



Work Plan for FY2009

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Introduction (Work Plan FY09)

The work plan described in this document has been developed to cover work to be done by the United States Nuclear Data Program (USNDP) during fiscal year 2009 that begins on October 1, 2008. Previously, 9 work plans have been prepared for the data program covering fiscal years 2000 - 2008. This plan has been prepared in consultation with the members of the Coordinating Committee who represent the organizations participating in the program. Each Coordinating Committee member prepared a draft plan for his/her organization. Each contribution was integrated into a unified work plan. The draft plan was then circulated to the Coordinating Committee for comments and corrections before the final document was submitted to the Department of Energy.

As was the case in the work plan for FY2008, the tasks proposed by the various organizations were reviewed internally according to the following criteria which were developed considering the mission and goals outlined in past review panel reports and oversight committee discussions, and in consultation with the DOE program manager.

1. A task should meet one of the three program priorities:
 - a) Maintenance & update of information in the USNDP nuclear physics databases
 - b) Improvement in dissemination of the information contained in those databases to the user community
 - c) Modernization of data evaluation software used by the program participants
2. A task should be useful to at least one major user community
3. A task should not duplicate effort within or outside the program

The plan is divided into six major components. Specific tasks have been assigned to one of these components. They are as follows:

- I. NNDC Facility Operation
- II. Coordination
- III. Nuclear Physics Databases
- IV. Information Dissemination
- V. Nuclear Structure Physics
- VI. Nuclear Reaction Physics

The following section details the proposed work plan for FY2009, defining tasks, organizational responsibilities, and planned activities. It is envisioned that this document will serve as the basis for a performance review at the end of fiscal year 2009. Incorporated in the NNDC plan is a small group of subcontracted scientists, including nuclear structure evaluators and compilers.

The major challenge for the USNDP is the volatile funding situation. Thus, in FY06 we lost 6.6% of funding, followed by solid 14.6% increase in FY07, followed by almost flat-flat (+1.4% increase) in the current FY08. The numbers in FY09 Presidential budget for DOE-SC nuclear data program are very encouraging, yet, given an overall situation and in the light of the most

recent DOE-SC instructions the **present Workplan is prepared for the flat-flat FY09 scenario.**

The impact on the program is discussed below. Table 1 summarizes the US Nuclear Data Program budget and metrics for previous years and provides projections for the current year FY2008 and for FY2009.

Tab.1. US Nuclear Data Program funding and metrics for FY 2001 – 2009, with metrics for FY08 and FY09 representing projections.

Fiscal Year	USNDP Funding	Change	Compi-lations	Evalu-ations	Dissemination (in thousands)	Reports	Papers	Invited Talks
2001		-	7,139	334	667	21	25	22
2002	\$4,890K	-	6,159	300	799	23	40	22
2003	\$4,932K	0.9%	4,975	260	966	27	40	23
2004	\$5,015K	1.7%	6,241	276	1,212	35	36	43
2005	\$5,437K	8.4%	6,623	422	1,642	72	59	42
2006	\$5,099K	-6.6%	4,936	318	1,863	47	60	48
2007	\$5,841K	14.6%	5,355	366	2,239	40	60	51
2008*	\$5,924K	1.4%	5,000	320	2,700	38	50	45
2009**	\$5,924K	0.0%	4,800	300	3,300	35	45	40

*) Numbers shown for metrics are projections for approved \$5,924K budget in FY08.

**) Flat-flat scenario adopted in the present document. FY09 President’s Budget assumes increase by \$401K plus \$2,066K new money for Advanced Fuel Cycle activities, in total \$8,391K.

AFC Activities. A comment should be made on the nuclear data activities for Advanced Fuel Cycle (AFC). In response to the renewed interest in nuclear energy applications the President’s Budget for both FY07 and FY08 included \$1mil for AFC, but these funds were never approved. The President’s Budget FY09 continues in this trend, proposes somewhat more than \$2 mil for AFC, but it seems highly unlikely that it will get approved.

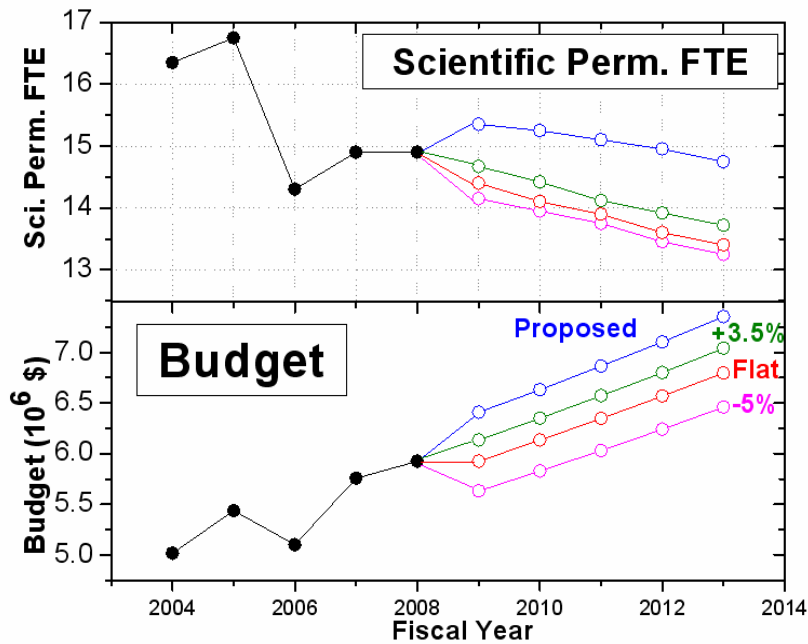
Tab.2. USNDP scientific permanent effort: Projected levels in FY09 are compared with FY07.

Activity	2007	2009	Comment
I. NNDC Operation	0.35	0.35	Stable effort
II. Coordination	1.50	1.40	Some decrease due to overall reduction of effort
III. Databases	1.05	1.05	Stable effort
IV. Dissemination	1.75	1.85	Small increase
V. Nuclear Structure	6.26	6.15	Small decrease, continues to be priority
VI. Nuclear Reactions	3.95	3.25	Reduction largely caused by the loss of 1 FTE at BNL
Total FTE scientific	14.86	14.05	Total reduction by almost 1 FTE

Detailed FY2009 projection of staffing levels is given at the end of the present document. Here, we focus on the scientific effort, representing its most important aspect. Projected scientific permanent staffing levels in FY2009 are summarized in Table 2 where comparison with final FY2007 is made. The DOE-SC supported scientific permanent effort is expected to decline by almost 1 FTE in FY09. This is largely due to projected loss of one FTE at BNL, with the vacancy unfilled since September 2007.

In FY06, the US Nuclear Data Program lost 6.6% of the funding which, as can be seen in Fig. 1, impacted the total number of scientific permanent FTE. We note that this figure was prepared a year ago, in February 2007. Taken into account flat-flat FY08 budget and projected flat-flat FY09 budget implies that last-year FTE projections must be rescaled down. Thus, after some recovery in FY07 we face decline in both FY08 and FY09. Continuing gradual reduction in the scientific permanent staffing level will have negative impact on the program, though this could be somewhat offset by more staff in the scientific temporary category.

Fig.1. USNDP budget and scientific permanent FTE with projections prepared last year, in February 2007. At that time we assumed we would get President's FY08 proposed budget.



