The Future of DOE and its Intersections

Steven E. Koonin
Under Secretary for Science
US Department of Energy
July 2010
Outline

- A bit about my role

- INT and nuclear physics

- Department of Energy
Office of Science Programs: FY 2010 Appropriation

1 July 2010

1. Advanced Scientific Computing Research (ASCR)
   - ASCR, $394,000K
2. Basic Energy Sciences (BES)
   - BES, $1,636,500K
3. Biological and Environmental Research (BER)
   - BER, $604,182K
4. Fusion Energy Sciences (FES)
   - FES, $426,000K
5. High Energy Physics (HEP)
   - HEP, $810,483K
6. Nuclear Physics (NP)
   - NP, $535,000K
7. Workforce Development for Teachers and Scientists (WDTS)
   - WDTS, $20,678K
8. Science Lab Infrastructure (SLI)
   - SLI, $127,600K
9. S&S, $83,000K
10. SCPD, $189,377K

FY 2010 Funding Total = $4,903,710K
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Principal Recommendation: We recommend a five-year plan to strengthen nuclear theory, reversing the declining trends of the past decade. An important aspect of this plan would provide 60–65 additional Ph.D. level personnel, bringing the fraction of nuclear scientists who are theorists in the range of 26%. This plan is based on our analysis of the immediate needs of nuclear science for theoretical leadership, diversification, and support and the quality of new personnel that would be supported. It is consistent with the field’s capacity for absorbing additional faculty and staff, producing new postdoctoral fellows, and training new students. The plan would require an additional $9.0 M in FY93 (FY88 dollars). Such an increment would increase theory funding from the present level of about 6% of the nuclear science operating budget to about 10% in FY93, in accord with the increase recommended by the 1979 Long Range Plan. A key-part of our plan is an enhanced number of theorists at universities with high-quality graduate programs, and the funding to provide for the training of students in nuclear theory. This is essential for the future of the field.
Scientific Discovery in Nuclear Physics:
Four national user facilities provide quality nuclear beams for the research community

Users of NP Facilities

- Approximately 40% of users are from foreign institutions

1 July 2010

PhDs by Subprogram

- Total NP Journal Publications:
  - ANL – 136
  - BNL – 99
  - JLab – 125
  - ORNL - 98
Scientific Discovery: Element 117

ORNL, LLNL, Vanderbilt, Dubna


1 July 2010
Scientific Discovery: QCD Physics at JLAB and RHIC Physics

New physics reach provided by the 12 GeV CEBAF Upgrade:

- Three-dimensional structure of the nucleon
- Exotic mesons
- Precision studies of parity violation
- Nuclear medium modifications of valence quark structure

Increasing RHIC luminosity with Stochastic Cooling:

- Longitudinal and vertical pickups and kickers installed in each ring
- Factor of ~8 increase in collision rate with heavy ion running

1 July 2010
Scientific Discovery: Facility for Rare Isotope Beams

Dec. 2008: DOE selects MSU to establish FRIB
June 2009: Cooperative Agreement between DOE and MSU
Sept. 2009: First Lehman Review
March 2010: Lehman Mini-Review of Preparations for CD1
July 2010: Lehman Review CD-1
Sept 2010: CD-1 Approval Planned

- Produce and determine properties of neutron rich nuclei
- Astrophysics of heavy element production

Expect to request the start of engineering design in FY 2011

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DOE missions

- Sustain **basic research**, discovery and mission driven
- Catalyze a transformation of the national/global **energy system**
- Enhance **nuclear security**
- Contribute to **US competitiveness** and jobs

DOE Secretary, Dr. Steven Chu

30 June 2010
Basic Research

- How do we determine US position in various scientific fields?
- How can we balance resources in basic research between fields close to vs distant from applications?
- How do agencies talk to the public, Congress?
- How can we improve climate science?
Accelerating energy transformation

Energy security: 3.5 M bbl/day reduction in crude use

Greenhouse gas emissions: 17% reduction by 2020, 83% by 2050

- Changing the historically-decadal timescale?
- S&T engaging society and industry? The best research structures?
- Coupling basic and applied research?
- Communicating sensible policy?
Nuclear Security

- Maintain technical base?
- Keep staff engaged?
- Energy prospects for the National Ignition Facility?
- Exploit simulation capabilities
US Competitiveness

- How do we get to a deep understanding of the issues?
- What is the US strategy?
- How do we get public dialog/understanding?
- How do we execute?
- What role do scientists and S&T play?
FY09 Federal Spending

U.S. DEPARTMENT OF ENERGY

1 July 2010
Federal deficit projections

IN BILLIONS

ACTUAL

PROJECTED

CBO estimate

White House estimate

0 '00 '01 '02 '03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16 '17 '18 '19

CBO: -$1.85 trillion

White House: -$1.75 trillion

U.S. DEPARTMENT OF ENERGY

1 July 2010
What can a scientist do?

- Help advocate for basic research
  - Your field and others
  - Applications and “spin offs” are important but not sufficient

- Understand the bigger problems
  - They *will* affect you, both as a citizen and a scientist
  - Advocate for sensible policies
  - Become involved technically
Questions/Comments?