

Row 1, Extraction

- Mix of energy production going to unconventional methods
  - Causing different kinds of water production; different quantities/qualities
  - No place to put this water
  - Legal problems
  - Different treatment requirements
  - Unclear who owns water (4 votes)
  - Requiring more/greater well density
  - Disconnect in formulating water policies (6 votes)
  - Water purveyors do not want this kind of water
- Utilities not interested in water from short-term kinds of production sites (not reliable supply)
- Not cost effective to build a facility to treat it
- Plumbing system (infrastructure) needed to move water around (5 votes)
- 15-40 cents/bbl to treat water in Powder River region
- Problems are dependent on location
- Energy water production (oil and gas wells) impact directly drinking water supplies (7 votes)

Row 2, Fuel Production

- Want potable water back-up even when they use recycled water
- In opening ethanol plants—direct competition for biofuels (feedstock comes from Midwest, water local)—competing with ag use of water
- Cause for “Delta Smelt” decline. Water coming into power plant from river.
- Temperature of discharge and timing (1 vote)
- Competing uses of water—water flowing to highest dollar (6 votes)
- Economics drive all decisions (7 votes)
- Depends on location—each state has different laws pertaining to water
- Water issues are specific to individual watersheds (5 votes)
  - All watersheds are fully appropriated or over-appropriated. (2 votes)
- Water quality/quantity as associated with oil shale
- Lack of adjudication of groundwater (2 votes)

Row 3, Electricity Production

- Retrofits on dams difficult to do (trying to protect fish pop).
- Hydro will not be a significant contributor to power in the future
- What is the location of sustainable water supply (2 votes)
- Electric power companies put up barriers for individual water purveyors to produce their own power (3 votes)
- Fish regulations/environmental concerns (2 votes?)
- Water quality/quantity concerns (9 votes)
- Local communities fight the construction of new power generation plants—leverage water issues
- Also construction of transmission lines

- Lots of plants are pushed to use reclaimed waters—quantity and quality of water becomes an issue (5 votes)
- Cycle of reclaimed water causes problems due to unavailability during peak times
- Salt accumulation is a concern (2 votes)
- Lack of infrastructure (incl. transmission lines) where there's going to be demand (5 votes)
- Trans-boundary problems due to use of US water by other countries
- Environmental impact of cooling water discharge—especially the more times you cycle (2 votes)

#### Row 4, Renewables

- For bio-fuels production—using water that's not a renewable
- Dependent on weather, water, etc.—high risk venture (1 vote)
- Climate change impacting water availability and timing (6 votes)
- Geothermal: traditionally uses recycled water—going to a new method that requires more water and infrastructure
- Depending on how we obtain hydrogen determines on how much water is required—“How we split the atom.” (1 vote)
- For many renewables—there are no water problems; however, backup may require water
- Reliability of alternate sources?
- Water quality (1 vote)

Row 6, Urban Uses, Surface water

- Urban water runoff = urban soup
- Disposal of storm water (1 vote)
  - Millions of dollars spent on disposal via drainage systems
- Definition of surface water varies from state-to-state, agency-to-agency, also regulatory guidelines
- Water is priced as cost of service vs value derived from it. Counter to conservation (no incentive) (9 votes)
- Not much surface water that can be called on to meet future demand
- Surface is not being captured and stored (2 votes)
- Rapidly increasing demand for water (4 votes)
- Relationship between surface and groundwater is ignored (4 votes)
- Growing constraints on surface water use due to f&w need (ESA)
- Increasingly stringent regulation due public health concerns—impacts source or water and quality (1 vote)
- Secondary pollution (2 votes)
- Industry specific variances for water quality compliance

Row 6, Urban Uses, Groundwater

- Unregulated withdrawals (2 votes)
  - Underground injection controls not enforced
- Lack of enforcement of controls (3 votes)
- Land subsidence
- Lack of resource definition—lack of what “groundwater” is
- Growing reliance on groundwater for water supply and shrinking supply (groundwater mining) (10 votes)
- Elevated salinity issues (1 vote)
- Emerging contaminants
- Paving over recharged areas (2 votes)
- Increasing cost in obtaining water for muni supply because of competing resources and lifting costs (1 vote)

Row 6, Urban Uses, Econ Development

- Privatization of water sources (rights)
- Limited water leads to limited growth leads to limited bond ratings
- Regulations prohibit conservation—reuse
- Injustice claimed when out of region water transfers occur—impact on region, cost, etc. not considered or fair value not obtained
  - Third party impacts not considered
- Inter-basin transfers don’t take into consideration impact on third parties, environment, etc. (4 votes)
- Unreliable water supplies—need to guarantee water supplies in urban areas (1 vote)

