

# The Spallation Neutron Source Overview

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by

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# The Spallation Neutron Source (SNS)

The logo for the Spallation Neutron Source (SNS) features a stylized orange and red starburst or neutron symbol to the left of the text 'SNS' in a large, white, sans-serif font. Below 'SNS' is the full name 'SPALLATION NEUTRON SOURCE' in a smaller, white, sans-serif font.

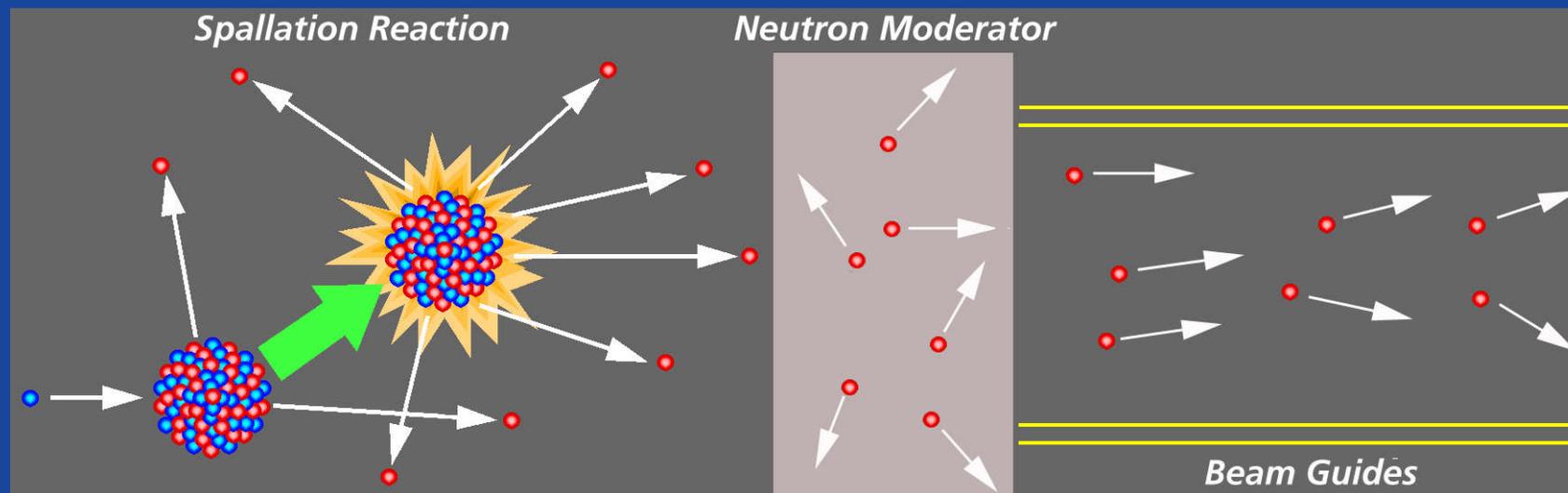
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- A proposed \$1.3B construction line item to be constructed from 1999 through 2005
- A large, world class facility for neutron scattering research in the areas of physics, chemistry, biology, medicine, and engineering
- The "highest priority" for DOE Basic Energy Sciences
- Will have a next generation, most intense neutron source in the world
- Is upgradable to higher intensities and capabilities for more research instruments
- Designed and constructed by a collaboration of five national laboratories
- Will be an international center for neutron science research

# How Are Neutron Beams Produced?

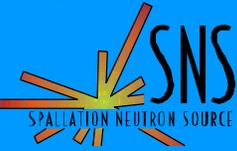


- Neutrons are one of the fundamental building blocks of matter that can be released through:
  - The fission process by splitting atoms in a nuclear reactor
  - The spallation process by bombarding heavy metal atoms with energetic protons



- The moderated neutrons, once released, can be transmitted through beam guides into the laboratory and used for a wide variety of research and development projects

# Scientific Justification for SNS



- Neutrons provide unique insight into materials at the atomic level
  - ‘see’ light atoms in biomaterials and polymers
  - study magnetic properties and atomic motion
  - measure stress in engineering components
- Neutron scattering was developed in the US but we now have a serious shortage of facilities and they are not best in the world
  - State-of-the-art neutron source has been an urgent priority for ~15 years
- The SNS will be world leading and help restore US leadership

# A Brighter Source Of Neutrons Could Bring A Brighter Future

## Magnetism & Superconductivity



High-speed trains of the future that will be levitated by super-conducting magnets will be even faster than the TGV in France (shown here).

## Polymers



Much of the Boeing 757 airplane is made of lightweight plastic. Neutron studies may lead to safer, faster, more energy-efficient aircraft.