Individual laboratories foresee the following impact in FY09 and beyond:

- BNL.** The NNDC staffing situation continues to deteriorate. At the end of FY05, the NNDC lost 1 FTE of scientific permanent staff due to budget cut in FY06. In the ongoing FY08, we face loss of another 1 FTE scientific permanent staff in the nuclear reactions activities. Under FY09 flat-flat scenario this loss will become permanent. Such decline in permanent scientific staff already has negative impact on the ENDF evaluation effort and ENDF support activity. In an attempt to mitigate this recent loss, the nuclear reactions compilation work has been outsourced. In spite of all effort to maintain the quality of the nuclear databases and services, deterioration is inevitable. Another consequence is increased need for exceptionally flexible and skilled staff, with broad capabilities always concentrated in one person, spanning from compilation skills, evaluation expertise, database management and web application development capabilities. The painful truth is that such nuclear physics scientists, with very few

exceptions, either do not exist or are not available to join gradually declining data program.

- **ANL.** The part-time post-doc would be lost with no benefits from the investment made in recruiting a very well qualified individual for this position and from the training effort spent during FY08.
- **LANL.** The proposed FY09 budget would allow the LANL nuclear data evaluation group to hire a new Post-Doc, although some fraction will be supported from funds other than the nuclear data program. The USNDP funding would help to maintain LANL scientific activities as well as other DOE programs that require high quality nuclear data.
- **LBNL.** In FY08, ~0.5 FTE of ENSDF evaluation effort had to be funded by LBNL from sources outside of the Data Program. A flat-flat FY09 budget for LBNL further exacerbates this problem and it will result in a loss of this ENSDF evaluation effort. In addition to the reduction of evaluation productivity, this would adversely affect the longer-term viability of the Isotopes Project.
- **LLNL.** The planned flat-flat budget scenario for FY09 and beyond presents a serious problem. Support from the USNDP was 0.5 FTE in FY05, but the continued budget level coupled with the increase of costs at LLNL has eaten away at the effectiveness of the this support. In FY09, we expect this level of funding to cover 0.4 FTE worth of effort. At this level, we are forced to cancel several tasks laid out in our Field Work Proposal submitted to the Office of Science. In particular, we will not be performing any covariance tool development and development of structure rich nuclear data formats and tools will be severely curtailed.
- **McMaster.** McMaster University had DOE supported personnel of 1.0 FTE from July 1, 2003 to June 30, 2006 (0.5 FTE for nuclear structure evaluation and 0.5 FTE for nuclear astrophysics data). From July 1, 2006 to June 2007, 0.5 FTE for nuclear astrophysics data was discontinued. In the current grant from July 1, 2007 to June 30, 2010, total DOE personnel supported is 1.6 FTE (0.6 FTE permanent staff and 1.0 FTE post-doctoral fellow). Division of work is ~1.35 FTE for nuclear structure work and ~0.25 FTE for nuclear astrophysics work. In addition there is some partial support for undergraduate student. In the scenario of flat-flat budget for FY-09, some of the compilation activity may be curtailed. It is anticipated that 0.4 FTE support from Canadian research agency (NSERC) for nuclear structure evaluation will continue in FY-09.
- **NIST.** The NIST Neutron Cross Section Standards effort would have to be discontinued if DOE funding is stopped. Maintaining this work is important for future standards evaluations that are the basis for cross section libraries. NIST resources that provide leverage to the DOE funding for this work are contingent on DOE support.

- **ORNL.** Due to budget cuts, the ORNL Nuclear Data Project has within the last 3 years lost a consultant, 2 part-time research staff members, 2 graduate students, and one undergraduate student. A flat budget in FY09 will result in the loss of an experienced part-time (0.3 FTE) ENSDF evaluator, and will impact both A-chain evaluations and reaction evaluations for astrophysics. Continued flat budgets will put the nuclear astrophysics online computational suite at risk of being taken offline.
- **TUNL.** The nuclear modeling effort (0.4FTE) at TUNL lost the funding in FY07. Expected recovery of the funding in FY08 and FY09, still below the FY 2005 level, would allow increase in the ENSDF evaluation effort.

Work Plan Tasks and Planned Activities (Work Plan FY09)

I. NNDC Facility Operation (Work Plan FY09)

A. Management

This task includes planning, budgeting, personnel, interaction with BNL management, and interaction with funding authorities.

B. Library

NNDC maintains an archival collection of low- and intermediate-energy nuclear physics publications. This library supports the NNDC compilation activities and the U.S. nuclear reaction and nuclear structure data evaluation and international nuclear structure data evaluation effort.

C. Computer Operations

The NNDC operates several servers running Red Hat Enterprise Linux in support of their compilation, evaluation, database maintenance, and information dissemination functions. In addition, each staff member has a PC that supports an interface to these Linux servers and supports administrative functions such as word processing and email. Furthermore, MS Windows servers provide centralized backup, printing and file serving for the PCs. This task includes software upgrades, hardware and software procurements, machine operations and internal user support for both the Linux and Windows platforms.

Over several years the NNDC has been developing and continues to develop new web applications for users of the NNDC web service. These applications often require considerable increase in demand for computer power. In view of this, regular upgrades of the NNDC computer system are necessary.

BNL Planned Activities:

- Scan and remediate regularly vulnerabilities on NNDC servers and clients to ensure compliance with DOE cyber security requirements

- Provide computer support to the NNDC staff and its visitors as necessary.

- Upgrade aging NNDC computer system, including database servers and web servers by purchasing and installing new servers.

II. Coordination (Work Plan FY09)

A. National Coordination

National coordination is required for activities under the US Nuclear Data Program as well as Cross Section Evaluation Working Group. This is mostly performed by the National Nuclear Data Center, with contributions from other laboratories (USNDP Working Groups and Task Forces as well as CSWEG Committees).

ANL -- Chair the Covariance Committee of the Cross Section Evaluation Working Group.

ANL Planned Activities:

Organize and chair the CSEWG Covariance Committee.

BNL -- Chair USNDP Coordinating Committee, chair Cross Section Evaluation Working Group, develop USNDP work plan, and maintain its USNDP website.

BNL Planned Activities:

Prepare FY2010 work plan for USNDP in time for spring 2009 FWP submittals.

Organize and chair CSEWG Meeting at BNL in November 2008.

Organize and chair USNDP Meeting at BNL in November 2008.

Edit and publish summary reports of the CSEWG and USNDP meetings.

Edit and publish USNDP Annual Report for FY2008.

Maintain CSEWG and USNDP websites.

LANL -- Chair U.S. Nuclear Data Program's Nuclear Reaction Working Group and to help coordinate nuclear reaction data work at different labs to advance USNDP; chair Evaluation Committee of the Cross Section Evaluation Working Group.

LANL Planned Activities:

Organize and chair CSEWG Evaluation Committee meeting at BNL, November 2008.

Organize and chair Nuclear Reaction Working Group meeting at USNDP meeting in November 2008, and help coordinate Homeland Security, and Astrophysics Task Forces.

LBNL -- Serve as a member of the USNDP Coordinating Committee and chair the USNDP Nuclear Structure and Decay Data Working Group in addition to overseeing, coordinating, and directing the work of members of the Isotopes Project. The latter effort includes working with LBNL management, with other members of the USNDP, and with the program officers of the DOE.