Row 6, Urban Uses, Environment

- Maintenance of protected habitats
- Lack of inspection re: regulatory compliance (2 votes)
- Inefficient muni system—lots of leaks = wasted water; resulting in water quality problems (3 votes)
- Aging infrastructure (3 votes)
- Lack of understanding of true environmental impact and being able to assign an economic value to them (1 vote)
- Need for source water protection (1 vote)
- Lack of resources to carry out the guidelines

Row 7, Agricultural Uses, Surface water

- Ag is exempt from many regulations and take advantage of that (2 votes)
- Non-point source pollution
- Ag water prices so artificially undervalued—that impacts “value of water” (4 votes)
- Alteration of drainage networks and construction of riparian areas
- Use higher quality supplies of water vs other qualities plus are major polluters of water (2 votes)
- Ag controls most of water rights or have senior water rights (1 vote)
- Right water abuses—illegal diversion of surface water (1 vote)

Row 7, Agricultural Uses, Groundwater

- Ditto same points as surface water and urban groundwater (may vary in some locations)

Row 7, Agricultural Uses, Econ Development

- Ag controls most water rights
- Negative impact on ag communities when urban communities take over (6 votes)

Row 7, Agricultural Uses, Environment

- Point and nonpoint source pollution
- Contribute to the recharge of local aquifers (2 votes)
- Overgrazing that leads to erosion
- Participate in habitat protection programs on voluntary basis
- Alters water balance in most locations (1 vote)
- Alters streamflows—habitats, riparian areas, dewater stream flows (1 vote)

Row 8/9, Energy Production, Surface water

- Larger hydro alters natural flow of the river
- Disconnect between peak need and flow (1 vote)
- Competitor for water
- Perceived potential polluter
- Quality of produced water discharge (1 vote)
- Confusing regulations re: produced water
- Energy producers/suppliers not plugged into land use decisions (1 vote)

- Increases salinity in local watershed (2 votes)

Row 8/9, Energy Production, Groundwater

- Ditto, same as energy-surface water (1 vote)
- Reduced water supply permanently (1 vote)
- Uncertainty about amount of groundwater available to us (9 votes)
- Difficulty defining impact when we haven't/can't define the resource

Row 8/9, Energy Production, Econ Development

- Energy production systems use a lot of water

Row 10, Environment and Rec Use, Surface and Groundwater

- Sport fisheries decline (1 vote)
- Not enough water for rafting
- Timing of streamflows
- Impact of temperature changes on swimming, fisheries, and basic species caused by diversions

Row 10, Environment and Rec Use, Econ Dev

- Competing uses of water (1 vote)
- Env. Regulations make it more difficult to construct a power plant

### Priority Energy Problems

- Water quantity and quality concerns
  - Electric power generation
  - Extraction
  - Fuel production
  - Back up for renewables?
  - Recycled water users
  - Specific concerns
    - Salinity
    - Temperature
    - Chemical composition (organic and inorganic)
    - Quantity issue/quantity constraints
- Competing uses of water
  - Water flowing to highest dollar
- Water pricing is independent of any intrinsic value
  - Water is unevenly subsidized
  - Who owns the water
- Produced water (in relation to extracted water) is not included in water resource allocations
- Lack of coordination and planning
  - Lack of infrastructure where there's demand
  - Don't have modern conveyance system to transport water
  - Don't have the legal structure

### Priority Water Problems

- Growing reliance on groundwater supply
  - Shrinking supply
  - Uncertainty about quantity
  - Lack of regulation enforcement and controls
  - Link to surface water
  - Paving over recharged areas
- Water pricing is independent of an intrinsic value
  - No incentive for conservation
  - Ag water is subsidized
- Inadequate infrastructure (at all scales)
  - Aging
  - Leaking muni systems
  - Increased demand for water generates demand for improved infrastructure
- Climate change impacting water availability and timing
- Source and receiving water protection from point and nonpoint source pollution

### Priority Energy Problem: Energy, Water Quantity and Quality

- NEED: Better assessment of water resources
- NEED: Comprehensive information system including data and maps covering energy systems, water resources, water ownership, controls or rivers, habitats

