



Report on the US Nuclear Data Program

Budget Briefing: 16 February 2011

abridged presentation
by
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US Nuclear Data Program

USNDP composition

- ◆ Universities
 - * McMaster
 - * TUNL
 - * NIST
- ◆ Argonne (ANL)
- ◆ Brookhaven (BNL)
- ◆ Los Alamos (LANL)
- ◆ Oak Ridge (ORNL)
- ◆ Livermore (LLNL)
- ◆ Berkeley (LBNL)

USNDP budget perspective

- ◆ FY2011 - **5.7%** drop expected but not yet confirmed
- ◆ FY2012 - 5.2% increase proposed
- ◆ FY2013-2017 - 3% increase, cost of living assumed

Stimulus funding made for a good FY10 and will continue to support the program in FY11.

Nuclear Data

Link Between Basic Science and Applications

Nuclear Science Community

- ◆ microscopic experiments
- ◆ (microscopic) theories
- ◆ publications



Nuclear Data Community

- ◆ compiles results of microscopic measurements
- ◆ evaluates them and provides complete files of recommended values using nuclear theory modeling
- ◆ archives and disseminates, bibliography, experimental data and recommended data files in readable format (ENDF, ENSDF)
- ◆ preservation of information worth billions
- ◆ development of nuclear reaction theory