## Disordered Materials

Intense neutron beams will offer clues on preparing better surfaces of wear- and corrosion-resistant alloys for use as hip implants.



## Complex Fluids



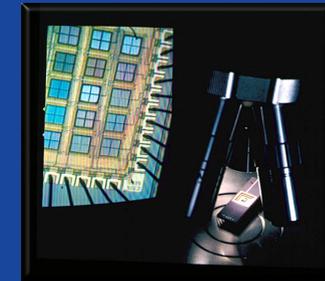
Shampoo is one of many complex fluids studied with neutrons whose molecular structure changes as a one-directional force is applied, making the thick liquid thin enough to spread through hair.

## Crystalline Materials



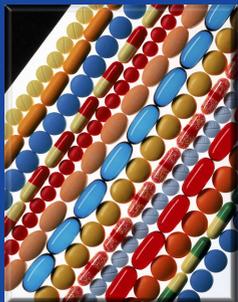
Smaller, faster electronic chips that may result from neutron studies will bring low-cost power devices and the convenience of smart cards and ubiquitous computing.

## Semiconductors



Thin films that can be probed by the SNS will be used for non-volatile memory, extending the life of laptop computer batteries.

## Structural Biology



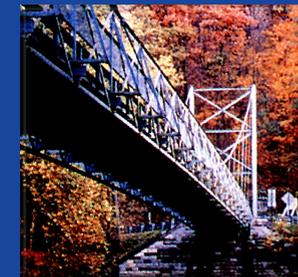
Using neutron scattering to determine the structure of body enzymes will aid in the development of more effective therapeutic drugs.

## Chemistry



Healthier, lowfat foods (like ice cream) that have better taste and texture will be madewith guidance from neutron scattering.

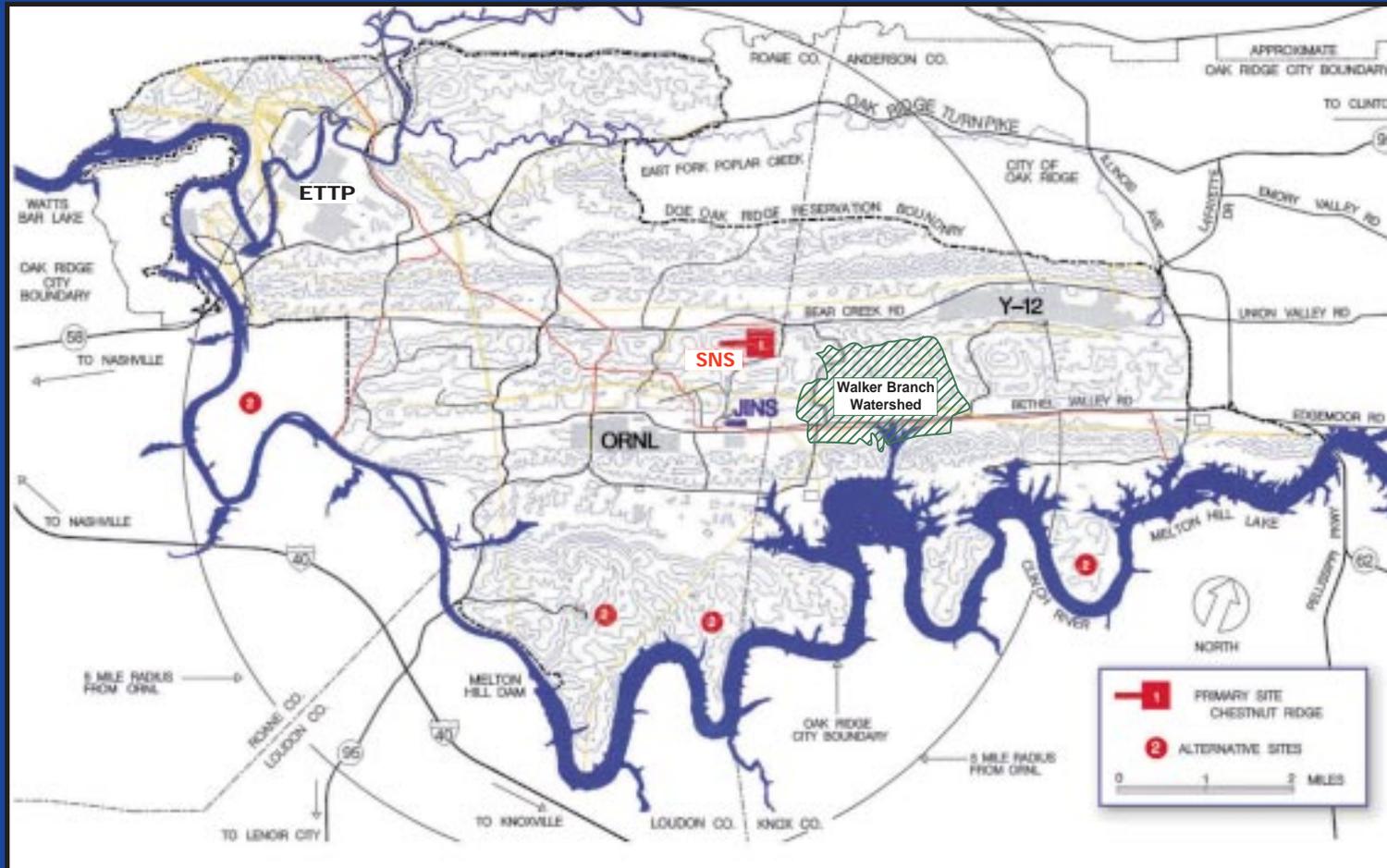
## Engineering



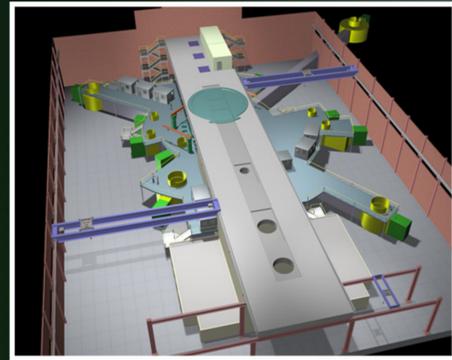
The Corbin Bridge in Pennsylvania was thefirst to have an aluminum deck replacement (in 1996). Aluminum welds for such decks are being characterized by neutron scattering.

# SNS

## Site Locations



# SPALLATION NEUTRON SOURCE



TARGET HALL

SUPPORT SHOPS



INSTRUMENT STATIONS



OFFICE BUILDING



# Joint Institute for Neutron Sciences



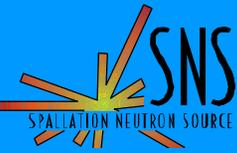
## During Construction of Joint Institute for Neutron Sciences

- Projected to support 300 full-time jobs
- Generate \$210,000 in state sales tax revenue

# Spallation Neutron Source

## Key Statistics of the Facility

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- Site: Over 100 acres
- Roadways: Over 4 miles
- Process piping: Over 35 miles
- Buildings: 15 with 7 acres of floor space
- Cooling capability: Over 12,600 tons
- Electrical power usage: 51,400 kW
- During seven-year construction of SNS
  - Projected to support 1,500 jobs during peak construction
  - Generate an annual state sales tax revenue of \$3.6M