LBL Planned Activities:

Organize and chair Nuclear Structure and Decay Data Working Group meeting at USNDP meeting, November 2008.
Serve on USNDP Coordinating Committee.

LLNL -- Chair the Task Force on Nuclear Data Needs for Homeland Security of the Cross Section Evaluation Working Group.

LLNL Planned Activities:

Organize and chair the CSEWG Task Force on Nuclear Data Needs for Homeland Security.

ORNL -- Chair the Astrophysics Task Force, and help facilitate and coordinate nuclear astrophysics data work at different labs to advance USNDP goals; provide leadership in planning future activities in nuclear data for nuclear astrophysics

ORNL Planned Activities:

Summarize USNDP efforts in nuclear data for nuclear astrophysics at USNDP Meeting in November 2008
Communicate current efforts and future plans with researchers in nuclear astrophysics data.
Represent USNDP nuclear astrophysics efforts at international collaboration meetings on nuclear astrophysics data.
Initiate collaborative research projects to raise the visibility of nuclear data projects directed at astrophysics applications
Discuss future plans in nuclear astrophysics data with DOE, with USNDP/NNDC, and with other agencies.

B. International Coordination

ANL - Represent the ANL in IAEA-sponsored Nuclear Structure and Decay Data Network (NSDD) and Decay Data Evaluation Project. Participate in IAEA-sponsored coordinated research programs (CRP) and training workshops.

ANL Planned Activities:

Participate in IAEA CRP on “Updated Data Library for Actinides”.
Participate in the 2009 NSDD meeting.
Provide a lecturer at the IAEA/ICTP organized nuclear structure data workshop, if one is scheduled.

BNL -- Represent the United States in IAEA-sponsored Nuclear Reaction Data Center Network (NRDC) and Nuclear Structure and Decay Data Network (NSDD). The NNDC center head is the U.S. member and vice-chair of the IAEA International Nuclear Data Committee (INDC), the

lead US member of the NEA Working Party on International Evaluation Cooperation (WPEC) in his position as chair of CSEWG. Many of the NNDC staff participate in IAEA/ICTP-sponsored activities such as Workshops and Technical Meetings.

BNL Planned Activities:

- Participate in the IAEA-sponsored NRDC meeting in 2009.
- Participate in NEA WPEC annual meeting in 2009.
- Serve as coordinator of the WPEC Subgroup 24 on fast neutron cross-section covariances.
- Provide lecturer(s) to the IAEA/ICTP workshops on nuclear structure and nuclear reaction data (if organized).
- Coordinate development of the EMPIRE nuclear reaction model code and make it available to the international community.

LANL -- Participate in and chair international nuclear reaction data collaborations. This insures that the U.S. benefits from breakthroughs around the world, and plays a leadership role in new developments. LANL staff members participate in NEA/WPEC committees on covariance data and international model code development cooperation. LANL will host visits by foreign scientists with international reputations to benefit from the exchange of information and ideas.

LANL Planned Activities:

- Participate in NEA-WPEC 2009 meeting.
- Participate in relevant IAEA CRP meetings (FENDL and minor actinide data).
- Participate and give invited talks at the 16th Pacific Basin Nuclear Conference (16PBNC) - Pacific Partnership toward a Sustainable Nuclear Future - October 13-18, 2008 in Aomori, Japan.
- Make latest version of NJOY data processing code available to the international community.
- Host a couple of international visitors to LANL to collaborate on the evaluation of reaction data.

LBNL – Participate in IAEA-sponsored training workshops, planning meetings and coordinated research programs on nuclear structure and decay data.

LBNL Planned Activities:

- Conclude participation in IAEA CRP on “Reference Database for Neutron Activation Analysis” (CRP ends in November 2008).
- Participate in NSDD meeting at IAEA in March 2009.
- Participate in IAEA/ICTP nuclear structure and decay data evaluation training workshop if one is scheduled during FY09.

McMaster – Represent the Canadian effort in nuclear structure and decay data evaluation at the International network NSDD operating under the auspices of the IAEA.

McMaster Planned Activities:

- Participate in the policy matters related to the NSDD network.
- Participate in training/mentoring of new ENSDF evaluators through collaborative work, as needed and as the opportunity arises

III. Nuclear Physics Databases (Work Plan FY09)

A. Nuclear Science References (NSR)

The NNDC is responsible for NSR, the bibliographic database for nuclear physics research. This task includes quality control, file update and maintenance, and file distribution to collaborators. Updates are done on a continuing basis. The preparation of NSR entries falls under Nuclear Structure Physics.

BNL Planned Activities:

Database distributed to collaborators monthly.

B. Experimental Nuclear Structure Data (XUNDL)

The NNDC is responsible for maintaining and providing access to the XUNDL database. This database contains compilations (in ENSDF format) of recently published or completed level-structure data for high-spin and low-spin physics. The compilation work is mainly carried out at McMaster University. The McMaster group also coordinates this work with that of other centers. The NNDC maintains, updates, and distributes the database as new/revised data sets are received from McMaster.

BNL Planned Activities:

Update database as input is received from McMaster.

C. Evaluated Nuclear Structure Data File (ENSDF)

The NNDC is responsible for the ENSDF, a database of evaluated experimental nuclear structure and decay data. The NNDC is responsible for format and content checking, preparation of manuscript, and the quality control (review) of evaluations submitted for inclusion. The NNDC maintains the database, which includes database updates and distribution to collaborators. Corrections are implemented on a continuing basis.

BNL Planned Activities:

Database distributed to collaborators twice a year.
Process evaluations received from NSDD evaluators.

D. Numerical Nuclear Data File (NuDat)

The NNDC is responsible for NuDat, which consists of a database and a suite of codes that access it, allowing web users to search for level and γ -ray properties extracted from ENSDF, ground and meta-stable state properties (Wallet Cards), atomic and nuclear radiations derived

from ENSDF, and thermal neutron cross sections and resonance integrals. Additionally, NuDat contains an interactive Chart of Nuclei and interactive level schemes.

BNL Planned Activities:

Update NuDat database as necessary, about 10 times a year.

E. Neutron Reaction Data Bibliography (CINDA)

The NNDC continues to contribute to the CINDA database that contains references to nuclear reaction data in the published and unpublished literature. Since 2004, CINDA also contains bibliography information on charged-particle and photonuclear reactions. The database serves as an index to the data contained in the experimental database, CSISRS. The database is maintained by the Nuclear Data Section, IAEA Vienna.

BNL Planned Activities:

Contribute to CINDA by compiling experimental cross-section data to the CSISRS database (150 compiled papers expected).

F. Experimental Reaction Data File (CSISRS)

The NNDC is responsible for maintaining the CSISRS database at BNL. This database contains experimental nuclear reaction data for incident energies below 1 GeV, including neutron-induced reactions and reactions with incident charged particles of mass $A \leq 12$. Many groups worldwide compile experimental data and send it to the central database in Vienna in the EXFOR format. Then, each is responsible to update its own database. The effort described here includes quality control, file update and data transfer activities. The NNDC database is updated, as compilations are exchanged and checked from the compiling centers. The compilation activity is given under Nuclear Reaction Physics.

BNL Planned Activities:

Update CSISRS with EXFOR compilations from cooperating centers (500 entries expected).

The NNDC compilation work can be found under Nuclear Reaction Physics, chapter V of the present document.

