# ADAPTATION IN THE NATIONAL CLIMATE ASSESSMENT AND BEYOND

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## Climate Change and Extreme Weather: Vulnerability Assessment of the US Energy Sector

## DOE/Atlantic Council, Washington, DC

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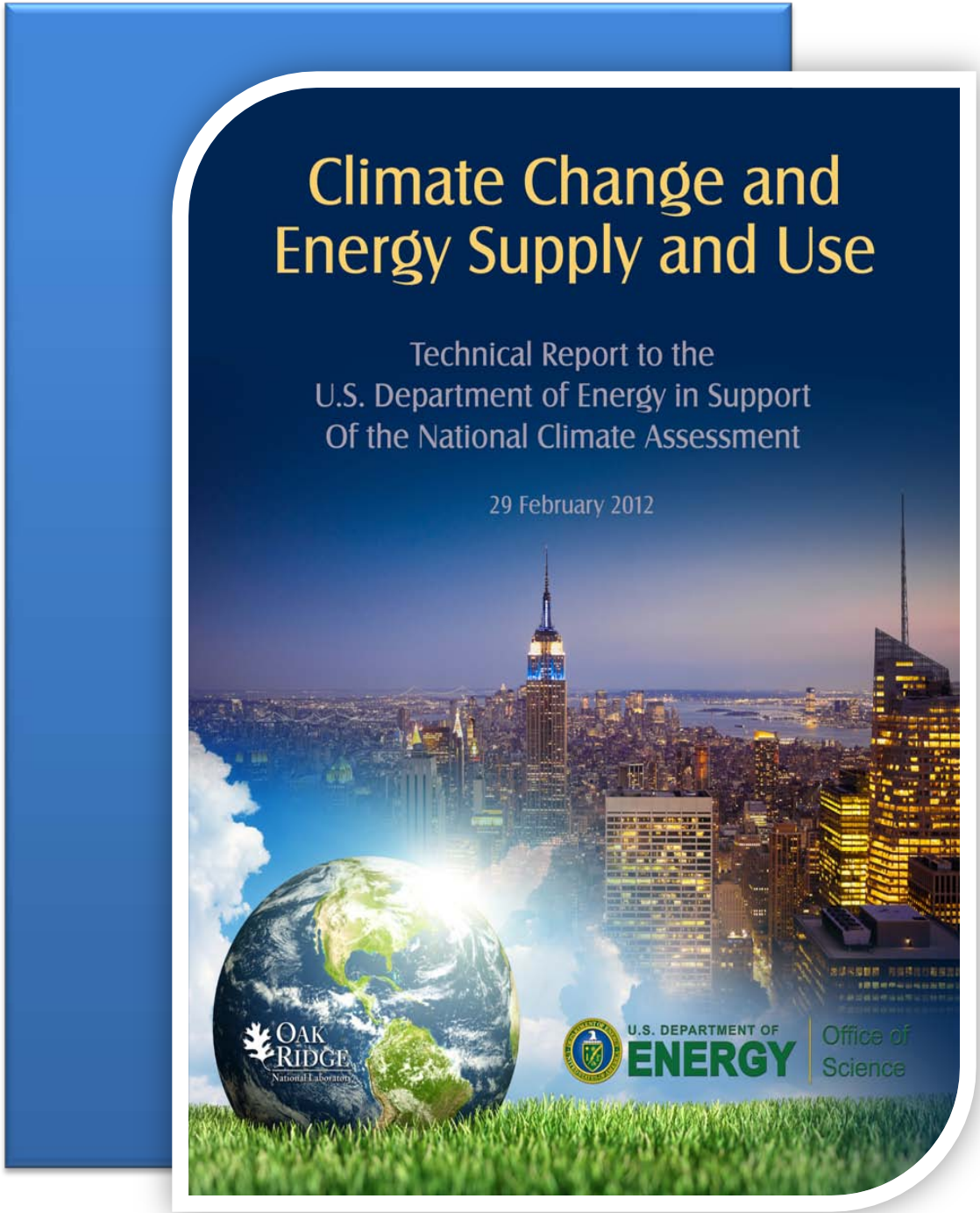
U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY

MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

# Current Federal Government Activities Related To Climate Change Vulnerabilities, Impacts, And Adaptive Responses By The U.S. Energy Sector :

- The third National Climate Assessment (NCA), due to the U.S. Congress in 2013
- A Presidential Executive Order (October 2009) directing federal agencies to evaluate climate change vulnerabilities and risks for their missions and operations: initial assessments and plans due to be submitted in 2012
- The 2012-2021 strategic plan of the US Global Change Research Program, which includes a commitment to advance climate change adaptation and mitigation science


Climate Change and
Energy Supply and Use
Technical Report to the
U.S. Department of Energy in Support
Of the National Climate Assessment
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# CLIMATE CHANGE AND ENERGY SUPPLY AND USE

## Technical Report for the U.S. Department of Energy in Support of the National Climate Assessment


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# About the NCA Energy Report:

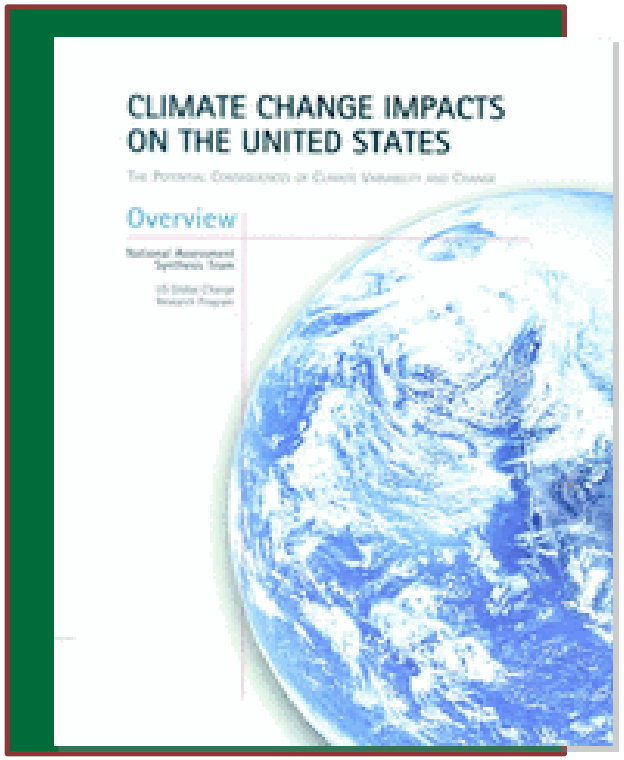
- Includes 20 key findings about implications of climate change for components of the nation's energy supply and use (principal vulnerabilities), risk management strategies (including adaptation approaches), knowledge and research gaps, and developing a broad-based assessment process for the longer term
- Not a "doom and gloom" report: optimistic that, if vulnerabilities are identified and assessed in a continuing process over time, the energy sector can adapt effectively – although the challenges are greater if climate change is severe than if it is moderate
- Calls for developing more effective approaches in the US for discussion, information sharing, and collaborative problem-solving across institutional boundaries, such as private/public sector
- Available to all (URL at the end of the presentation)

# The Current National Climate Assessment Effort Is Part of a Congressionally-mandated Continuing Assessment Process:

- The Global Change Research Act of 1990 calls for a report to the President and the Congress every four years that reports findings of the US Global Change Research Program, analyzes effects of global change on systems of interest, and analyzes current trends in global change
- Full reports have been produced in 2001 and 2009, along with reports along the way on a variety of specific topics

