Update on the NSAC Nuclear Data Charge Subcommittee

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Briefing to DOE
February 14, 2023
The First Part of the Charge (due 9/15/22)

1. Assess USNDP Status, which would include the following actions:
   a) Assess and document recent achievements in nuclear data and their impact.

   **Input from USNDP staff**

   b) Survey current and future federal and non-federal needs for reliable, accurate, secure, accessible nuclear data.

   **Input from the NSAC Nuclear Data Charge Subcommittee (NSAC-ND)**

   c) Assess the role, competitiveness, and importance of the USNDP in an international context.

   **Input from USNDP and IAEA staff**
The NSAC Nuclear Data (NSAC-ND) Charge Subcommittee

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<td>Friederike Bostelmann</td>
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<td>Arjan Koning</td>
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<td>Mike Carpenter</td>
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<td>Ken LaBel &amp; Tom Turflinger</td>
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<td>Mark Chadwick</td>
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<td>Caroline Nesaraja</td>
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<td>Max Fratoni</td>
<td>UCB</td>
<td>Syed Qaim</td>
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<td>Ayman Hawari</td>
<td>NC State</td>
<td>Catherine Romano</td>
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<td>Lawrence Heilbronn</td>
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<td>Sunniva Siem</td>
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<td>Calvin Howell</td>
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<td>Artemis Spyrou</td>
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<td>Jo Ressler</td>
<td>LLNL</td>
<td>Etienne Vermeulen</td>
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<td>Thia Keppel</td>
<td>J-lab</td>
<td>Ramona Vogt</td>
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All of these people were chosen based on their experience in nuclear data and some of the applications that rely on it
The first report by the numbers…

- Totals: 88 pages, 6 Chapters, 30 figures, 7 tables, 293 references

1. USNDP since 2018-now Accomplishments: 25 items; 23 pages
2. International efforts/collaborations: 4 pages
3. Nuclear Data needs (50 pages): Basic Science (8); Energy (9), including 4 detailed tables); Medical (8); National Security (3); Nonproliferation (8); Space (10).
4. Crosscutting Needs: Workforce Development; Ongoing Fission Evaluation; Accelerated Decay Data Evaluation; Statistical Structure Evaluation; (n,x) data & High energy data (5 pages).

Some information was moved to the second report and a final version released on January 22, 2023
The Second Part of the Charge (due 1/30/23)

2. Based on the USNDP Status Report (from part 1), provide recommendations for maintaining effective stewardship of nuclear data, which includes the following actions:

   a) *Identify challenges* for nuclear data stewardship in the future, *including identifying and prioritizing the most compelling opportunities to enhance and advance NP stewardship of nuclear data* and the impact if those opportunities can be realized.

   b) Describe possible ways the Nuclear Data (ND) community can work to *train and retain* a diverse, equitable, and inclusive workforce capable of sustaining the U.S. ND enterprise.

   c) Identify *access needs for facilities and instrumentation, crosscutting opportunities with other federal programs, and potentially mutually beneficial interactions with other domestic and international stakeholders.*

   **The first report and input from the USNDP was used**
The second report by the numbers…

- Main Body: 41 pages, 4 Chapters, 9 figures/tables, 123 references
  1. Executive Summary (2 pages)
  2. Challenges and Opportunities for Nuclear Data (28 pages)
  3. Diverse, Equitable & Inclusive Workforce Development (3 pages)
  4. Facilities and Instrumentation Access Needs (8 pages)

- Appendix: Domestic Nuclear Data Generating Facilities
  • 21 Facilities @ 17 National Labs and Universities
  • Updated & Expanded from the 2015 NDNCA Whitepaper Appendix D.
Three critical “Take Aways” from the Second Report

1. Continued support is necessary for the existing nuclear reaction (ENDF), structure (ENSDF) and mass (AME) evaluation efforts.

2. A number of *new initiatives* are required to address societies evolving nuclear data needs. These initiatives will require a concerted recruitment effort and support over time to build.

3. These new evaluators should be a part of any experimental activities to ensure expedite data incorporation and ensure a good understanding of the nominal values and uncertainties of the data being measured.

*Collaboration is Essential*
A key finding is that USNDP members should be part of **Topical Nuclear Data Collaborations (TNDC)**

1. The TNDC brings together application and data subject matter experts and includes workforce development in its project plan.

2. Data would be published in appropriate peer-reviewed journals as well as being incorporated into new or existing databases.

*This paradigm is already used by NP (e.g., FIRE) and by NA-22 (e.g., ventures)*
Fourteen Nuclear Data Thrust Areas were presented including eleven new initiatives

1. Supporting Structure Evaluation Capabilities
2. Enhance Reaction Evaluation Capabilities
3. Maintain Atomic Mass and Nuclear Property Evaluation
4. Nuclear Astrophysics Evaluation
5. Develop Statistical Nuclear Structure Data Evaluation and Databases
6. Establish Methods for Continuous Fission Evaluation
7. Targeted Accelerated Decay Data Evaluations
8. Provide Comprehensive, Consistent Neutron Reaction and Structure Data
9. Charged-particle stopping powers measurement and evaluation
10. Comprehensive reaction measurement and evaluation to E/A≤10 GeV/amu)
11. Provide Nuclear Data for Fusion Energy
12. Continue Development of Modern Data Formats
13. AI/ML for Modern Nuclear Data Compilation, Evaluation, and Dissemination
14. Create an Infrastructure for Data Preservation and Open Data

Existing USNDP ± Covered Efforts at a WANDA Workshop

Topical USNDP Initiatives

A workshop is being planned for April 2023

Enabling USNDP Initiatives
These 14 crosscutting nuclear data topics map onto all of the topic areas presented in the first report.

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<thead>
<tr>
<th>Nuclear Data Initiative</th>
<th>Basic Science</th>
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Existing USNDP Efforts: [Existing Efforts]

New USNDP Initiatives: [New Initiatives]

Enabling USNDP initiatives: [Enabling Initiatives]
Each nuclear data initiative is presented in 4 parts

1. **Issue**: Identification of a crosscutting nuclear data need;
2. **Background**: A discussion of how the initiative is related to the need;
3. **Recommendation**: A recommendation of how to carry out the initiative, including an estimate of the additional workforce needs and a recruitment/training timeline;
4. **Impact**: The societal benefits that would result from carrying it out.

The target audience for these initiatives are congressional staffers
The time scale of this expansion can be adjusted to fit funding profiles.
Next Steps

• The report was sent to NSAC on 2/13/23.
• The report will be discussed at the 3/7/23 meeting.
• Input from the report will be used for portions of the Long Range Plan (e.g., applications, low-energy program etc.)

Special Thanks
Ramona Vogt, Cathy Romano, Bethany Goldblum, Jo Ressler and many of my colleagues in the USNDP