G. Evaluated Nuclear Data File (ENDF)

The NNDC is responsible for ENDF, a database of evaluated nuclear data required for many nuclear applications. The work is organized under the Cross Section Evaluation Working Group (CSEWG), coordinated by the NNDC. The ENDF file contains complete descriptions of nuclear reactions of neutrons with many nuclides and elements for energies up to 20 MeV and radiations from radioactive decay. A number of evaluations for energies up to 150 MeV and for incident charged particles and photons are also included. The data are stored in the ENDF format

developed at NNDC about 35 years ago, and adopted as an international standard. In addition to the U.S. library, ENDF/B, the database contains evaluated data libraries from the European Union, Japan, Russia, and China. This activity includes the processing and quality control for the U.S. ENDF/B library, the distribution of this database in the United States and the exchange of libraries internationally.

New evaluations for the next release of the library, ENDF/B-VII.1, will be assembled, tested and made available to users through a preliminary ENDF/A web interface.

BNL Planned Activities:

Maintain ENDF discussion list to facilitate validation of the new ENDF/B-VII.0 library.

Collect and maintain new evaluations submitted for future release of the ENDF/B-VII.1 library.

Perform phase1 testing of all new evaluations for the ENDF/B-VII.1 library.

H. Database Software Maintenance

This activity includes software bug fixes and enhancements for the six nuclear physics databases maintained by NNDC.

BNL Planned Activities:

Fix bugs and develop enhancements for the six nuclear physics databases maintained by NNDC.

I. Database Systems Development

The multi-year effort to migrate the USNDP databases to a Linux/Sybase environment was completed in FY2004. Afterwards, several follow-up tasks needed to be performed.

A new database along with web interface called Sigma is under development to facilitate the retrieval of evaluated reaction data from ENDF libraries along with experimental data from the CSISRS library by non-ENDF users, such as nuclear astrophysics. This database focuses on the class of users who do not possess specialized knowledge of complex ENDF-6 format. In addition to basic retrieval and plotting of cross sections in Sigma-1.0 version released in 2007, new features will be added step-by-step, including retrieval and plotting of angular distributions of emitted neutrons, neutron energy spectra, photon energy spectra, mathematical operation on cross-section and ultimately also covariance data.

BNL Planned Activities:

Effort needed to maintain Linux/Sybase database system.

Maintain and improve Sigma database and web interface for users without specialized knowledge of ENDF-6 format. (See also information dissemination, chapter IV).

IV. Information Dissemination (Work Plan FY09)

The goal of the dissemination activities of the USNDP is to provide scientists and engineers with nuclear data from the USNDP-maintained nuclear databases in a variety of user-friendly formats and media.

A. Web Site Maintenance

The NNDC provides electronic access to the nuclear physics databases that it maintains on behalf of the USNDP as well as access to other nuclear physics information through its web site. The NNDC web services are powered by four 2.8 GHz dual-processor Dell servers running on the Linux operating system and using the Apache Tomcat and Sybase server software. This solution was made public in April 2004 and has proven to be secure, fast and to have minimum downtime. Most of the databases were redeveloped to take advantage of the new hardware possibilities as well as new programming technologies, such as the use of the Java and Java scripts languages. In FY 2005 this system was upgraded from a single web server to dual web server system. This upgrade significantly increases reliability of the system. The NNDC also maintains the Atomic Mass Data Center website. Other USNDP members also offer nuclear physics information through their websites. These services require resources to maintain currency and improve performance.

ANL Planned Activities:

- Maintain and upgrade the ANL/NDM report series web site.
- Maintain and upgrade Experimental Resources for Nuclear Data web site.
- Maintain and upgrade ANL Nuclear Data Information web site.

BNL Planned Activities:

- Improve NSR and ENSDF web interfaces.
- Maintain web interface to the ENDF database.
- Improve Sigma web interface by adding new and extended features following user's requests.
- Maintain web interface for double-beta decay.
- Improve reliability and cyber security of its web services by installing the latest version of Apache/Tomcat servers and mod-jk connector software for a new dual web server system.
- Maintain currency of the CSEWG, USNDP and the NNDC web sites.
- Explore possibility for a nuclear astrophysics webpage in collaboration with JINA.

LANL Planned Activities:

- Include access to new reaction and structure data evaluations, supported by DOE/Nuclear Physics, via the T-16 web site.

Provide actinide ENDF/B-VII data via LANL web site for criticality data testing, together with other LANL evaluations (e.g., light nucleus reactions).

LBL Planned Activities:

Maintain Isotopes Project existing web pages.

LLNL Planned Activities:

Maintain LLNL's Nuclear and Atomic Data Viewer.

Extend the Nuclear and Atomic Data Viewer as per user requests.

Maintain and upgrade LLNL's Computational Nuclear Physics web pages.

ORNL Planned Activities:

Continued development and maintenance of our online software suite to convert nuclear data to astrophysical reaction rates and plot, manipulate, and share results online; this activity is at risk of termination.

TUNL Planned Activities:

Continue to improve the TUNL website and provide access to new information on $A = 3 - 20$ nuclei.

Continue to prepare new PDF and HTML documents of the most recent TUNL reviews.

Continue to provide PDF and HTML documents for FAS reviews for the $A = 3 - 20$ series;

Continue to provide General Tables to accompany the most recent TUNL reviews of the $A = 3 - 20$ series;

Continue to provide Energy Level Diagrams (in GIF, PDF and EPS/PS formats) to accompany the PDF and HTML documents for the most recent TUNL reviews and preliminary reports, and for the earlier FAS reviews.

Develop web page to provide compiled and evaluated data on particle decay of unstable ground states.

B. Customer Services

This task accounts for the non-electronic services which the USNDP renders to customers. At the scientific staff level, this means direct assistance to users needing advice from nuclear data experts or advice on solving complex queries *via* electronic access to the database. The NNDC staff allocation at the support level is for maintaining a "help desk" and for administrative/clerical support of its customer services.

BNL Planned Activities:

Effort required to provide technical support to users as necessary.

Maintain Comments/Questions option for all reaction databases, for the NNDC web service and for Nuclear Wallet Cards.

C. Publications

The USNDP provides some paper publications as well as electronic access to the nuclear physics databases that it maintains. This includes the Nuclear Data Sheets published by Elsevier and various versions of the Nuclear Wallet Cards.

BNL Planned Activities:

Prepare twelve issues of Nuclear Data Sheets for publication.

Prepare special issue of Nuclear Data Sheets on neutron reaction data.

IV. Nuclear Structure Physics (Work Plan FY09)

A. NSR Abstract Preparation

The literature search and preparation of KEYWORD abstracts for publications included in NSR require scientific expertise. BNL continues to have the overall responsibility for this database. The IAEA is expected to provide more than 20% of the keywords. Similar contributions from other external collaborators are expected. These will be checked and edited by BNL as necessary before being added to the database.

BNL Planned Activities:

- Prepare entries for about 3,800 new references, and keyword abstracts for 2,500 of them.
- Check and edit approximately 700 key-worded abstracts for three European journals prepared at the IAEA Nuclear Data Section.
- Check and edit key-worded abstracts from other collaborators as applicable and necessary.