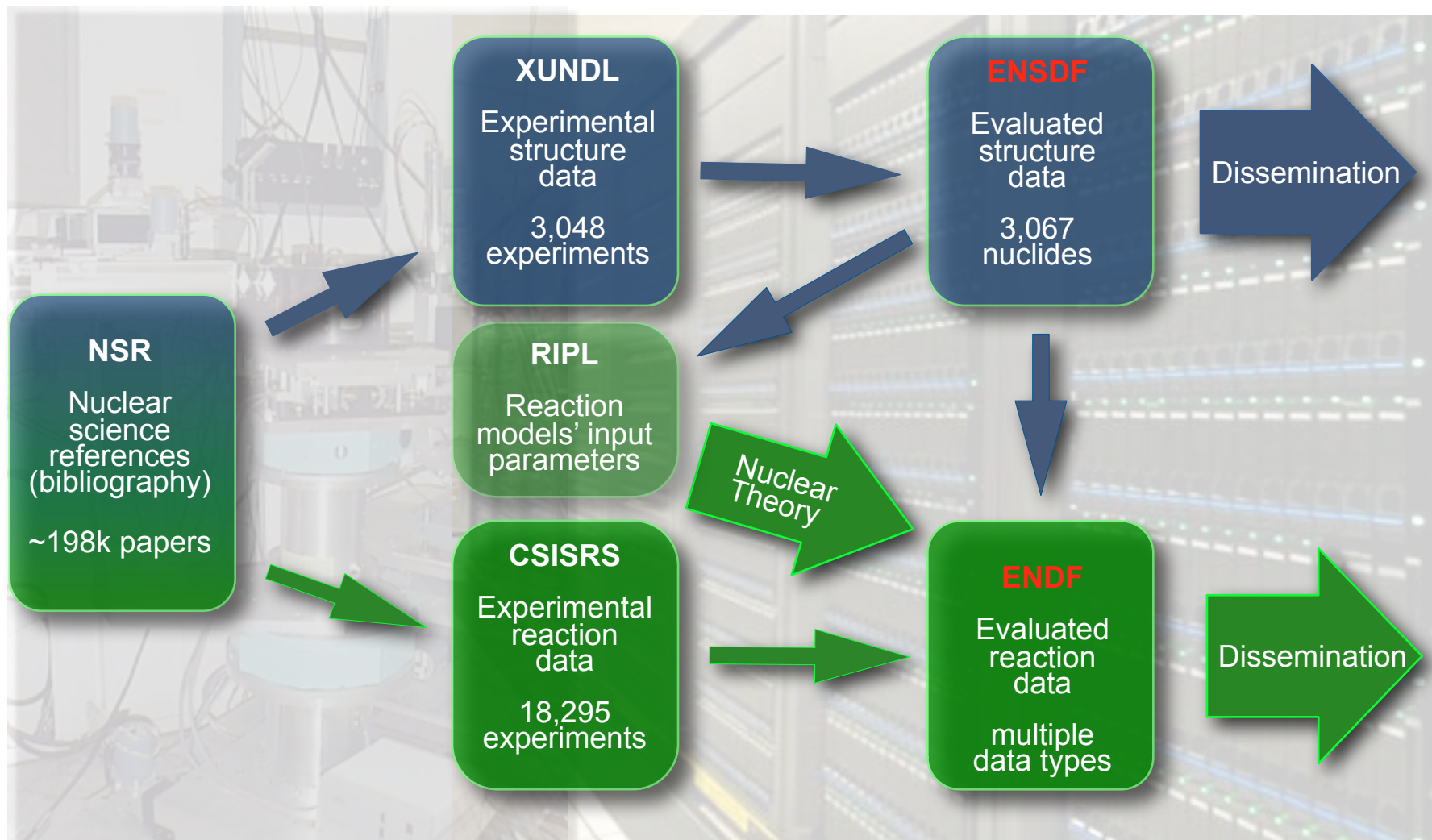


Application Community

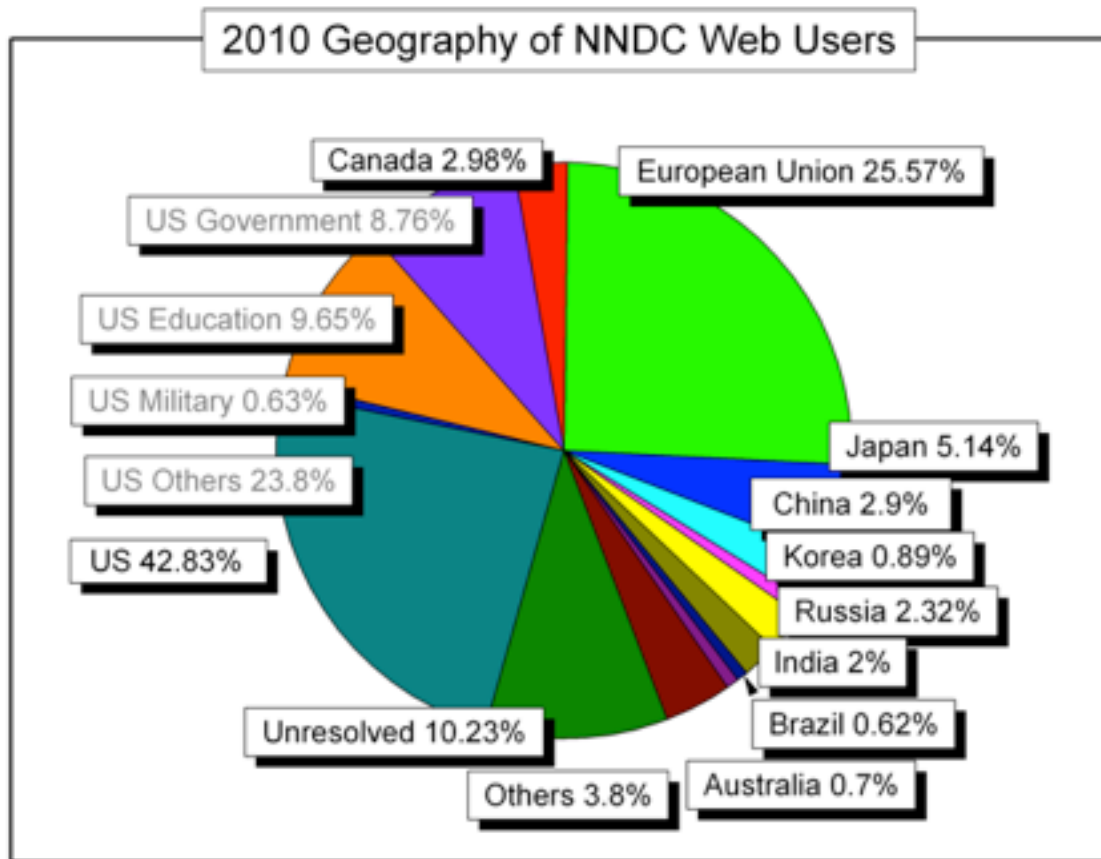
- ◆ For R&D needs data:
 - complete
 - consolidated
 - organized
 - traceable
 - readable
- ◆ Validates data against integral measurements