- NEED: Funding for data gathering/collection and management in accessible form by region or state
- NEED: Integrated assessment of interaction between water and energy
- NEED: Timely development and funding of the system and collection and assessment of the data
- NEED: Better documentation on water ownership and how much
- NEED: Develop technologies for more efficient water use in energy producing industries including renewables
- NEED: Reduce water intensity of energy producing industries
- NEED: Identify incentive-based best practices
- NEED: Need incentive for energy producing industries to decrease their consumption of water/improve efficiency
- NEED: Develop materials and equipment that allow companies to use lower quality water for industrial purposes

Priority Energy Problem: Competing Uses of Water and Water Pricing

- NEED: Be able to identify uses of water vs value of water
- NEED: Mechanisms to facilitate redistribution of water
- NEED: To understand impact of water cost on energy price
- NEED: Incentives for water agencies to reduce energy consumption in production of water
- NEED: To include the ag community in solving the problem

Priority Energy Problem: Lack of Coordination and Planning

- NEED: Coordination and planning of water and energy production and use
  - Energy facility siting (5-10 yr in advance)
  - Integrated assessment (see pg 19) including conveyance
  - Best practices for legal requirements for coordination and planning
  - Conveyance systems for energy and water
  - Coordinate any best practices for energy with new best practices for water
  - Better coordination among major players in water and energy research (AWWA, EPRI, etc.)

Priority Water Problem: Growing Reliance on Groundwater

- NEED: Need for awareness of importance of maintaining water recharge
- NEED: Identify and map recharge areas
- NEED: Land use planning to consider areas of recharge
- NEED: Identify potential water resources that we might not be using
- NEED: More technologies for recharge and recovery
- NEED: Identify potential conservation in various sectors
- NEED: Understand the potential to reduce water consumption in the various sectors
- NEED: Education of the public of water cycle and groundwater's role in it

Water Problem

1. Understand how to manage limited groundwater
2. Water pricing is independent
  - a. Need for advancing water conserving technologies for ag/urban/etc.
3. Inadequate infrastructure
  - a. Need regional inventory (look at current studies)
  - b. Need to take regional or national approach in planning the fix (include energy-water interactions)
  - c. Prioritize infrastructure needs based on areas that have a national interest
  - d. Prioritize the opportunities to increase water efficiencies (throughout entire system)
4. Climate change
  - a. Understand and project potential impacts of climate change on water supplies
  - b. Adaptive management and planning and mitigation
  - c. Identify water infrastructure needed under climate change scenarios
5. Source and Rec
  - a. Need regulatory process to be streamlined so that regulations are implemented and enforced in timely manner
  - b. Need an informed public regarding energy-water link and water overall
  - c. Need science to establish water quality standards

#### Needs

- Comprehensive information
- Strategies for optimizing use/resources
- Planning and coordination

#### Solutions

- Comprehensive information
  - DOE should develop and maintain a comprehensive information system that includes, but is not limited to,
    - Existing energy and water databases
    - Validation of data
    - Water ownership
    - Confidence levels of data
    - Groundwater availability and streamflow
    - Superfund sites
    - Brownfields
    - Landfill locations
    - Inventory of produced waters from energy production
    - Point source permits
    - Power grids; source of fuel
- DOE should fund cast studies/pilot projects that demonstrate multiple benefits
  - Sector-based progs include. Food, hospital, commercial, industrial with demonstrated water and energy savings
  - Cooling tower retrofits
  - Collocation of power generation/water reuse or treatment

- Innovation legal/policy initiatives
- Integrated planning and management
- New generation technologies involving water efficiency as a driver
- Strategies for optimizing use of resources
  - Promote findings of pilot programs
  - Deployment of successful technologies coming from pilot projects
  - Public education and outreach
  - Integrated regional models
  - Value priced water incl. appropriate rate structures
  - Conservation promoting price structure
  - Review and reorg of water subsidies
  - Use of produced waters from energy production
  - Modernize and implement standards and regs (i.e., leak detection, water quality, facility siting regs)
  - Promote conjunctive use surface and groundwater
  - Climate studies
- Planning and coordination
  - Develop a process for working together on regional projects, including
    - Research community/entities
    - Local governments and leaders
    - State agencies
    - Private water companies
    - Energy producers
    - Investor-owned coops and muni/tribal electric utilities
    - Stakeholders
  - Develop an integrated assessment that includes needs and prioritization framework for the assessment
  - Use integrated assessments in guiding facility sitings
  - Incorporate future supply and demand in water and energy resources under different risk scenarios (drought, climate change, pop growth)

#### Parking lot

- Security of water distribution systems