B. Compilation of Experimental Structure Data

This activity involves compilation of recently published or completed experimental nuclear structure data for inclusion in XUNDL. The compilation is done by McMaster, while the NNDC is maintaining the database. In FY09, ANL plans to start contributing to compilation effort.

ANL Planned Activities:

- Compile and review datasets for recently published experimental nuclear structure data for inclusion in the XUNDL database.

BNL Planned Activities:

- Compile new BE(2) experimental data.
- Compile new $\beta\beta$ -decay experimental data.
- Maintain, update and distribute XUNDL.

McMaster Planned Activities:

- Compile data sets (in ENSDF format) for current experimental nuclear structure publication. The websites of prominent journals in nuclear physics will be scanned regularly for new papers.
- Review compiled data sets submitted by other data centers prior to inclusion in the XUNDL database.
- Communicate with the authors of the original papers for data-related problems and to request additional details of unpublished data. On a timely basis send a copy of all such private communications to NNDC for archival and distribution purposes.
- Train a new undergraduate student in early 2009 for XUNDL compilation work.

C. Data Evaluation for ENSDF

The USNDP evaluates nuclear structure and decay data for inclusion in the ENSDF database. This effort includes the critical analysis of all available experimental nuclear structure and radioactive decay data for a nuclide or a group of related nuclei to deduce recommended values from the measured data and prepare a file in ENSDF format that is the basis for publications in “*Nuclear Data Sheets*” and is used to update the contents of the USNDP nuclear structure and decay database, ENSDF. The US effort is supplemented by foreign contributions prepared under the auspices of the IAEA-sponsored international Nuclear Structure and Decay Data network.

ANL Planned Activities:

- 1 equivalent mass chain will be evaluated and published.
- 1 mass chain will be reviewed.
- Collaborate with scientists from other NSDD data centers on evaluation projects.

BNL Planned Activities:

- At least 6 equivalent mass chains will be evaluated.
- At least 6 mass chains will be reviewed.
- Continue mentoring new ENSDF evaluators.

LBNL Planned Activities:

- Evaluate the equivalent of at least 3 mass chains, including a minimum of one from the $A=21-30$ region. In the course of this, an attempt will be made to identify specific needs of the nuclear structure community and tailor some evaluation activities to meet those needs (*e.g.*, specific isotope evaluations in neutron-rich regions).
- Review mass-chain evaluations, as requested.

McMaster Planned Activities:

- 3.5 equivalent mass chains (including the $A=31-44$ region and the data for new nuclides as mentioned below) will be evaluated.
- Mass chains will be reviewed as requested.
- Update ENSDF for the identification of new nuclides and for the first publications on the findings of the excited states of nuclides.
- Collaboration with a new center/evaluator as part of mentoring process, as needed.

ORNL Planned Activities:

- Complete evaluation of structure information for one nucleus in $A=241-249$ region.
- Review one mass chain evaluation.

TUNL Planned Activities:

Prepare the ENSDF files corresponding to new publications in the “Energy Levels of Light Nuclei” series.

D. Ground and Metastable State Properties

The NNDC maintains a database of nuclide properties for the Nuclear Wallet Cards.

BNL Planned Activities:

Update database as new information becomes available.

E. Radioactive Decay Data Evaluation

Decay data for nuclides of importance for metrology are evaluated in an international collaboration. When complete, these evaluations will be entered into the ENSDF format, included into the ENSDF database and made available to ENSDF evaluators. In the United States, E. Browne (LBNL) coordinates this project at no cost to the US Nuclear Data Program.

ANL Planned Activities:

Evaluation of two radionuclides will be carried out as a part of the ANL contribution to the IAEA CRP on “Updated Decay Data Library for Actinides” and the DDEP collaboration.

Reviews of selected nuclides will be carried out, if requested.

McMaster Planned Activities:

Evaluate or review decay datasets for one or two radionuclides.

F. Neutron-Induced γ -Ray Data Evaluation

The EGAF (Evaluated Gamma-ray Activation File) database, disseminated by the IAEA and maintained by LBNL, currently provides discrete-line prompt γ -ray information from thermal (n, γ) reactions in a format tailored to suit the needs of the neutron activation analysis community. However, it requires ongoing maintenance and development to make it more useful to the applied communities it serves. Statistical-model calculations can generate quasi-continuum photon cascade data to complement these experimental discrete-line data. Together, the experimental and calculated data could constitute a valuable resource required for updating the ENDF database. Additionally, delayed photon data need to be added to EGAF. The k_0 -value database currently used by the neutron activation analysis community needs to be assessed and compared with the corresponding decay information in ENSDF, and the resulting evaluated k_0 values then need to be integrated into EGAF and, ultimately, made available to ENSDF evaluators.

LBNL Planned Activities:

Continue the following activities outlined in the FY07 Work Plan with a view to maintaining and developing the EGAF database:

- (i) Continue collaboration with LLNL to perform statistical-model calculations of quasi-continuum γ -ray cascade information and generate ENDF-format capture γ -ray datasets for use with MCNP and other transport-code calculations.
- (ii) Add to EGAF the neutron-activation file produced in the course of participating in the IAEA CRP on "Reference Database for Neutron Activation Analysis" (November FY2008 completion date for CRP).
- (iii) Add any new thermal (n, γ) data that become available, along with any total radiative-capture cross-sections derived from them.

G. Evaluation of Light Nuclei for *Nuclear Physics A*.

TUNL evaluates additional data not included in ENSDF for publication in *Nuclear Physics A* and on its web site.

TUNL Planned Activities:

Prepare "*Energy Levels of Light Nuclei, A = 13 - 15*" manuscript for publication in *Nuclear Physics A*.

H. Nuclear Structure Data Measurement

ANL - ANL will devote a relatively small effort (0.1 FTE) to participate through collaborative agreements in nuclear physics research activities related to nuclear data needs. The emphasis will be on data measurements aimed at providing answers to specific questions that arise from recent nuclear data evaluations and at improving the quality of existing databases in specific areas, such as (but not limited to) decay data of minor actinides and neutron-rich fission products. Maintain important collaborative connections with RIA and GRETINA research communities, because of their vital importance to the nuclear science in US.

ANL Planned Activities:

Complete decay data measurements on ^{245}Cm as a part of the ANL commitment to the IAEA-CRP on "Updated Decay Data Library for Actinides".

Participate in the development of the Argonne Total Absorption Gamma-ray Spectrometer at the CARIBU facility and the corresponding data infrastructure analysis, compilation and evaluation of decay data for neutron-rich fission products.

LANL -- LANL/LANSCE continues to maintain a small program to measure nuclear decay data information.

LANL Planned Activities:

Examine prompt gamma-ray emission data and gamma-gamma coincidence data from neutron reactions on ^{56}Fe to search for previously unobserved transitions in this nuclide.

Interact with mass chain evaluators on the nuclear structure of these nuclei.

LBL – to promote a closer working relationship with the nuclear structure community, LBNL will devote a small effort (~0.1 FTE) to participation in local nuclear structure experimental work.

LBL Planned Activities:

Participate in local nuclear structure experiments with an emphasis on topical issues and data needs such as AFC-related measurements or nuclear structure experiments on nuclei far from stability.

I. ENSDF Physics and Checking Codes

The NNDC maintains ENSDF checking and physics programs on behalf of the national and international evaluator networks

BNL Planned Activities:

Maintain and upgrade ENSDF checking and physics programs for format changes as required.

