



**Office of Science**  
**U.S. Department of Energy**

*Safe Handling of Engineered Nanoscale Materials:  
DOE Office of Science Expectations*

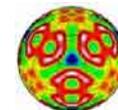
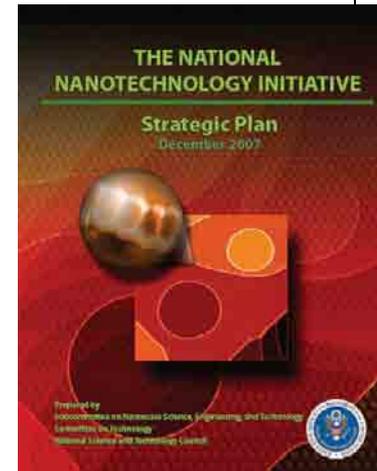
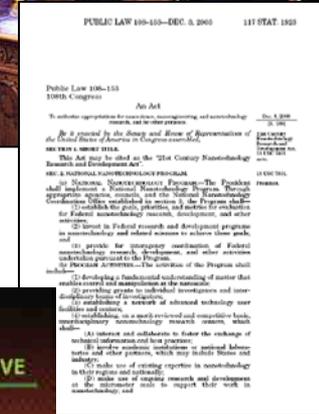
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*July 7, 2008*

# Nanotechnology efforts are coordinated across the Federal government

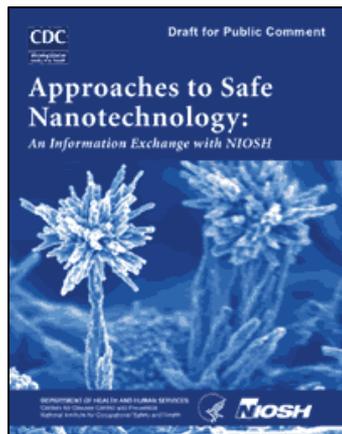
- **The National Nanotechnology Initiative (NNI) is an interagency program of nanoscale R & D activities and related efforts among various participating Federal entities (currently 25)**
- **The NNI began in 2001 and its activities were codified and further defined in the 21st Century Nanotechnology Research and Development Act (Dec. 2003)**
- **NNI activities are coordinated by the Nanoscale Science, Engineering, and Technology (NSET) Subcommittee of the National Science and Technology Council (NSTC)**



# *DOE participates in and contributes to interagency nanomaterials environmental, health, and safety efforts*



- **Environmental, health, and safety issues are primarily addressed through NSET's Nanotechnology Environmental and Health Implications (NEHI) Working Group**
- **DOE representatives (from SC and HSS) serve on the NEHI Working Group, and (from SC and EERE) on the parent NSET Subcommittee, including as Co-Chair**
- **Documents and other inputs from other agencies (such as NIOSH) and outside sources (such as standards organizations) are important reference materials**

