

**Energy Water Nexus
Eastern Workshop
Group C**

Day 1 – Session 1 -

Problem Areas - Energy Supply

Chansler, James	- Jacksonville Electric	xClark, William	- AMWA
Stokes, Gerry	- Batelle	Erback, Don	- USDA/ARS
Hatcher, Caterina	- EPA Region II	xStevens, Jack	- DOI
Reismann, Ann	- BNL	xPikus, Irv	- Univ. of Virginia
xMiner-Nordstrom, Laura	- DOE/EE	xDemakos, Peter	- Niagra Blower Co.
xTaylor, Roger	- NREL	xRiding, M.Q.	- Connectiv Energy
xScholze, Richard	- Corps of Engineers	xLinky, Ed	- EPA Region II
xMike Hightower	- SNL	xHarris, Mary	- SRNL

Problem Areas Water for Energy Supply

Extraction

- New oil and gas drilling in Pennsylvania – creating produced water, treatment needs, application of water, and environmental impacts
- Coal slag – groundwater and surface water contamination problems
- Coal mine- acid mine drainage environmental issues
- If you use this water for cooling, may be air emissions issues on how you use
 - PM 10 issues with evaporation drift, limitations on contaminants that might be in the water
 - Impacts downstream municipalities water treatment costs and water utilization
- Problems in Ohio, Penn, maybe Alabama
- Near term cost issues – concerns will stay the same, politics may get worse
- CBM produced waters in Alabama, Kentucky
 - CBM water has higher TDS, is an environmental contaminant, might need to be treated for beneficial use for ag or other applications
 - Likely to increase with time due to demand of energy resources
 - Lots of coal in the east and will probably be utilized

Fuel Production and Refining

- Some refineries started in ND for oil sands from Canada
 - Mined like coal, needs lots of water and energy- cooling, processing
 - Oil comes in a pipeline and preworked in Canada
- Several refineries planned for Indian Reservations
 - Need water
 - Refineries could impact groundwater
- Transportation of fuels
 - Spills on water can cause shutdown of electric power plant
 - Security issue of intentional spill to shut down power plants
 - Unintended consequences – plus seem to be getting worse

- Plant loop contamination problems
 - Contamination of cooling water in plant requires treatment or
- Biofuels will require more water and is considered growing
 - More crops being used for fuel
 - May be a big issue in the east
 - Issue of energy vs. food
 - Fertilizer for crops uses fossil fuels
- Existing refinery issues does not seem to be a problem

Electricity Production

- Connecticut does not see a problem currently in East Penn, Jersey, Mass (East PJM) power goes to NY
 - Added reservoir to increase water availability
 - Some issues with drought, but not much of a problem
 - Expect industrial use of water to be a lower tier, so authorities will reduce water availability in Mid Atlantic for power to provide to domestic uses
- New plants that reduce water use are cost effective for utilities
- Older plants are being shut down – generally coal fired, being replaced by combined cycle gas turbines
 - Will cost of gas cause return to coal
 - Higher water demand for coal plants
- Seeing movement for new coal plants that use more water
 - Must address water needs or improve water use efficiency
 - Takes 6-10 years to get permits so will be a 5-10 year problem
- Seeing new movement for nuclear power, that uses most water
 - Will need to improve water use efficiency
- Water quality issues of electricity production
 - Thermal pollution,
 - Air quality issues on water – mercury considerations,
 - All along east coast
 - Power plant waste impacts on water quality
- Instream flow requirements – not a big issue

Renewable Sources

Other

- Wind not being considered offshore because of political and aesthetic issues
 - Also lack of access transmission
- Geothermal and solar concentrating still require condensing water for steam
 - Trying to use geothermal brine for condensing
 - Corrosion issues are a problem if open loop
- Biomass as transportation fuels
 - Takes lots of water for biorefining and irrigation for crops, but might not be as susceptible
 - Need to get efficiency in cellulose