Major USNDP databases

Cover 100 years of research



Retrievals from the USNDP data servers geographical distribution



Total number of retrievals ~2.8 million

Stable geographical distribution



Retrievals from the USNDP data servers

Universities: 451987 retrievals in FY10

1 University of Michigan, Ann Arbor	56166	16 Georgia Institute of Technology	11189
2 Texas A&M University	49905	17 Ohio State University	8910
3 Duke University	39088	18 Ohio University	8747
4 University of Notre Dame	26493	19 University of New Mexico	8418
5 Rensselaer Polytechnic Institute	24975	20 Purdue University	7782
6 Michigan State University	24112	21 Washington University, St. Louis	7701
7 Massachusetts Inst. of Technology	22345	22 Washington State University	7508
8 Yale University	20067	23 University of Rochester	7422
9 University of Tennessee, Knoxville	18150	24 North Carolina State University	7413
10 University of Missouri	16308	25 Brigham Young University	7053
11 University of Wisconsin, Madison	15458	26 Pennsylvania State University	6849
12 University of NC, Chapel Hill	12932	27 University of Texas	5493
13 University of California, Berkeley	12682	28 University of Nevada, Las Vegas	5471
14 Florida State University	12249	29 Indiana University, Bloomington	5211
15 University of Washington	12065	30 Mississippi State University	5198
		31 Colorado School of Mines	5023



USNDP Permanent Scientific Staff

	Actuals				Jan		FY13		FY14
	FY07	FY08	FY09	FY10	FY11	FY12	COL	Lab	Lab
								Prop	Prop
Universities	1.7	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6
ANL	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	2.0
BNL	7.6	6.7	5.3	5.0	6.2	6.5	6.4	8.4	8.4
LANL	2.2	2.1	1.9	1.6	1.6	1.6	1.7	1.9	1.9
LBNL	2.1	2.1	2.0	2.0	2.0	2.0	2.0	3.0	3.0
LLNL	0.5	0.4	0.2	0.3	0.4	0.4	0.3	0.4	1.4
ORNL	0.3	0.3	0.7	1.1	1.1	1.1	1.1	1.6	1.6
Total	15.3	13.9	12.5	12.6	13.9	14.2	14.1	17.9	19.9
Comp. to 07		-8.9%	-18.0%	-17.3%	-8.7%	-6.9%	-7.3%	17.4%	30.5%

- In FY10 decline has been stopped, still 2.7 FTE below FY07
- Major losses at BNL (-2.6 FTE) and LANL (0.6 FTE)
- ORNL the only one to grow (+0.8 FTE)
- **Major issue: availability of qualified candidates in FY09 and FY10!**

Recent ND scientific staff movement

head counting

◆ ANL

- * Gulhan Guradal, Postdoc, joined Nov. 30, 2009
- * Chitra Nair, Postdoc, joined March 1, 2010
- * Will search 1 postdoc/staff in FY13

◆ BNL (see NNDC report)

◆ LANL

- * O. Bouland — (reaction theory) left for CEA, Cadarache, France
- * B. Perdue — (experiment) new post-doc from Duke University
- * Searching 1 staff and 1 postdoc

◆ LBNL

- * Aaron Hurst, joined in 2010
- * Shamsu Basunia, retained in 2010
- * Richard Firestone to retire 2013

Recent ND scientific staff movement

head counting

◆ LLNL

- * Caleb Mattoon, joined Sept. 2010 from **BNL**
- * Nidhi Patel, joined Oct. 2010

◆ McMaster

- * Balraj Singh to retire July 2013!
- * Jun Chen at risk to be lost for the ND program

◆ NIST

- * David Gilliam, retired in June 2010 (0.02 FTE)