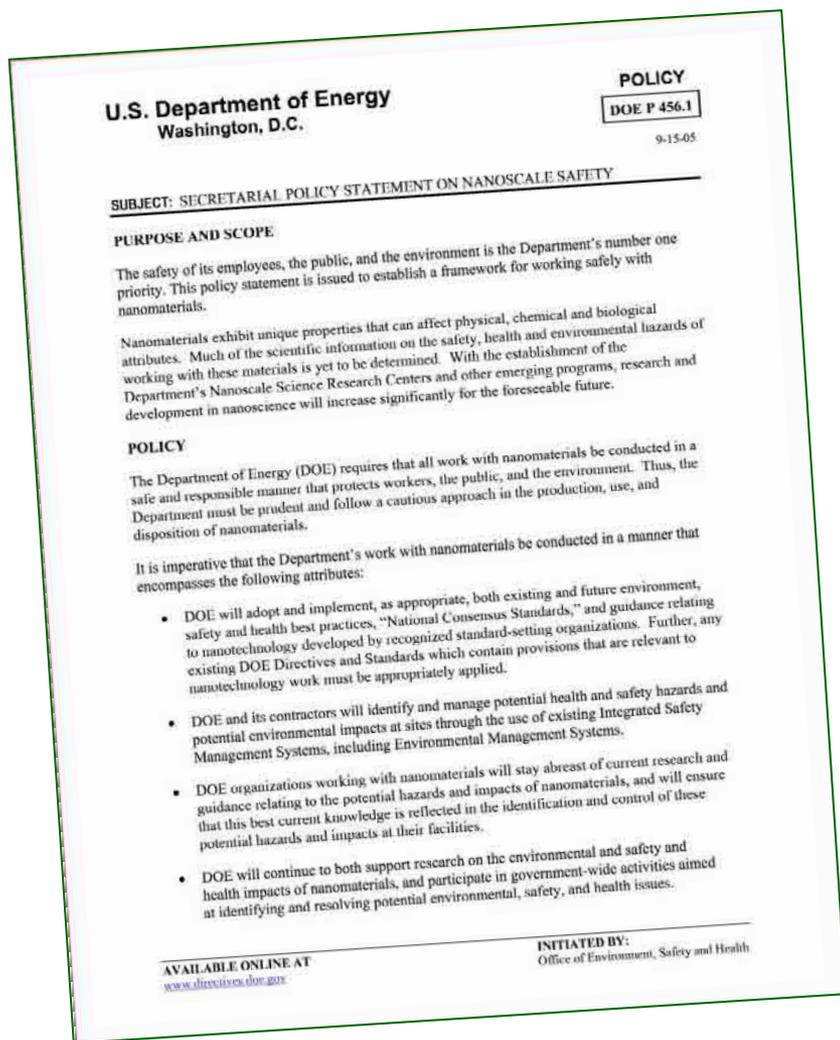


# *The NNI definition of nanotechnology*

## **What is “nanotechnology”?**

- **Nanotechnology is the *understanding and control* of matter at dimensions between approximately *1 and 100 nanometers*, where *unique phenomena* enable novel application.**
  - **Nanotechnology involves imaging, measuring, modeling, and manipulating matter at this length scale**
- 
- ***Not just another step towards miniaturization; fundamental differences in physical, chemical, and biological behavior at this level compared to bulk materials or individual atoms/molecules***
    - *quantum phenomena*
    - *dominance of surfaces*
    - *self-assembly*
  - ***With reference to the National Nanotechnology Initiative (NNI): broadly encompasses nanoscale science, engineering, & technology***

# DOE Policy 456.1: Secretarial Policy Statement On Nanoscale Safety

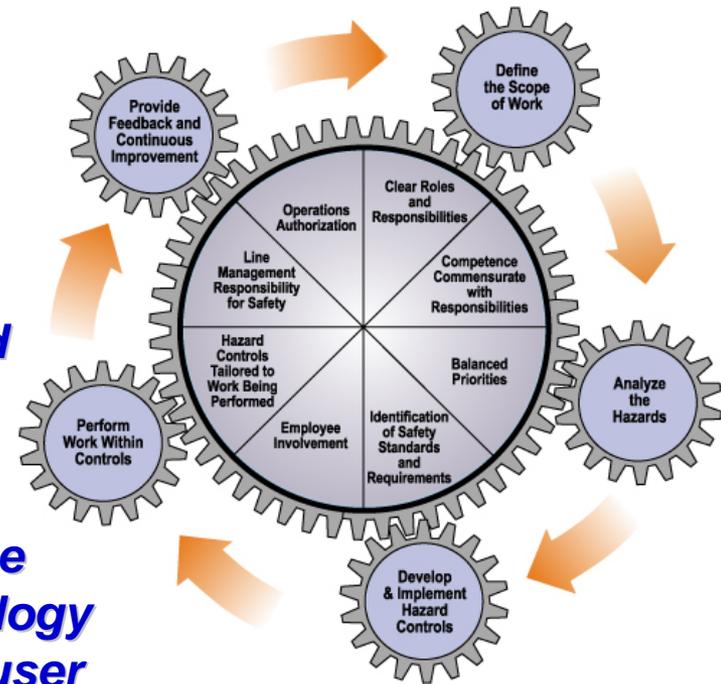


- **Adopt and implement existing and future best ES&H practice (Consensus Standards)**
- **Use ISMS to identify and manage potential ES&H issues**
- **Stay abreast of current research and guidance; ensure best current knowledge is applied to ID and control of hazards**
- **Continue support of ES&H related research, participation in government-wide activities**
- **All involved share responsibility for ES&H consistent with Policy**