VI. Nuclear Reaction Physics (Work Plan FY09)

A. Experimental Data Compilation

The NNDC, as part of a larger international cooperation, has responsibility for compiling experimental nuclear reaction data that have been produced in the U.S. and Canada.

Incident neutron reactions have been well covered historically. NNDC thus concentrates on new measurements, but continues compilations of earlier publications that have not been included in the CSISRS database.

Since incident charged particle data have not been completely compiled in the past, NNDC is compiling new charged-particle measurements. In addition, because of emerging needs such as astrophysics, the NNDC is compiling older data. Hence, there is a larger staff commitment to compiling this type of data.

BNL Planned Activities:

Compile experimental data from 150 charged particle and neutron reaction publications.

B. ENDF Evaluations

Evaluated nuclear reaction data, for applications and for basic science needs, are stored in the ENDF database, which is maintained by BNL. As chair of the CSEWG evaluation committee, LANL staff works with BNL to insure quality control, particularly for new evaluations. New evaluations funded primarily from other sources are prepared for archival in the ENDF library. BNL, LANL, LLNL and ORNL provided neutron, proton and photonuclear reaction data evaluations for ENDF/B-VII released in FY2007. LLNL develops a computer code that translates LLNL evaluations in the internal ENDL format into ENDF-6 formatted data so that LLNL evaluations can flow back into the nuclear data community.

ANL Planned Activities:

No work planned for FY2009.

BNL Planned Activities:

Respond to user needs for evaluated nuclear reaction data.

Collect and address users' feedback related to the ENDF library.

Work with LANL on upgraded evaluations for future release of the ENDF/B library (version VII.1).

Improve methodology for providing covariance data, in the fast neutron energy region, to the next release of ENDF.

LANL Planned Activities: (work mostly supported from other sources)

Upgrade the LANL ENDF evaluations for actinides that perform well in criticality benchmarks, considering new LANSCE experimental data.

Provide upgraded ENDF evaluated data files for light elements, including covariance data. An improved treatment of three-body breakup channels will be incorporated into the EDA code in order to better describe data for (n,xn) reaction on ^9Be .

Continue to study a problem on oxygen, which is reported by criticality benchmarks.

Re-evaluate V data, for which problems in the criticality benchmarks are reported.

Submit the covariance data for light elements (this is supported by many projects including APCI, criticality safety, and also a WPEC collaboration).

Provide new delayed gamma-ray data.

LLNL Planned Activities:

Perform new evaluations as per LLNL customer requests and submit these and other LLNL generated evaluations into ENDF.

C. ENDF Manuals and Documentation

The NNDC is responsible for maintaining the format and procedures manual for the ENDF system. We also produce the documentation supporting the contents of the ENDF/B library.

BNL Planned Activities:

Maintain ENDF-6 formats manual that is available on the web and prepare major update of the manual. This format is used for the ENDF/B-VII library.

D. Nuclear Reaction Standards

Nearly all neutron cross section measurements are made relative to a neutron cross section standard such as the hydrogen elastic cross section. Maintaining accurate current values for the standard cross sections is the objective of this task that can be most efficiently accomplished through international cooperation. A new international evaluation of the neutron cross-section standards, which was initiated by the CSEWG, was recently completed. The work was performed largely by an IAEA Coordinated Research Project (CRP) with support from the NEA Working Party on International Evaluation Cooperation (WPEC) of the Nuclear Energy Agency and the CSEWG. It is important to improve the standards database and procedures for evaluations in preparation for new evaluations of the standards.

ANL Planned Activities:

No work planned for FY2009.

LANL Planned Activities:

- Participate in the international effort to reevaluate the light-element standard cross sections with LANL leadership for H, Li and B, and investigate the nature of output covariance data from R-matrix analyses of systems containing the light-element standard cross sections.
- Incorporate the cross section standards into the new ENDF evaluations, and perform validation tests with integral measurements.
- Measure cross sections for the standards reaction ${}^6\text{Li}(n,\alpha)$ from 5 to 10 MeV to provide improved data for R-matrix analysis.
- Study covariance data evaluation for the standards in a different technique when the R-matrix analysis gives extremely small uncertainties.
- Complete report on H(n,p) angular distribution standards measurements at 15 MeV with Ohio University and NIST.

NIST Planned Activities:

- Continue work on the IAEA data development project on maintenance of the neutron cross section standards. Attend the IAEA Consultants' Meeting on this project and provide results on the updating of the standards database and its impact on the standards.
- Continue the documentation of changes to EXFOR files based on the corrections obtained from the files of Poenitz and new information obtained from the CRP investigations.
- Continue to recommend and encourage new measurements and perform examinations of the data from them for use in future evaluations of the standards.
- Begin an experiment using neutron detection (instead of proton detection) to measure the H(n,n) angular distribution in collaboration with Ohio University and LANL. Investigate use of a time projection chamber for angular distribution measurements.
- Continue to acquire and monitor samples in the National Repository for Fissionable Isotope Mass Standards. Also make these samples available for loan in physics experiments.
- Complete a calibration of NBS-I, the U.S. national primary standard neutron source.
- Complete a measurement of the ${}^6\text{Li}(n,t)$ standard cross section at ~ 4 meV neutron energy using an improved fluence determination based on α - γ coincidences with the ${}^{10}\text{B}(n,\alpha\gamma)$ reaction.
- Complete efforts to improve the ${}^3\text{He}(n,p)$ standard cross section by making measurements of the spin-dependent n- ${}^3\text{He}$ coherent scattering length.

E. Nuclear Model Development

This task covers activities such as development and validation of nuclear reaction models used for prediction of nuclear reaction cross sections. The two major codes are GNASH (LANL) and

EMPIRE (BNL). Measurements made by ANL and LANL along with other measurements made with DOE low-energy physics funds will play a crucial role in the validation of the models in these computer codes. BNL and LANL will also participate in the IAEA Coordinated Research Project RIPL-3 to improve accuracy and reliability of input parameters used in nuclear reaction calculations

BNL – We are active in nuclear reaction model development focusing on the BNL code EMPIRE. The work in this fiscal year will concentrate on further extensions and improvements of its capabilities, including a new version of the level densities with appropriate parameterization. The work on validation of the code will be actively pursued, in particular in relation to emerging requirements of homeland security applications. Close collaboration with LANL will continue focusing on validation of the fission models in EMPIRE and GNASH. Major effort is dedicated to the development of capabilities for estimating covariance data for fast-neutron reaction cross sections.

In response to the needs from many user groups (such as Gen-IV reactors, criticality safety, Advanced Fuel Cycle Initiative), BNL will collaborate with LANL and ANL on a methodology for nuclear data covariances. To this end, a covariance module in EMPIRE for fast neutron energies should be extended and tested.

BNL Planned Activities:

- Release new version of the code EMPIRE with above-mentioned improvements.
- Develop the improved version of the covariance module in EMPIRE for fast neutrons.
- Implement and test the new resonance module allowing to generate covariances utilizing information from Atlas of Neutron Resonances.

