

completing the energy sustainability puzzle



**WATER**

*for*

**ENERGY**

# US Energy Sustainability

A critical piece is missing



# To sustain energy production, we must



- Understand the interdependencies of water-reliant systems and their impact on future energy demand
- Ensure regional water availability
- Balance water demands across all users
- Develop technology to reduce water use, loss, and environmental impact in energy systems



# The solution requires innovative prediction tools and technologies





## Create a suite of decision tools that

- Integrate economic, regulatory, infrastructure, and supply & demand forces
- Forecast water and energy supply and demand on a regional basis
- Predict energy impacts on water quality and quantity
- Identify trouble spots through “what if” scenario analysis



## Develop advanced technologies that

- Provide cooling alternatives
- Desalinate salt water
- Access currently unused water sources
- Generate electricity using less or no water
- Filter and treat energy-related water waste
- Deliver water and energy more efficiently
- Monitor water conditions accurately



## Partner with industry and other stakeholders to

- Verify predictive tools and decision support systems
- Prototype and test technological innovations
- Implement technological solutions rapidly



# This initiative helps complete the energy sustainability puzzle





# The federal government, especially the DOE, must lead the way



*Our overarching mission is national security. . . . Our energy and science programs should be judged by whether they advance this nation's energy — and hence, national — security.*

*— Spencer Abraham,  
Secretary of Energy*

- National security is at stake
- Long-term, high-risk investment without enough profit incentive for industry to take lead
- Requires multidisciplinary scientific and technical expertise

# DOE labs possess the capabilities needed to lead such an initiative



- Coordination and management of large, integrated projects and complex physical systems
- Strong partnership with fossil energy industry
- Technological innovation in advanced energy generation, waste treatment, cooling systems, and geo-engineering
- Advanced simulation and prediction tools for power and hydrologic systems, physical phenomena, and natural resources
- Experimental and computational methods to address model integration, scaling, and non-linear complex systems

# Partnerships are crucial to success of the program



- State and Federal agencies responsible for water, energy, and environmental management
- Universities to perform fundamental research in areas relevant to program
- Industry and consortia involved in production and/or distribution of water and energy



# The Water for Energy Program will help ensure US energy sustainability by



- Creating water/energy decision support tools to aid policy-makers
- Providing well-targeted technological solutions
- Ensuring a stable water resource for energy producers
- Reducing the energy cost of providing clean, affordable water
- Improving the quality of the nation's fresh water supplies
- Alleviating competition between energy producers and other water users





# Water for Energy Workshop

## June 11-12, 2002, Denver, Colorado

- Inaugural Water for Energy stakeholder meeting
- Participants included State and Federal government representatives, the Oil and Gas industry, and Coal Bed Methane producers
- DOE participants included LANL ,NETL, and SNL

# Water for Energy Workshops Overview



- The goal of the Workshops was to solicit input from stakeholders regarding issues and priorities related to water, the interdependencies of water and energy, and the implications for the US from an economic growth and national security standpoint.
- The Water for Energy initiative is designed to closely examine the interdependencies of the relationship between water and energy and to develop the tools, technologies, and partnerships necessary to ensure U.S. energy sustainability.





# Water for Energy Workshop, Denver, CO

## Keynote Speakers



- *Energy Industry Requirements for Water Now and in the Future* Carl Bauer, Associate Director, Coal and Environmental Systems, National Energy Technology Laboratory
- *Water in Oil and Gas Production* Frank Yates, Yates Petroleum
- *Technical Concerns for Water and Energy Production* Pat Brady, Distinguished Staff Member, Geochemistry Research, Sandia National Laboratories
- *Coal Bed Methane Production: Impacts on Energy and Water* Dave Burnett, Piceance Natural Gas
- *Interdependency of Water Supply and Energy Supply* Steve Hall, Executive Director, Association of California Water Agencies



# Water for Energy Workshop, Denver, CO

## Keynote Speakers (cont)



Keynote speakers concurred on several points:

- Affordable reclamation of produced waters in oil, gas, and coal-bed methane extraction is key to future energy sustainability and growth
- Economic impacts of increasing enforcement of Clean Water Act regulations need to be better understood
- Government and industry should collaborate to accelerate technology development and acceptance

# Water for Energy Workshop, Denver, CO

## Strawman Questions



- 1) What are the principal factors affecting the ability of states and regional water entities to provide/obtain adequate water for the energy sector now?
- 2) What are the potential opportunities to increase water availability in the oil and gas industry in the future?
- 3) What are the social, economic, and environmental issues facing state and regional water and energy managers and regulators?





# Water for Energy Workshop, Denver, CO

## Strawman Questions (cont)



- 4) What are the potential future water issues and concerns in the domestic oil and gas industry (viewing entire energy cycle: exploration, extraction, refining, distribution, and use)?
- 5) What areas of research, development, and demonstration are needed to address future water issues, concerns, and opportunities related to energy demands?



# Water for Energy Workshop, Denver, CO

## Results -- Stakeholder Needs



- Coherent, accepted, and validated body of information and data on the relationship between water and energy, and the expertise to synthesize and use this information.
- Ability to predict the economic impacts of regulation and policy both within the industry and among water-use sectors.
- Improved guidelines for water rights, water transfers, and jurisdiction over produced water.

# Water for Energy Workshop, Denver, CO

## Results -- Stakeholder Needs (cont)



- Integrated water & energy physical infrastructure (including co-location of production and use).
- Economically viable technology to treat produced waters.
- Reasonable, science-based standards for produced water quality appropriate for different types of beneficial use.
- Incorporation of market processes into pricing and distribution of water, still balancing market forces with social needs.



# Water for Energy Workshop, Denver, CO

## Results – Priorities & Next Steps



- Participants return to their colleagues and discuss workshop outcomes/issues/goals. Provide team with additional contacts to expand understanding of issues.
- Review state water laws pertaining to energy production, and provide recommendations for legislation and/or policy changes.
- Develop guideline document on appropriate water treatment for Oil and Gas production.
- Inventory treatment technologies available to industry for near-term implementation; prioritize existing technology gaps.



# Water for Energy Workshop, Denver, CO

## Results – Priorities & Next Steps (cont)



- Convene task force to deal with produced water regulations and technologies.
- Initiate demonstration projects in areas of water treatment, co-location, etc.
- Develop mechanisms for industry to get technical assistance, including government-industry partnerships.

# Water for Energy Workshop, Denver, CO

## What Will Success Look Like in ~5 years?



- Broad-based stakeholder (geographic, interests) acceptance of innovative technologies based on pilot demonstrations.
- Early assessment and implementation of technologies that begin to address elements of overall program goals.
- Range of relevant technology options that will result in just and reasonable prices for water & energy in all regions and sectors.

# Water for Energy Workshop, Denver, CO

## What Will Success Look Like? (cont)



- Regulations based on sound science with consideration of economic efficiencies, all stakeholders, and coordination mechanisms.
- Public/private teams to predict trouble spots with enough lead time to develop and implement solutions in policy, water and energy.
- A world in which there is sustainable energy for growing population centers and wise use of natural resources.



# Water for Energy Workshop, Denver, CO

## The Future.....



- Pittsburgh Workshop
- Obtain additional input from State agencies
- Integrate results from all Stakeholders, issue report.
- Support passage of S. 2599
- Form planning and action teams between DOE labs, industry and agencies; issue plan.
- Water for Energy National conference in 2003 to report out long range plans and review progress.