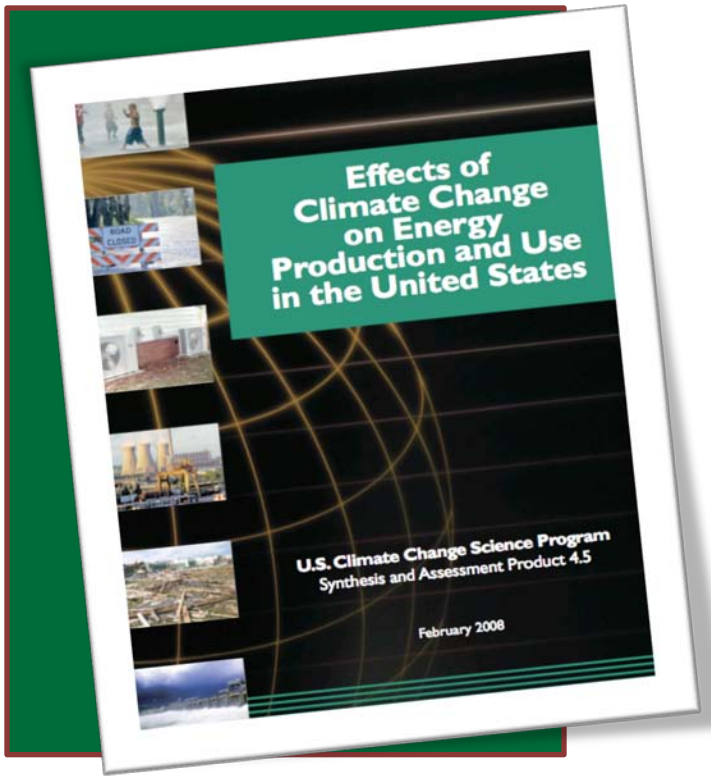
# The First US National Assessment (2001):

- Included five sectoral reports – but not energy
- Included regional reports as well, with one focused on an urban environment: Metropolitan East Coast (New York City area)



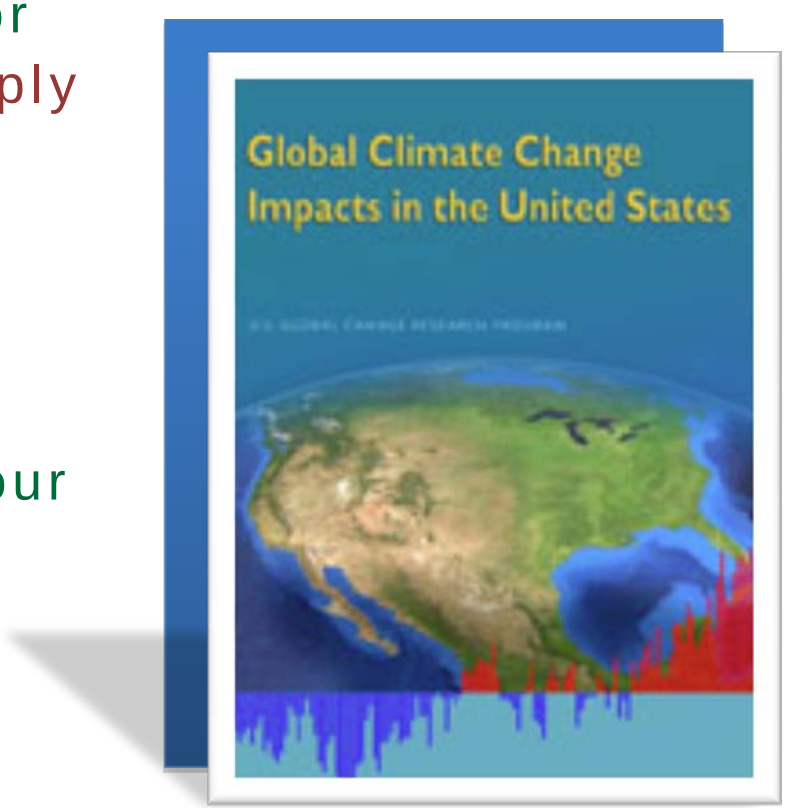
# During the Following Decade, 21 Synthesis and Assessment Products (SAPs) Were Produced, Summarizing Knowledge about Implications of Climate Change:

- Including SAP 4.5 (energy production and use)
- And many others, e.g., 2.1 (GHG scenarios), 2.2 (carbon cycle), 4.1, 4.3 (agriculture, land, water), 4.6 (human health and welfare/human settlements), 4.7 (transportation/Gulf Coast)