LANL – Nuclear reaction theory calculations have played a crucial role in the evaluation of nuclear data, and will continue to play an important part in future evaluations due to the decrease in operating experimental facilities throughout the world. The LANL GNASH code has proved to be an important tool, and we will continue development of a new version of this code, McGNASH, to provide a state-of-the-art capability to predict reaction cross sections. This also involves a close collaboration with experimentalists at LANSCE to interpret new measurements using the GEANIE and DANCE gamma-ray detectors, and FIGARO detectors for neutron emission as well as (n,charged-particle) data. These data will result in advances in our understanding of nuclear reaction mechanisms, and improvements in our modeling codes. Also, largely under DOE/DP support, we will continue modernization of our R-matrix EDA code (used for light nucleus calculations and data evaluations) and explore implementation of exact particle-exchange formalism.

LANL Planned Activities:

- Perform neutron inelastic scattering and fission-neutron spectrum measurements with the FIGARO array. Correlate $^{56}\text{Fe}(n,\gamma)$ data from GEANIE with $^{56}\text{Fe}(n,xn)$ data from FIGARO.

Complete analysis of measurement of the fission-neutron spectrum for fission induced by neutrons of 1 to 200 MeV on ^{235}U and ^{239}Pu . The shape of the major part of the emission spectrum between 1 and 8 MeV will be determined in this experiment, performed in collaboration with CEA researchers, and will be compared with the Los Alamos model prediction. The modeling includes the Monte Carlo prompt neutron emission technique and the microscopic quantum mechanical preequilibrium calculations.

Perform radiative capture calculations on Eu isotopes in support of DANCE detector capture measurements, and provide the Maxwellian averaged cross section to s-process study.

Perform radiative capture calculations for fission products, in collaboration with CEA (France).

Develop a code to calculate the delayed gamma spectrum from fission products, using the Monte Carlo technique for the Hauser-Feshbach statistical decay.

Develop a theory and method to calculate compound reactions when strongly coupled-channels exist. This is crucial to study reaction cross sections for actinides.

Modern nuclear structure models, such as Hartree-Fock, will be applied to calculate nuclear reaction cross sections to reduce phenomenological model parameters.

Study ^{238}U and ^{232}Th neutron inelastic scattering at low-excitation energies where theoretical calculation underestimates experimental data.

TUNL – Ongoing work involves the development of preequilibrium nuclear reaction models, as well as the improvement and benchmarking of the computer code PRECO. The unique strengths of this program are its ability to describe reactions with complex particles in the exit and/or entrance channel, and the comprehensive nature of the state densities, which contain the effects of shell structure, the pairing interaction and isospin conservation.

TUNL Planned Activities:

DOE funding for this activity has been discontinued.

F. Nuclear Reaction Data Measurements

The measurement of nuclear data is essential to provide data, which either cannot be calculated or cannot be calculated with sufficient accuracy for user applications. This activity is also essential to support and verify nuclear model development and application.

BNL – We are responsible for compilation of nuclear reaction data within the USNDP. It is very important for the compilers to maintain active contact with data producers so that they have up-to-date knowledge of measurement procedures and techniques, including their advantages and

drawbacks, along with an understanding of data uncertainties. This goal can be best achieved by taking part in nuclear data measurements, such as LANSCE at LANL.

BNL Planned Activities:

No activities planned for FY09.

LANL Planned Activities:

. Measure and analyze prompt neutron emission following interactions of fast neutrons with fission products such as strontium. These measurements are gated on gamma rays from (n,n'γ) reactions.

Complete data analysis for gamma-ray output from neutron-induced fission of ^{235}U , ^{238}U , and ^{239}Pu for neutron energies from 1 to 100 MeV. Collaborators include scientists from CEA (France).

Design an experiment to measure that part of the fission neutron spectrum that lies below 1 MeV.

Complete analysis of gamma-ray production for neutrons on fission products such as ^{136}Xe with the goal of deducing partial reaction cross sections.

Measure the neutron capture cross-section of ^{241}Am at DANCE for neutron energies less than 200 keV.

Measure the neutron capture and fission cross sections of ^{239}Pu at DANCE for energies less than 200 keV.

Measure the neutron capture cross-section at DANCE for at least one radioactive isotope of importance to nuclear astrophysics.

LBNL – LBNL has recently initiated a new program to use surrogate reactions to deduce reaction cross sections which are of importance to Advanced Fuel Cycle (AFC) programmatic needs (a national priority). This is collaboration between the nuclear structure and nuclear reaction groups at LBNL and outside groups at LLNL and the University of Richmond that is currently funded from outside of the DOE Data Program. The LBNL group is leading a series of benchmarking experiments to test the applicability and accuracy of these new techniques for deducing cross sections of importance to AFC and the s-process. It is anticipated that this activity will provide nuclear reaction data measurements of importance to the Data Program. LBNL is collaborating with the Budapest Reactor Centre in the measurement, using isotopically-enriched targets, of selected thermal (n,γ) cross section data to supplement earlier elemental target measurements from which important information was either lacking (*e.g.*, data from low-abundance isotopes) or discrepant.

LBNL Planned Activities:

Continue to perform (n,γ) cross section measurements at thermal energies in collaboration with the Budapest Research Centre.

Lead series of surrogate-reaction benchmarking measurements at LBNL.

LLNL Planned Activities (work completely supported from other sources):

Neutron induced reaction measurements on one or more isomer targets.

Perform surrogate (n,n'), (n,2n), (n, γ) and (n, f) measurements on several nuclei with programmatic and/or astrophysical importance.
Perform neutron capture measurements with DANCE array at LANSCE in collaboration with LANL.
Perform fission cross-section measurements with the lead slowing down spectrometer at LANSCE in collaboration with LANL.

G. Evaluation of Data Needed for Astrophysics

The objective of this activity is to support the nuclear data needs of the increasingly sophisticated simulations of astrophysical phenomena. The Astrophysics Task Force of the USNDP, presently chaired by ORNL, serves to improve communication and coordination of nuclear data evaluation activities relevant for studies in astrophysics.

ANL Planned Activities:

Complete work on ^{186m}Re that is of relevance to the $^{187}\text{Re}/^{187}\text{Os}$ cosmochronometer, including measurements and modeling of the production and destruction cross-sections of the ^{186m}Re isomer (in collaboration with TUNL).
Evaluate weak interactions data for the needs of the nuclear astrophysics community

BNL Planned Activities (largely done by guest scientist not funded by USNDP):

Perform systematic evaluations of neutron capture cross sections in the energy region of interest for nuclear astrophysics (neutron unresolved resonance region). Produce Maxwellian averages of these data.
USNDP support of this work will be limited to including the evaluations in appropriate databases and to providing data dissemination.

LANL -- Participate in the USNDP effort to develop high-quality data for astrophysics calculations of nucleosynthesis. Make new calculated and evaluated results available to the wider astrophysics research community *via* the USNDP Astrophysics Task Force.

LANL Planned Activities:

Continue N-N analysis to energies above 50 MeV and provide evaluated n-p capture cross-sections, rates, and covariance data.
Improve neutron capture models to provide neutron capture rates off-stability to s-process hydro-dynamics simulations.
Provide neutron emission rates for the electron capture process in the astrophysical stellar environment.

McMaster -- The evaluation of nuclear astrophysics data is expected to complement the ongoing experimental program of measurements of radiative capture cross sections and particle-transfer experiments using radioactive ion beam facilities at TRIUMF, NSCL, RIKEN and ANL.

McMaster Planned Activities:

Specific reactions planned for evaluation in FY09: $^{27}\text{Si}(p,d)^{26}\text{Si}$ and $^{28}\text{Si}(^{12}\text{C}, ^6\text{He})^{34}\text{Ar}$.

