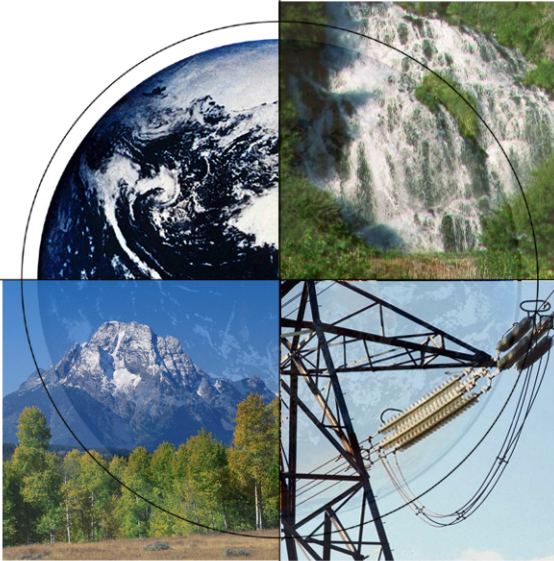


National Energy Technology Laboratory's Water-Energy R&D Activities



LERDWG Meeting

*Washington, DC
February 27, 2003*

Thomas J. Feeley, III
National Energy Technology Laboratory



Presentation Outline

- **Watershed Science & Technology**
- **Oil & Gas/CBM Produced Waters**
- **Carbon sequestration**
- **Electric Utilities & Water**



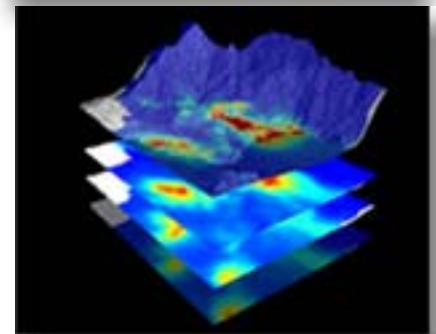
NETL's Watershed Science & Technology Research Activities

- **Remote sensing capabilities:**
 - Thermal infrared
 - Very-low frequency
 - Magnetometry
 - Terrain conductivity
- **Used to survey/map surface and sub-surface ground water sources and point/non-point discharges**
- **Active, passive, and semi-passive treatment technologies**

*NETL
Airborne
Remote
Sensing
Platform*

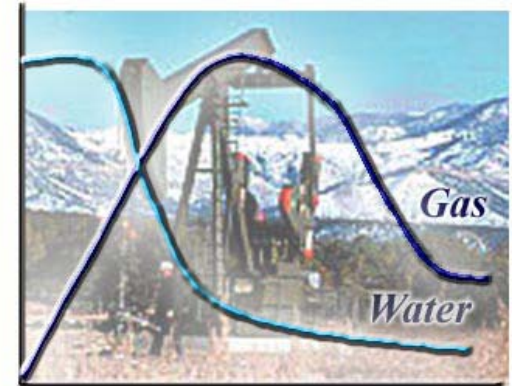
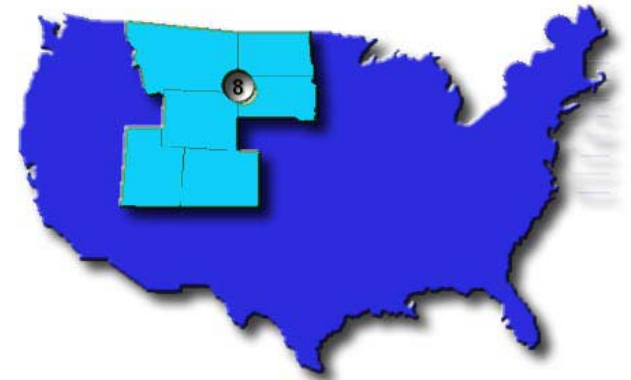


*Conductivity
"Stack" of
Sulfur Bank
Mercury Mine*



Coalbed Methane (CBM)

- **7.5% of total U.S. production**
- **Powder River Basin CBM**
 - 151.2 million Mcf CBM in 2000
 - 337.9 million barrels (14 billion gallons) of produced waters
- **Potential produce water issues**
 - Groundwater and drinking water contamination
 - Stream morphology alteration and sedimentation



NETL's Oil & Gas Research Activities

- Ensure that produced waters do not adversely impact environment and are beneficially used where possible
- Program includes 26 projects in three areas:
 - Water Management Approaches and Analysis
 - Water Management Technologies
 - Coalbed Methane and Produced Waters
- Policy and regulatory impact analysis