- Low head hydro may be an opportunity
 - May be a large resource – issues with permitting of dams, environmental issues, economies of scale
 - Changes in PURPA – 1978, does incentivize small producers
 - Regulated utilities have no financial incentives to take power from small systems – transmission study, access requirements,
 - Land use issues
- Conventional hydro
 - Ownership of water and control of water behind dams is an issue
 - Endangered species impacts on management
- Hydrogen
 - At current time problems with fossil fuels are the same with hydrogen since hydrogen is now made from fossil fuels
 - Wind being considered to create hydrogen from water –
 - What are water needs for a hydrogen economy
- Synfuels
 - Strategic study by utilities already seeing investment –
 - Need for fuel security is driving synfuels consideration
 - Possible cyanide issues
- Biogas
 - Chick manure use – problems with chemical constituents and dewatering
 - May be better at smaller scale – requires more and would be a competing demand
 - Utilities have question of availability of supply
- Ground source geothermal
 - No demand for water, but being close to groundwater helps significantly in ability to use
 - Corrosion is an issue if not closed loop

Problems:

- Investment in or need to create new analytic tools to be able to evaluate these interdependencies
 - Lack of analytic framework to evaluate this
 - Risks need to be considered – security, economic, health, safety, risk of inaction

Ranking

**Energy Water Nexus
East Workshop
Group C**

**Day 1 – Session 2 -
Problem Areas - Water Supply Impacts**

Chansler, James	- Jacksonville Electric	xClark, William	- AMWA
Stokes, Gerry	- Batelle	Erback, Don	- USDA/ARS
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Urban

- Infrastructure improvement needs
 - Spending money for repair rather than improvements
 - Contribute to water quality – leaks in sewer will impact water quality
 - Loss of water is in the 10-20% loss, big cities lose even more which causes large need for extra pumping and treatment
- Backup power for water treatment and distribution have only about 48 hours supply, need better backup or redundant energy supply
 - Big issues for widespread disasters, i.e. Katrina
 - Need better preplanning
- Water quality issues
 - Under Ground storage tanks contamination,
 - Use of contaminated water for several applications have issue, fire fighting,
 - Water treatment will need to be improved – Crypto is a driver, stage two disinfection byproducts rule, will require new monitoring and treatment technologies that will use more energy
 - New monitoring technologies needed for real-time, cost effective, contaminant specific
- Land use and urban sprawl could lead to degradation of water supply
- Saltwater intrusion on water quality – seeing it in groundwater AND surface water impoundments, mostly in SE
- Wastewater impacts on surface water – as expanding growth may have bigger impact on surface water quality
 - Storms force wastewater plant to not be able to discharge – has occurred several times in the past
- Cost of water for fresh water is driving cities to go to desal
 - Security directions from EPA is probably going to raise costs of water, specifically better technologies for treatment – may be
 - Competing demands from other sectors are driving costs

- Some competing demands but battles for water going on - very localized up to regional or water shed issue

Energy Production and Generation Impacts on water

- Mercury from coal is a problem – need methods to stop mercury contamination
 - Better scrubber technology
 - Need 50 Mw scale of testing of new technology to get good scale of data
 - Would
- Contamination of cooling waters
- Thermal contamination of water
 - Impacts on biota
 - During droughts tuff to meet discharge standards
 - Negotiate standards – becoming bigger issue as states are trying to reduce thermal – but science reasons may be missing
- Acid Rain – Sox and Nox
 - Still a problem, especially far northeast
 - Major ecological problem
- Air emissions cause problems that need to be addressed nationally
- Trade off of thermal contamination vs. consumption
 - Once through cooling being discouraged
 - Going to evaporative vs. dry
 - Dry cooling not high on priority list - especially in areas with ok water
 - Going to the most cost effective approach – permitting, siting, technology
- Wastewater effluent for cooling
 - Treatment is required
 - Generally get secondary quality and treat to tertiary standards
 - Being commonly considered where appropriate
- Disposal and treatment of plant discharge
 - Some plants have Zero discharge – all water evaporated
- Expensive to run
- Sea water use in cooling
 - Big issue on the Gulf Cost where fresh water is not available
 - Need new materials that will not corrode – industry leading this

Recreation & Societal Use

- Water being impacted for swimmable, fishable
- Recreation contamination of water
- Retro movement,
- Aesthetics, accustomed to use
- View shed, has been somewhat quantified-needs more ability to quantify
- Ocean policy
- Security has impacted recreational use of dams and infrastructure

Environmental Management

- Competition for water from industry during drought
- