019

4. Role of SG-C/HPRL wrt SG46 TAR initiative

Approach

Idaho National Laboratory

- **The exercise will follow different phases:**
  - **First Phase: Definition of TAR (current)**
    - **First step: selection of target reactors**
    - **Selecting integral parameters and associated TAR**
  - **Second Phase: Uncertainty Quantifications**
    - **For all selected parameters and target reactors compute uncertainty for selected isotopes and reactions possibly using different libraries and associate covariance data. For contribution and computation and tables use guidelines indicated in https://www.oecd-nea.org/science/wpec/sg33/benchmark/format/Uncertainty_contributions.pdf.**
    - **Analyses of uncertainty assessment should select isotopes, and reactions where to look at the energy contribution using the 7 groups energy structure**
    - **Produce a first list of requirements based on previous step**

Phase I
Reactor physics only

Phase II
Nuclear data expertise on uncertainties and covariances available in different libraries

4. Role of SG-C/HPRL wrt SG46 TAR initiative

Approach

Idaho National Laboratory

Phase III

Reactor physics + Nuclear data expertise to analyse results

Possibility to assign variable cost parameters to different reactions

- **Third Phase: Performing TAR with inverse approach**
  - **First step: use 7 groups data, no correlation among covariances (only variances), λ cost parameters equal to 1, and 1 reactor and one parameter (recommended: K_{eff}).**
  - **Second step: use variable λ cost parameters (to be defined by reaction (isotope?))**
  - **Third step: repeat first and second step for one system and all parameters.**
  - **Fourth step: use all systems and parameters together**
  - **Fifth step: introduce correlations**
  - **At any step: if problem is untreatable (too many variables) consider using only 98% of total uncertainty (SG26 approach).**

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5. Status of deliverables

SG-C current mandate runs until June 2020

Deliverables

- ✓ A report on the status of all requests describing completed activities and outlook.
- ✓ An up-to-date online version of the "High Priority Request List for Nuclear Data".

The HPRL status report was completed in September-October 2019

- The first part of the report is based on an update of the ND2019 paper
- + comprehensive appendices extracted from the online HPRL

NEA is considering using this material for a high-level official publication.

6. Mandate extension

SG-C current mandate ends in June 2020

Deliverables

- ✓ A report on the status of all requests describing completed activities and outlook.
- ✓ An up-to-date online version of the "High Priority Request List for Nuclear Data".

Two-year extension (same mandate) requested in order to

- Finalize the NEA high-level publication and the CMS-based HPRL
- Finalize discussions with users for new HPRL entries (e.g., medical applications), contribute to the analysis of SG46 results, if available
- Maintain a standing point of reference for ND users and producers

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7. Status of publications

ND2019, Beijing, China, 19-24 May 2019

- Submitted to the conference LOC in July 2019
- Publication expected in EPJ Web of Conferences (2020)

NEA publication (see email from Michael Fleming on 15 April 2020)

1. Introduction / motivation for the HPRL
2. Proposal and approval process
3. Anatomy of an entry with examples
4. Composition history and track record of success
5. Current HPRL (brief overview in part based on the ND2019 paper + complete entries in annex)
6. New website
7. Outlook

8. Status of the CMS-based HPRL (and website upgrade)

Status as of June 2019

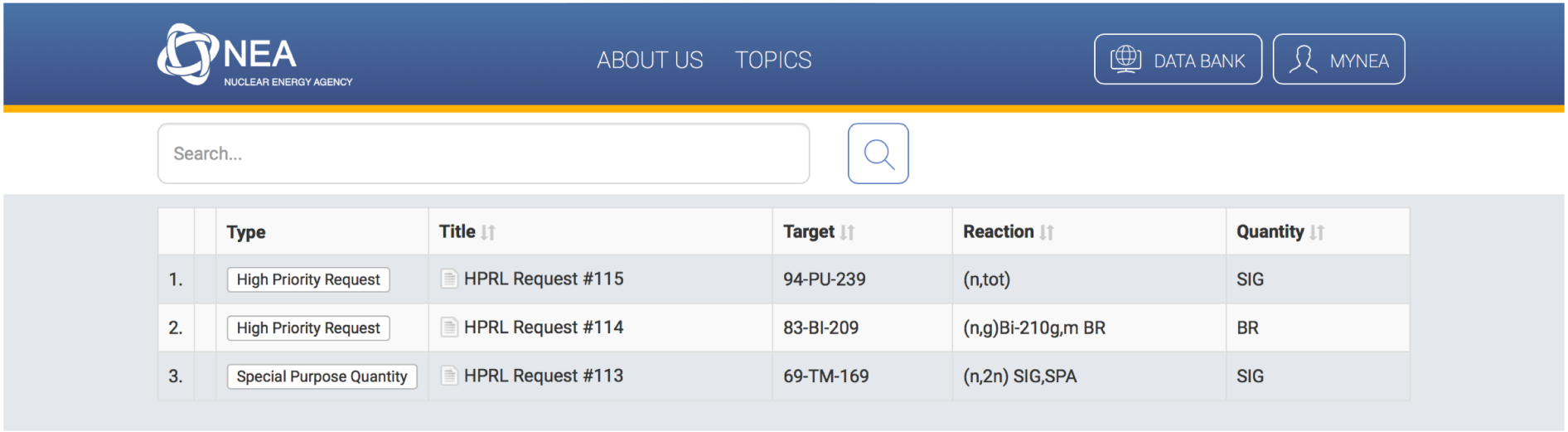
- Demo of a very preliminary CMS-based prototype (based on the conversion of a few entries and a list of those entries)
- Suggestions for improvements: more columns in the list, possibility to sort and filter the entries listed, add a summary table to each entries, etc.

Status as of November 2019

- Progress in implementing a few suggestions (in particular sorting/filtering the list of entries)
- Still far from a valid proof-of-concept to replace the current relational database

8. Status of the CMS-based HPRL (and website upgrade)

Table of requests as of June 2019
(sortable by clicking on column headers)



		Type	Title	Target	Reaction	Quantity
1.		High Priority Request	HPRL Request #115	94-PU-239	(n,tot)	SIG
2.		High Priority Request	HPRL Request #114	83-BI-209	(n,g)Bi-210g,m BR	BR
3.		Special Purpose Quantity	HPRL Request #113	69-TM-169	(n,2n) SIG,SPA	SIG

8. Status of the CMS-based HPRL (and website upgrade)

Table of requests as of November 2019
(sortable by clicking on column headers + very basic filtering capability)

ID		Type	Titre	Target	Reaction	Quantity	Energy	
113		Special Purpose Quantity	69-Tm-169(n,2n)	69-Tm-169	(n,2n) SIG,SPA	SIG	239Pu(n,f)	
12		High Priority Request	92-U-235(n,g)	92-U-235	(n,g) SIG,RP	SIG	100 eV-1 MeV	

Created
Accepted
Archived

ID		Type	Titre	Target	Reaction	Quantity	Energy	Archived
12		High Priority Request	92-U-235(n,g)	92-U-235	(n,g) SIG,RP	SIG	100 eV-1 MeV	Archived

Thank you for your attention!

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