◆ ORNL

- * no change

◆ TUNL

- * no change

Summary

ND scientific staff recruitment

- ◆ Situation better than in FY10/09
 - * 4 good staff candidates in structure (NNDC search)
 - * 4 good postdocs candidates in reactions (NNDC search)
- ◆ Structure better off than reactions
- ◆ Difficulties with trained evaluators in reactions, total lack of new candidates with leadership skills
- ◆ Labs searching for new hires in sister Labs
- ◆ **Critical issue:** preserve young but experienced ND scientists worldwide!
 - * Chris Chiara - currently on temporary position at Univ. of Maryland
 - * Jun Chen - currently at McMaster, will leave the field in a few months if not hired
 - * Naohiko Otsuka - to leave IAEA in 2 years, world class expert in EXFOR compilation

Proposal: BNL hires Jun Chen and ANL hires Chris Chiara within a few months if respective funding can be secured starting FY13.



Major Issue

Revert drop in permanent scientific staff

Year	FTE
FY03	17.5
FY05	16.7
FY07	15.3
FY08	13.9
FY09	12.5
FY10	12.6
FY11	13.9

- ◆ Gradual loss of permanent scientific staff in last 4 years (retirements, volatile funding)
- ◆ Difficulties with recruitment
 - * shortage of qualified candidates
 - * ND program looses when competes with basic science or defense
 - * retaining new hires is an issue
 - * **Solution** - make ND program more attractive
 - increase research component
 - modernize technology (more theory, high performance computing, artificial intelligence, state of the art web services)

Young Scientific Staff

Temporary Scientific Staff (FTE)							
	Actuals					COL	Proposed
FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY13
4.1	5.3	7.5	4.4	4.5	4.5	4.5	6.5

- Striking drop partially due to promoting postdocs to staff (2 instances)
- Poor chances for replacing retirees (2 out of 4.4 are actually **retirees**)



Young scientific staff in FY09/10
(head counting: **9** existing/expected)

- ANL - ~~1 post doc~~
- BNL - ~~3 post docs~~ **2 promoted**
- BNL - ~~1 young scientific staff~~
- LANL - **4 post-docs**
- LLNL - 1 post-doc
- McMaster - 1 post-doc
- ORNL - 1 young scientific staff
- TUNL - ~~1 post doc~~

External collaborators

Essential support to the program

Pro

- often excellent qualifications, e.g., retired ENSDF evaluators, EXFOR compilers
- extremely cost effective
- flexible amount of effort
- possibility (often the **only possibility**) of covering particular needs
- maintain and transfer specific know-how

Contra

- * continues availability of certain expertise can not be guaranteed
- * necessity of using job-shoppers increases the effective cost by 49%
- * lost of in house expertise in long run

BNL - about 13 external collaborators (EXFOR 100%, NSR 50%, ENSDF 50%, ENDF-6 manual 60%, ENDF checking codes 70%)

It is of utmost importance to maintain this option open!

FY2011 Objectives and Targets

◆ Scientific objectives and targets

- * Archival of high quality nuclear data for basic nuclear science and technologies.
- * Compilation of bibliography data, nuclear reaction and nuclear structure data to NSR, EXFOR and XUNDL databases.
- * Dissemination of nuclear physics data through Web based services.
- * Evaluation of nuclear structure & decay data for ENSDF database.
- * Evaluation of nuclear reaction data for ENDF database.
- * Advance nuclear structure and reaction modeling in support of data evaluation.
- * Maintain nuclear data formats and data verification codes.
- * Promote training of new structure and reaction evaluators.

CORE
ACTIVITIES



FY2011 Activities Supported and Anticipated Accomplishments

- ◆ Compilation of ~ 4700 entries for CSISRS, NSR, and XUNDL.
- ◆ Evaluation of structure & decay data for ~230 nuclides for ENSDF.
- ◆ Evaluation of nuclear reaction data for ~140 materials for ENDF.
 - * Work on the evaluated data library for nuclear science and applications, ENDF/B-VII.1. Three beta versions have already been released another two beta expected in FY2011. Final release in December 2011. (Supported by ARRA and non-USNDP funding through CSEWG.)
- ◆ About 5% increase in dissemination of nuclear physics data.
- ◆ Continued development of nuclear reaction codes with emphasis on covariances, modeling of fission, and prompt fission neutron spectra.
- ◆ Training of national and international nuclear structure evaluators will continue. Newly hired postdocs and permanent staff will be trained as evaluators to strengthen the evaluation effort.
- ◆ Development of automatic key-wording of NSR entries will continue.