ORNL -- Evaluate capture reactions on radioactive proton-rich nuclei which are important for element synthesis and energy generation in stellar explosions.

ORNL Planned Activities:

Continue assessments of capture reactions on p-rich unstable nuclides that are important for novae and X-ray bursts. The nuclei to be studied are those planned for measurements at ORNL's Holifield Radioactive Ion Beam Facility.

Extract spectroscopic information (excitation energies, spectroscopic factors, spins, parities, ANC's) on nuclei near the N=82 closed shell – ^{131}Sn , ^{133}Sn , ^{135}Te - from transfer reaction measurements on radioactive Sn and Te nuclei.

This information is important for modeling the r-process in supernovae.

I. Reaction Data for RIA Target Design

Rare Isotope Accelerator facility design needs high-quality nuclear reaction data for target design. LANL will collaborate in order to provide key reaction cross-sections using theory calculations and measurements to evaluate the data.

LANL Planned Activities:

We aim to maintain important collaboration connections with the RIA community because of its importance in nuclear science, but effort is limited because of budget restrictions. However, we will continue to maintain a presence in the RIA planning community via participation in RIA meetings and workshops.

Table 3: USNDP Staffing Table in FY2009

Workplan FY 2009	ANL		BNL			LANL	LBNL		LL NL	McMaster		NI ST	ORNL		TUNL		Program Total			
	Sci Per	Sci Tem	Sci Per	Sci Tem	Tec Adm		Sci Per	Sci Tem		Sci Per	Sci Tem		Sci Per	Sci Tem	Sci Per	Sci Tem	Sci Per	Sci Tem	Tec Adm	Total
I. NNDC Facility Operation	0.00	0.00	0.35	0.00	1.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	1.65	2.00
Management			0.35														0.35	0.00	0.00	0.35
Secretarial/Administrative Support					0.55												0.00	0.00	0.55	0.55
Library					0.25												0.00	0.00	0.25	0.25
Computer Operations					0.85												0.00	0.00	0.85	0.85
II. Coordination	0.05	0.00	0.65	0.00	0.00	0.40	0.20	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	1.40	0.00	0.00	1.40
National Coordination			0.35			0.10	0.20		0.05				0.05				0.75	0.00	0.00	0.75
International Coordination	0.05		0.30			0.30											0.65	0.00	0.00	0.65
III. Nuclear Physics Databases	0.00	0.00	1.05	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00	1.50	2.55
Nuclear Science References, NSR			0.10		0.70												0.10	0.00	0.70	0.80
Exper. Nucl. Structure Data, XUNDL			0.05														0.05	0.00	0.00	0.05
Eval. Nucl. Structure Data, ENSDF			0.20		0.65												0.20	0.00	0.65	0.85
Numerical Nuclear Data, NuDat			0.15														0.15	0.00	0.00	0.15
Reaction Data Bibliography, CINDA			0.05														0.05	0.00	0.00	0.05
Experimental Reaction Data, CSISRS			0.10														0.10	0.00	0.00	0.10
Evaluated Nuclear Data File, ENDF			0.30														0.30	0.00	0.00	0.30
Database Software Maintenance					0.15												0.00	0.00	0.15	0.15
Future Database System Develop.			0.10														0.10	0.00	0.00	0.10
IV. Information Dissemination	0.00	0.00	0.95	0.00	0.25	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.10	1.40	0.60	0.00	1.85	1.40	0.25	3.50
Nuclear Data Sheets			0.10		0.15												0.10	0.00	0.15	0.25
Customer Services			0.15		0.10												0.15	0.00	0.10	0.25
Web Maintenance & Development			0.70			0.10	0.10						0.10	1.40	0.60		1.60	1.40	0.00	3.00

Table 3: USNDP Staffing Table in FY2009

Workplan FY 2009	ANL		BNL			LA NL	LBNL		LL NL	McMaster		NI ST	OR NL		TUNL		Program Total			
	Sci Per	Sci Tem	Sci Per	Sci Tem	Tec Adm		Sci Per	Sci Tem					Sci Per	Sci Tem	Sci Per	Sci Tem	Sci Per	Sci Tem	Tec Adm	Total
V. Nuclear Structure Physics	0.90	0.00	2.90	1.20	0.00	0.10	1.80	0.20	0.00	0.60	0.75	0.00	0.00	0.30	0.85	0.50	6.15	2.95	1.00	10.10
NSR Abstract Preparation			0.70														0.70	0.00	0.00	0.70
Compilation of Exper. Structure Data	0.05									0.15							0.20	0.00	0.00	0.20
Eval. of Masses & Nuclides for ENSDF	0.55		1.75	1.20			1.30	0.20		0.43	0.75			0.30	0.45	0.25	4.48	2.70	0.00	7.18
Ground & Metastable State Properties			0.15														0.15	0.00	0.00	0.15
Radioactive Decay Data Evaluation	0.20		0.05							0.02							0.27	0.00	0.00	0.27
Thermal Capture Gamma Data Eval.							0.40										0.40	0.00	0.00	0.40
Light Mass Eval. for Nucl. Physics A														0.40	0.25		0.40	0.25	0.00	0.65
Nuclear Structure Data Measurement	0.10					0.10	0.10										0.30	0.00	0.00	0.30
ENSDF Evaluation Support Codes			0.25														0.25	0.00	0.00	0.25
VI. Nuclear Reaction Physics	0.05	0.00	0.75	1.40	0.00	1.60	0.10	0.00	0.40	0.00	0.25	0.20	0.15	0.25	0.00	0.00	3.25	1.90	0.00	5.15
Experimental Data Compilation				0.35													0.00	0.35	0.00	0.35
<i>Neutron Data</i>				0.10																
<i>Charged Particle Data</i>				0.20																
<i>Photonuclear Data</i>				0.05																
ENDF Manuals and Documentation			0.10														0.10	0.00	0.00	0.10
ENDF Evaluations			0.40	0.85		0.20			0.40								1.00	0.85	0.00	1.85
Nuclear Reaction Standards						0.10						0.20					0.30	0.00	0.00	0.30
Nuclear Model Development			0.20	0.20		0.60											0.80	0.20	0.00	1.00
Nucl. Reaction Data Measurements						0.30	0.10										0.40	0.00	0.00	0.40
Astrophysics Nuclear Data Needs	0.05		0.05			0.40					0.25		0.15	0.25			0.65	0.50	0.00	1.15
Reaction Data for RIA Target Design						0.00											0.00	0.00	0.00	0.00
	ANL		BNL			LANL	LBNL		LLNL	McMaster		NIST	ORNL		TUNL		Program Total			
DOE-SC Nucl. Data Funded Staff	1.00	0.00	6.65	2.60	3.40	2.20	2.20	0.20	0.45	0.60	1.00	0.20	0.30	1.95	1.45	0.50	14.05	6.25	4.40	24.70
Staff Supported by Other Funds			0.35	0.70	0.20	14.40			7.50	0.40		2.80					25.45	0.70	0.20	26.35
TOTAL STAFF	1.00	0.00	7.00	3.30	3.60	16.60	2.20	0.20	7.95	1.00	1.00	3.00	0.30	1.95	1.45	0.50	39.50	6.95	4.60	51.05