# Background to SC expectations for nanomaterials safety

- **The Department of Energy (DOE) requires contractors to ensure that all work at their laboratories will be conducted in a safe and environmentally compliant manner protecting workers, the public, and the environment.**
- **The mechanism for this is implementation and validation of an effective integrated safety management system (ISMS).**
- **DOE-SC is a major supporter of research at the nanoscale as part of the National Nanotechnology Initiative, supporting research programs and user facilities for nanoscale science at DOE laboratories**
- **The health and environmental impacts of many materials are not fully characterized at the nanoscale and may differ substantially from those in the bulk phase of the same materials.**



## *SC expectations for nanomaterials safety*

- *It is the policy and expectation of DOE SC's Office of Basic Energy Sciences (BES) that research using materials at the nanoscale will be conducted in a manner that recognizes the potential existence of unknown or incompletely understood hazards and mitigates potential risks in a manner that will protect workers, the public health, and the environment.*
- *Only work conducted in this manner will be supported by DOE-SC-BES.*



## *Fulfillment of SC expectations for nanomaterials safety*

- *Implementation of measures that are appropriate to activities and are consistent with overall organizational safety approaches, including Integrated Safety Management Systems and DOE P 456.1*
- *Awareness and due consideration of the evolving data, recommendations, standards, and practices developed and evaluated by the community*
- *Involvement of experts and health safety professionals in determining most suitable approaches to safe work based on the individual circumstances*
- *For NSRCs, evaluation of ESH aspects during every operational review (first round completed 2007-2008)*
- *Activities (such as this workshop!) to assist in sharing lessons learned across the NSRCs, more broadly across the DOE national laboratories, and indeed with the broader community*

## *The bottom line*

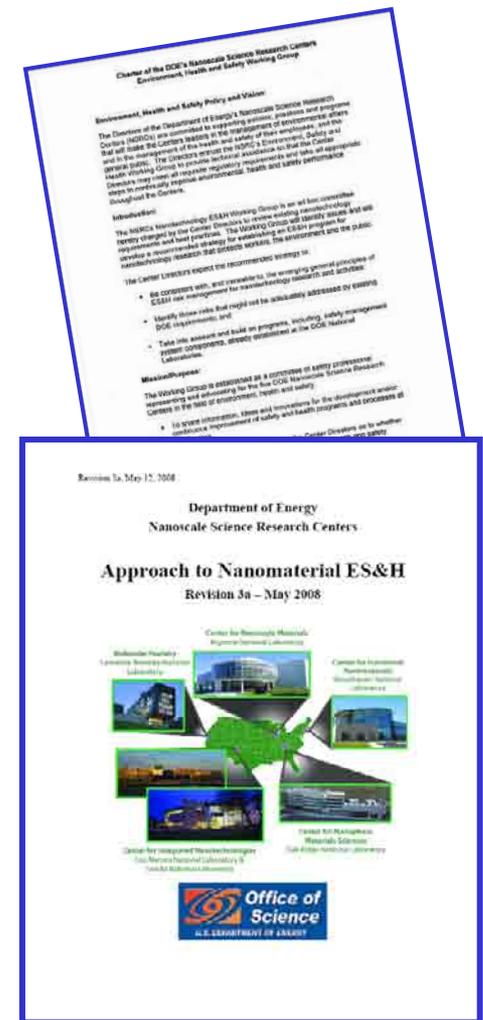
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***Creating a safe environment for  
laboratory staff, visitors, and  
communities - making it possible to  
advance nanoscale science and reap  
its benefits for society***



# Environmental, Safety, and Health Coordination among the DOE Nanoscale Science Research Centers

- A group of ES&H professionals involved with the five NSRCs first met in August 2004, while the NSRC buildings were still in construction
- Regular teleconferences were held thereafter to share information regarding project safety as well as planning for facility operations
- The NSRCs Environmental, Health and Safety Working Group was chartered by the NSRC Directors in February 2007
- A major output has been the “Approach” document, which is intended as a resource but not as mandatory guidance because specific approaches need to be tailored to the circumstances at hand (Rev. 3a, May 2008)



# Thanks to the five NSRCs and their ESH Working Group!



<http://nano.energy.gov>