
A Department of Energy Perspective on Water and Energy

Continuous technology innovation can strengthen our capability to meet the Nation's energy demands, and protect and conserve valuable water resources

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September 2009, Salt Lake City, UT*



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Water Resources Crosscuts

Department of Energy Programs

Federal government, and DOE in particular, supports a broad range of energy-water related activities

- Fossil Energy
 - Oil and gas R&D; coal-fired power generation and carbon sequestration R&D
- Energy Efficiency and Renewable Resources
 - Efficiency standards; industrial energy processes, renewable power generation and biofuels R&D
- Science
- Environmental/Legacy Management
- Power Administrations



Oil and Natural Gas Exploration & Production (E&P)

- History of Innovation
 - Smarter, farther, deeper, cleaner
- Advanced Technology
 - More efficient, more effective, more protective of the environment
 - Less waste, fewer emissions, smaller footprint
- New Challenges



Daunting Challenges Demand New Solutions: Oil and Gas E&P

1999

- Market volatility
- Sustaining technology progress
- Minimizing/controlling greenhouse gases
- Responsible development
 - Sustainable
 - Air, Land, Water resources

Now

- Economic uncertainty
- Revolutionary/breakthrough science and technology
- Low carbon energy future
- Energy-Water Nexus
- Produced water treatment/beneficial uses (<20 billion barrels, most injected)
- Resource challenges
 - Mature fields/marginal wells
 - Unconventional oil/gas – hydraulic fracturing and water use/reuse
- Basin-oriented strategies



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Daunting Challenges Demand New Solutions: New Energy Technologies

Now

- Economic uncertainty
- Revolutionary/breakthrough science and technology
- Low carbon energy future
- Responsible development
 - Sustainable
 - Air, Land, Water resources
- Deployment at scale
- Energy-Water Nexus

Water Use Efficiency in Energy Production*

	Gallons per Million BTU	
	Low Range	High Range
Natural Gas	3	N/A
Hydroelectric	20	N/A
Oil Shale	20	50
Coal	41	164
Geothermal	130	N/A
Solar Electric	230	270
Nuclear	2,400	5,800
Biodiesel	14,000	75,000

* Source: Virginia Tech Water Resources Research Center, 2008. Data from US DOE and others.



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Water and Energy

■ *Energy - Water Nexus*

- ❑ Championed by DOE national laboratories
- ❑ *Energy Demands on Water Resources: Report to Congress on Interdependency of Energy and Water* (December 2006)
- ❑ Primary focus on the threat to national energy production resulting from limited water supplies

■ *Energy - Water Roadmap*

- ❑ Pending energy legislation would direct the Secretary of Energy to develop an *Energy-Water Research and Development Roadmap* to define the future efforts necessary to address water-related challenges relating to sustainable energy generation and production
- ❑ Prior efforts to develop a roadmap may not fully reflect a DOE-wide perspective, as energy-water issues and knowledge continue to rapidly evolve in different forums
- ❑ Potential challenges -- Map versus action; script versus enabling principles



DOE Fossil Energy's Evolving Oil and Natural Gas R&D

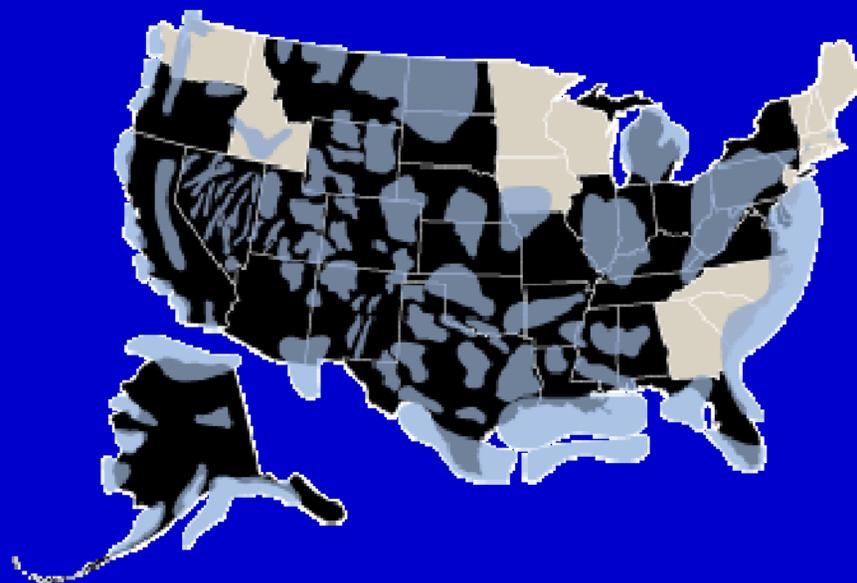
Largely driven by Congressional mandates; strong linkages to energy security, economic prosperity and environmental protection

■ Key Water-Portfolio Highlights *

- Produced water management
- Unconventional oil and natural gas -- Shale gas water resources technologies/hydraulic fracturing
- Decision Tools -- Risk Based Data Management (GWPC)

■ New Water Highlights

- *Basin-oriented strategies* to increase U.S. oil and natural gas supplies consistent with regional economic and environmental goals
- Regional energy-water frameworks?
- Advanced computational technology?



Today, oil and gas is produced in over 30 states. Nearly every region of the country has oil and natural gas potential.



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Building Awareness, Leveraging Resources

Knowledge to solve the Nation's water-energy challenges spans across a wide realm -- industry, inventors/entrepreneurs, universities, national laboratories, States, local government, federal agencies, advocacy groups, and the public.



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Vision for the Future? ... *What's Yours?*

- Continuous technology innovation strengthens our capability to meet the Nation's energy demands, and to protect and conserve valuable water resources
- Energy trends are successively smarter, more efficient, more sustainable
- Awareness of the *Energy-Water Nexus* expands
 - Integrated energy-water planning becomes the norm, rather than the exception
 - Collaboration increases
 - Science and technology increase confidence that above and below ground aspects of energy development and protection of underground sources of groundwater are compatible.
- GWPC Water-Energy Symposium participants contribute to defining a path forward to conserve, protect, make wise use of the Nation's water resources

Enjoy the dialogue!



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