Produced water discharged to holding ponds



NETL's Carbon Sequestration Activities

- Partnering with electric-utility industry to reclaim disturbed lands in order to:
 - Capture and store carbon
 - ***Improve surface and groundwater quality***
 - Provide wildlife habitat
 - Increase aesthetic and economic value



***Reclaimed Surface Mine Lands
Can Improve Water Quality***



Three Things Power Plants Require



1) Access to transmission lines



2) Available fuel, e.g., coal or natural gas



3) Water

Power Plants and Water

- **2nd largest user of freshwater in United States**
- **Use 190 billion gal/day**
- **71% of total withdrawals for fossil-fueled power plants**
- **A 500 MW closed-loop plant consumes about 7,000 gal/min, equivalent to 17 Olympic-sized pools of water every day**

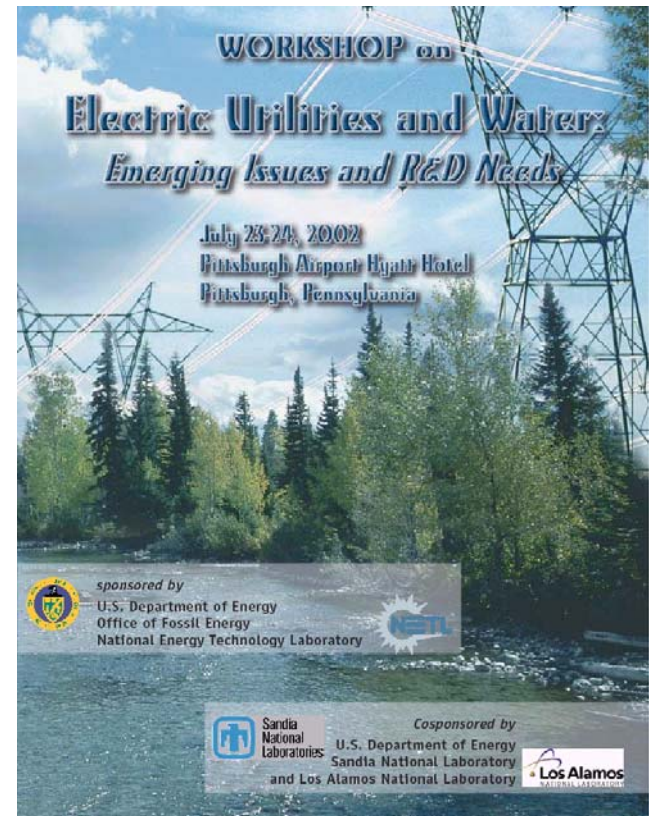


Power Plant Cooling Towers

Source: USGS Circular 1200, 1998

Workshop on Electric Utilities and Water

- July 2002 two-day workshop addressing emerging water/energy R&D needs
- Second in a series of workshops sponsored by NETL, LANL, and Sandia
- Meeting of government, utility industry, academia, and regulatory representatives



Key Issues Identified at Workshop

- **Advanced cooling systems**

- cost effectiveness
- reliability
- efficiency

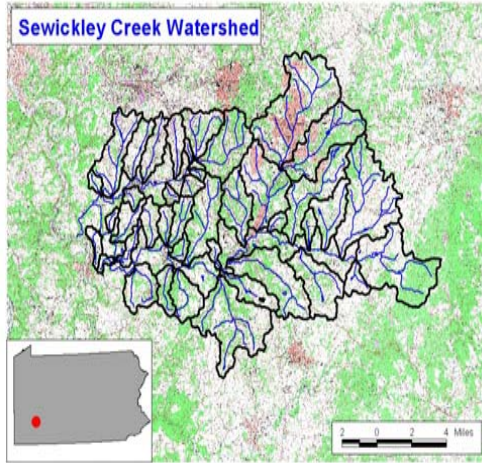


- **Alternative (non-traditional) water sources**

characterization of source:

- availability
- suitability
- long-term water quality variability

Key Issues Identified at Workshop



- **Regulatory issues**
 - 316(b) regulations
 - future regulatory uncertainty
 - trading program and water credits
 - impact of non-point source and atmospheric deposition on water quality

- **R&D Needs and Opportunities**

- systems studies profiling water demands, alternative sources, and cooling requirements
- treatment technologies for trace level contaminants
- better watershed characterization technologies

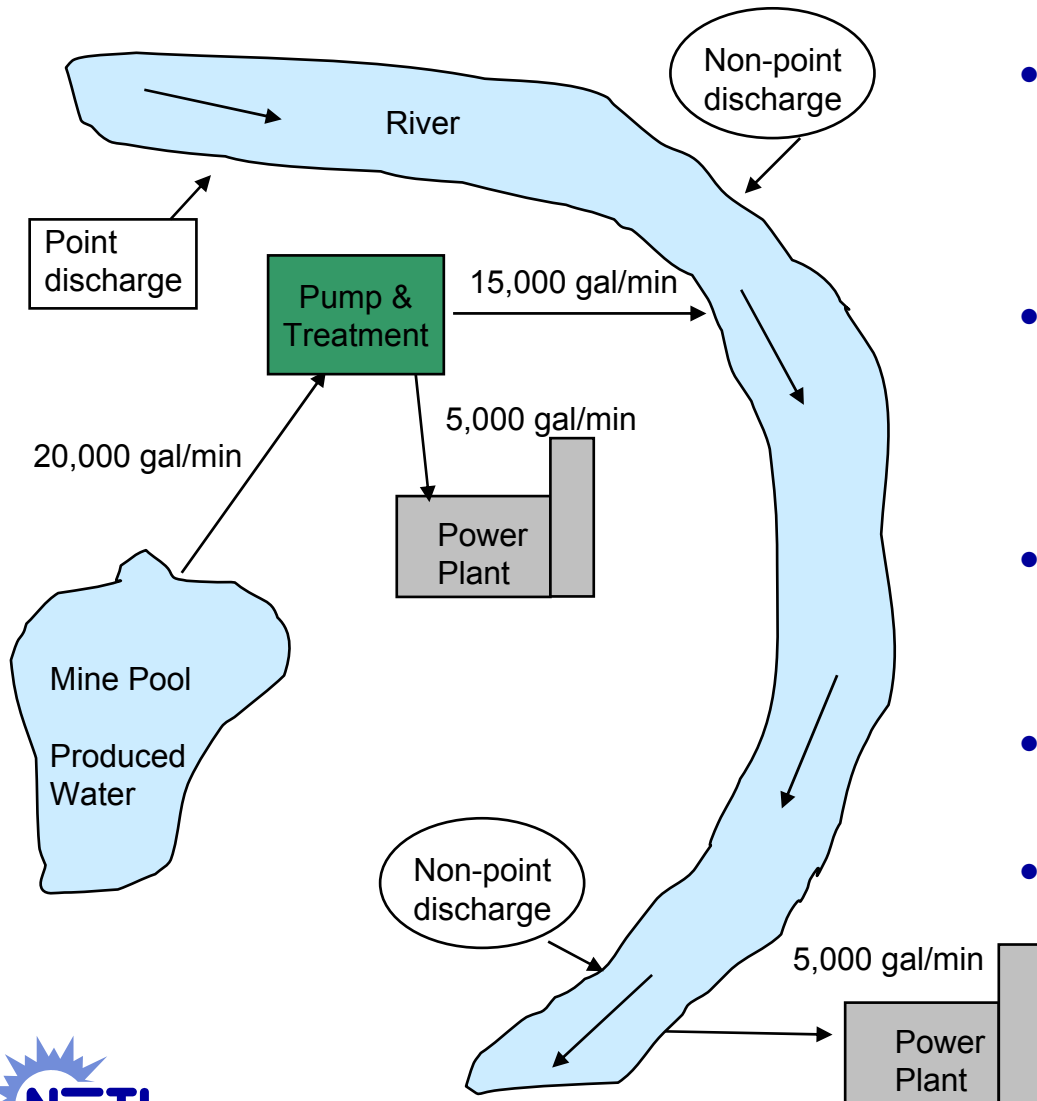


“Innovative Water Management Technologies and Concepts for Coal-Fired Electric Utility Boilers”

- **Targeted competitive solicitation closed February 14, 2003**
- **Four topic areas:**
 - Non-Traditional Sources of Process and Cooling Water
 - Innovative Cooling Technology
 - Advanced Cooling Water Intake Technology
 - Advanced Pollutant Measurement and Treatment Technology



Using Non-Traditional Waters for Power Plants



- Provide cooling makeup water for adjacent and downstream power plants
- Provide water to river during low flow to benefit in-stream use and biological systems
- Dilute unregulated point and non-point pollution discharges
- Control mine flooding
- Improve quality of mine pool/CBM produce waters

NETL's Water & Electric Utilities R&D Program



- Innovative water management concepts and technologies
- Regulatory and policy analysis
- Atmospheric transport and deposition of pollutants (e.g., mercury)
- Mine land reclamation and water quality improvements
- Water-quality trading