# Summarized by US GCRP's *Global Climate Change Impacts in the US* (2009) :

- Sectoral characterizations for water resources, energy supply and use, transportation, agriculture, health, and "society"
- Included as one of four recommendations: "expand our understanding of climate change impacts"



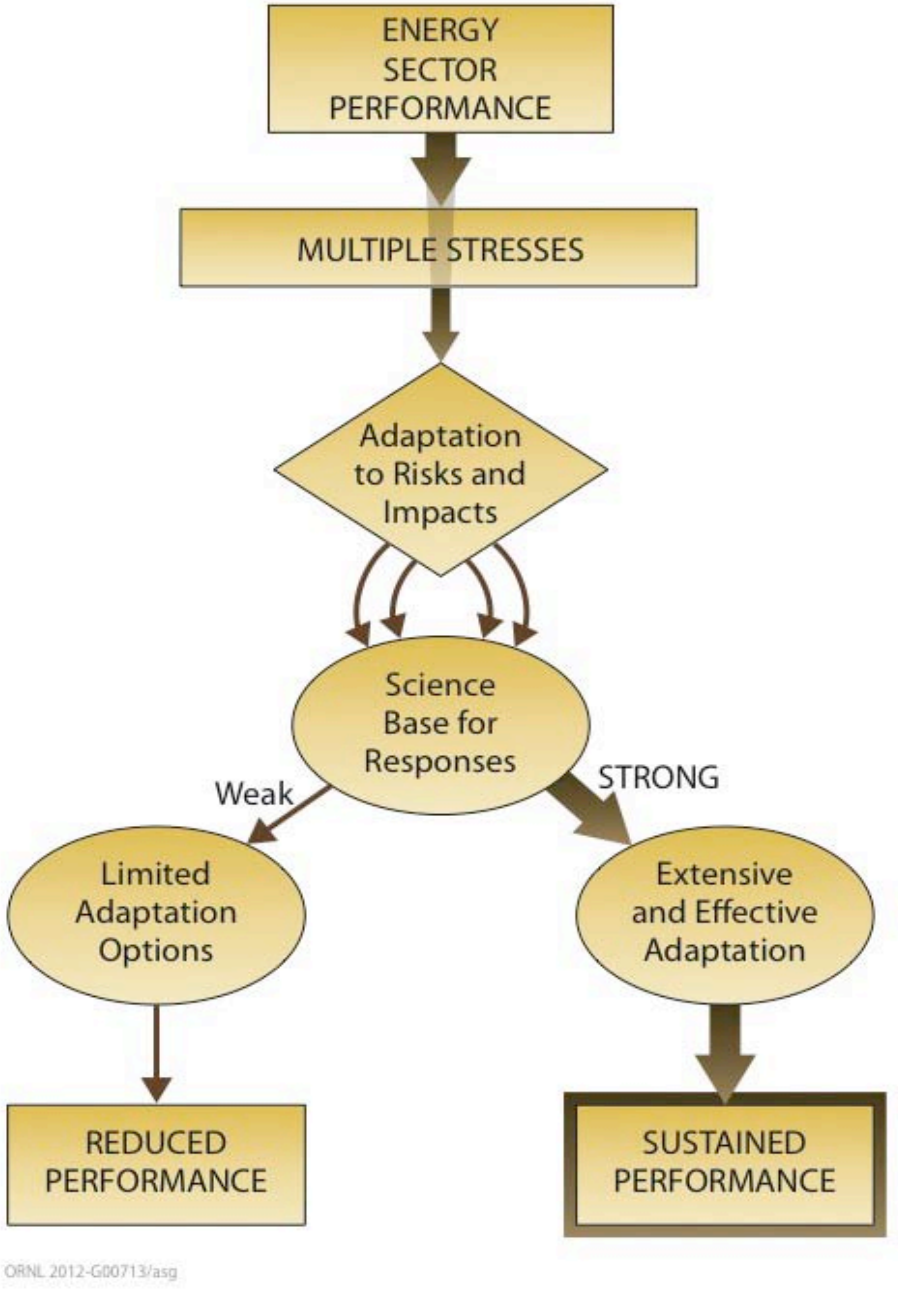
# The 2013 National Climate Assessment Will Include Assessments of:

- Impacts on seven sectors, including energy supply and use (Jan Dell and Sue Tierney, CLAs)
- Impacts on major US regions
- Cross-cutting impacts on sectors, including water/energy/land use
- Knowledge about framing issues, including adaptation, mitigation, and decision support

# The Current National Climate Assessment Effort Includes Both the 2013 Report and Developing a Sustained Long-term Assessment Process:

- 2013 report schedule: first drafts of chapters now being reviewed by experts, full revised draft expected to be made available for public review around the end of the year, final report to be submitted mid to late 2013
- The longer-term process is intended to:
  - Develop continuing interfaces with regional and sectoral experts and stakeholders
  - Improve assessment capacities in order to do better in the future, e.g.: data, indicators of status and progress, scenarios, and scientific foundations for reducing vulnerabilities
  - Timely reports on key vulnerability/impact/adaptation issues

# One Recent Development Is A Move Toward Adaptation Science, as a Stronger Foundation For Adaptation Practice:



# DOE's Office of Science Is Particularly Interested in Strengthening U.S. Energy Sector Resilience through Advances in Climate Adaptation Science:

- Adaptation science is seen as a body of theory, agreements on standards for analysis and treatment of such issues as uncertainty, and time series of fundamental data as a basis for evaluating options, along with a body of fundamental science and technology to enlarge the range of options at all scales and for all parties
- NRC 2010 identifies three categories of adaptation science:
  - Improving capacities for adaptation analysis and assessment
  - Improving the menu of adaptation options and our knwledge of their costs, benefits, potentials, and limits
  - Improving knowledge about how to implement and manage adaptation

# Adaptation Science Initiatives from an Energy Perspective Include a Very Recent DOE Assessment of Climate Adaptation Science and the Energy Sector:

- Including science for analysis and assessment: e.g., understanding feedbacks and tipping points, projecting severe weather events, improving the ability to analyze alternative adaptation strategies, and incorporating adaptive behavior in long-term projections of climate change
- Science to support electricity supply and use: e.g., more efficient and affordable space cooling technologies, advanced approaches for cooling thermal electric power plants that are less water-consumptive, T&D technologies less vulnerable to heat waves, technologies for peak-shaving, potentials for regional intertie capacities and distributed generation, improved options for storage and backup

# Adaptation Science Initiatives from a Sectoral Perspective Include a DOE Assessment of Climate Adaptation Science and the Energy Sector:

- Science to support liquid and gas fuel supply and use: e.g., increasing the resilience of coastal and off-shore production and distribution systems to severe weather events, materials to cope with new operating conditions such as heat and ocean acidification, new and adapted technologies for infrastructure and exploration and production in relatively vulnerable regions such as the Arctic, new technology and policy options for responding to surprises
- Science to support water for energy development: e.g., power plant cooling options for regions vulnerable to water scarcity, water use efficiency improvement, understanding groundwater dynamics and recharge, improved information about water use

# A Particular Interest of the DOE Office of Science Is in Fundamental Science to Support Innovative Technology Adaptation:

- Materials to cope with new operating conditions
- Sensors to monitor physical attributes of the environment and performance of energy technologies and systems
- Novel mathematical and computational approaches for complex system design and operation
- Improved IT systems, including monitoring and control systems to increase information and support flexible responses to disruptive events
- Accelerated development of affordable desaiination as a response to regional water scarcity, especially near coasts

# Interests in Energy Adaptation Science Are Being Supported by a Number of Related National Initiatives, e.g.

- A focus on improving the resilience of national built infrastructures to all hazards through research opportunities and priorities: Infrastructure Subcommittee, Homeland and National Security Committee, OSTP
- An interest on the part of ASCE in rethinking codes and standards for built infrastructure design, construction, and operation
  - To remove assumptions of "stationarity" of climatic and other parameters
  - To encourage flexibility as an objective for infrastructure capital stock

# *Climate Change and Energy Supply and Demand:*

http://www.esd.ornl.gov/eess/NCAEnergySupply.shtml

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