FY2011 Impacts

◆ FY11 compared to FY10 funding:

- * Decrease by **5.7%** would have serious effect on level of activities if not mitigated by ARRA and ANST funding and current shortage of staff.

◆ Impacts:

- * In general, current USNDP operations are not directly suffering from the funding issues. Still available stimulus funding mitigates eventual shortages in individual Labs. Concerns regard outgoing years.
- * Operations are affected by a shortage of qualified personnel. The BNL-NNDC, for example, is about to lose nearly all its reaction component and, before replacement is hired, it is going to resort to external collaborators to meet program goals.

◆ Priorities for Mitigating Impacts:

- * Rebuilding staff

FY2012 Proposed

◆ Scientific Objectives and Targets:

- * Same as in FY11

◆ Activities Supported and Anticipated Accomplishments:

- * Same as in FY11 plus
- * ENDF/B-VI.1 released with a dedicated issue of Nuclear Data Sheets.
- * Preparations will continue for the ND2013. Some resources diverted from the evaluation while compilation will retain the FY11 level.
- * Implementation of the automatic keywording of the NSR will be started.
- * Testing of the new XENDL format adequate, implementation delayed.

◆ Impacts:

- * All key activities maintained but no breakthrough undertakings, such as major redesign of the Web services.
- * BNL-NNDC will still be lacking solid capabilities for validating nuclear reaction data although a staff or postdoc could be trained.

◆ Other Issues/Concerns/Changes in Personnel/New Directions:

- * Assumptions: hiring in FY11 (BNL-NNDC 3 staff, LANL 1 staff + 1 postdoc), BNL replaces reaction leadership skills of Pavel Oblozinsky



FY2013-17 Cost-of-living

◆ **Scientific Objectives and Targets:**

- * Same as in FY12

◆ **Activities Supported and Anticipated Accomplishments:**

- * Same as in FY11(!) plus:
- * Organization the ND2013 in March, 2013 by BNL-NNDC. This will again divert some resources from the evaluation activities while compilation will be retain on the same level as in FY11(!).
- * Publication of the ND2013 proceedings in Nuclear Data Sheets.
- * Release of the ENDF/B-VII.2 library around 2015-2016.
- * Practical implementation of the automatic NSR key-wording

FY2013-17 Cost-of-living

◆ Impacts:

- * All key activities supported with some limited technical improvements in FY11-12. Tendency to stagnation since BNL's COL estimate is >3%.
- * BNL postdocs, hired in FY11 (non-USNDP funding), not converted to staff. No new postdocs. Effective drop in the productivity at BNL-NNDC and loss of the effort put into training.
- * XML format development at LLNL halted and expertise lost (no support for 1 FTE after ARRA funding expires).

◆ Other Issues/Concerns/Changes in Personnel/New Directions:

- * Termination of nuclear data activities at McMaster following B. Singh retirement in July 2013. Loss of nearly 30% of the USNDP nuclear structure output.
- * LBNL after retirement of R. Firestone. Without hiring the third person the group might not be strong enough to survive and may be forced to leave nuclear structure and decay data activity.
- * Further retirements unavoidable in FY13-FY17.

Conclusions

- ◆ Although short and long term USNDP budget situation is not certain there are no indications of dramatic cuts
- ◆ Stimulus funding will mitigate eventual short term cuts in the USNDP budget
- ◆ Recent call for proposals by DOE-SC inspires optimism
- ◆ Situation on 'hiring market' seems to have improved (generally structure stands better than reactions)
- ◆ Series of retirements is expected within two/three years
- ◆ Rebuilding the USNDP scientific staff will be the major issue for the future (retain existing evaluators)
- ◆ Attract and retain new hires - make program more attractive:
 - * more physics - add research component,
 - * modernize formats and evaluation methodology
 - * continue to modernize services
 - * cut repetitive work, facilitate communication and reporting using new technology
 - * closer link with users