## Formation of the SNS Collaboration

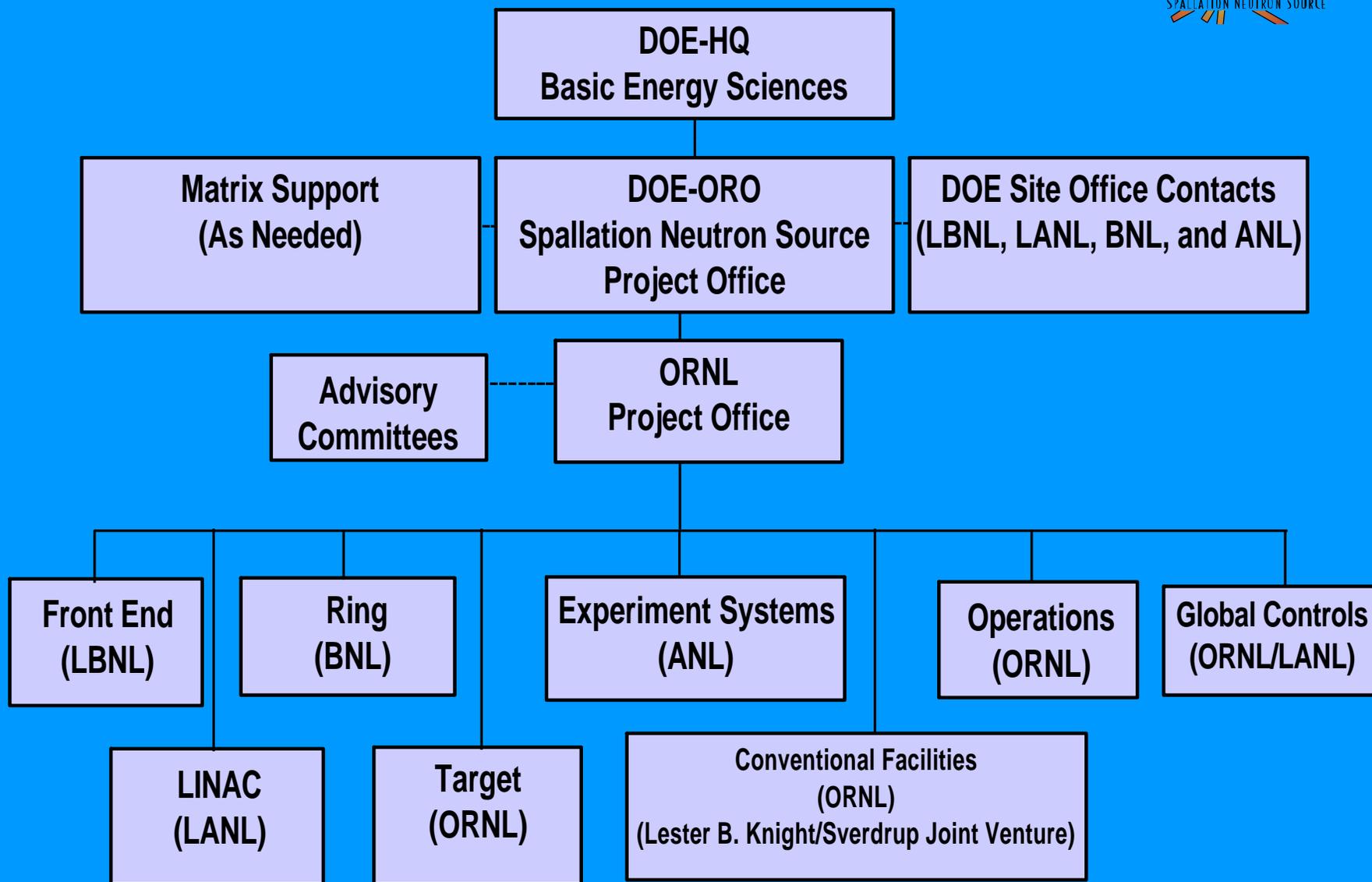


The SNS is a truly collaborative project involving Argonne, Brookhaven, Lawrence Berkeley, Los Alamos, and Oak Ridge National Laboratories that:

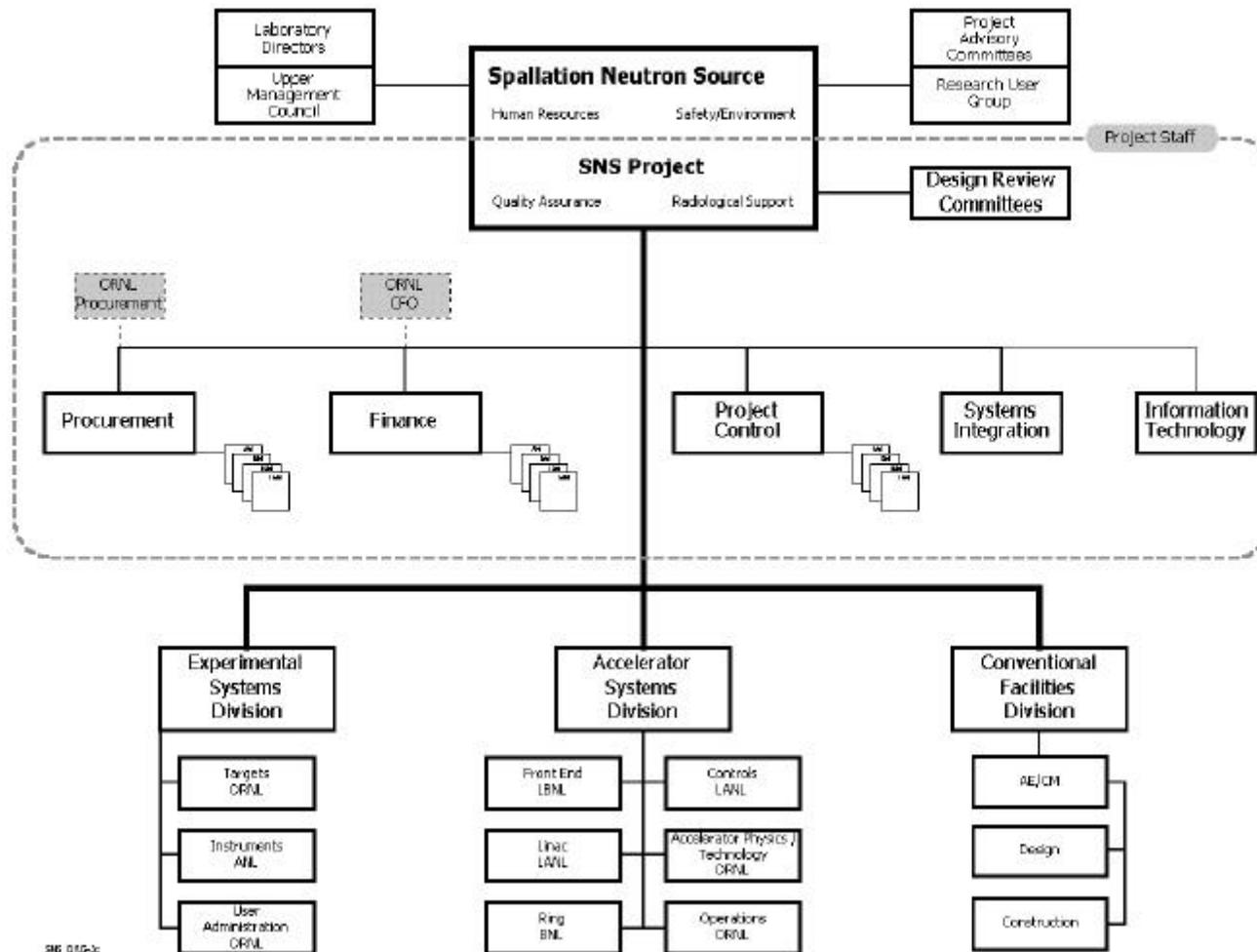
- Assembles the best available expertise
- Accesses the most current technologies
- Utilizes existing capabilities and experience at the other DOE labs:
  - LBNL (RFQ, Ion Sources, etc.)
  - LANL (LANSCE, PSR, APT, GTA, etc.)
  - BNL (AGS, AGS Booster, RHIC, NSLS, etc.)
  - ANL (IPNS, APS, etc.)
- Incorporates experience and insights from other spallation-source feasibility studies
- Involves other DOE active neutron user programs/facilities



# DOE-ORO Project Office



# Organization Chart



SNS\_015-3

# Financial Summary - Spallation Neutron Source

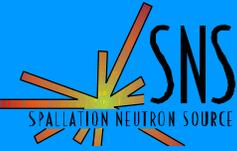
*(Optimum Profiles for a 7+ Year Schedule)*



*Budget Authority (BA) in Actual Year Millions of Dollars*

Line Item	Prior Years	<i>Fiscal Year</i>								<i>Total</i>
		1999	2000	2001	2002	2003	2004	2005	2006	
Line Item		101.4	196.1	267.9	262.5	193.6	78.3	49.2	10.5	1,159.5
R&D		27.8	17.0	11.8	7.9	3.7	2.6			70.8
Pre-Ops		0.8	0.4	1.3	1.9	6.4	16.0	48.5	15.4	90.7
Prior Year	39									39.0
<i>Total</i>	39	130	214	281	272.3	203.7	96.9	97.7	25.9	1360.0

# User Support at SNS



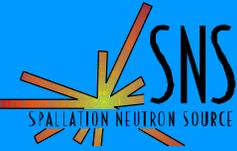
- Operations budget includes scientists and technicians to work with users
- User coordination(logistics,accommodation, user offices, users group, etc.) via JINS
- Instrument development to move beyond the initial 10 instruments part of the normal operating mode of SNS (SNS R&D to start the process)

# SNS will be a USER facility



- User input into the instrument suite
  - Instrument Oversight Committee + Workshops
- Support (technical, scientific, logistical) for users carrying out experiments
- Peer reviewed proposal system
- 1000-2000 users per year from academia, government, and industry

# SNS & ORNL



- The multi-lab nature of SNS provides a significant resource however
- SNS will reside at ORNL - success will require sustained support from ORNL for both construction and in operations
- SNS will impact ORNL science across a broad portfolio of programs

# Major Accomplishments Since June 1998



- **New Project Manager for ORNL Project Office (9/98)**
- **Project Officially Authorized and Started (10/98)**
- **AE/CM Contract Signed (Knight/Sverdrup) (11/98)**
- **New Senior Team Leader at LANL (11/98)**
- **Draft EIS issued for Public Comment (12/98)**
- **Dr. Dave Moncton named Project Director (3/99)**
- **Approval to Issue Final EIS (4/99)**
- **Re-assessment of Project Completed (4/99)**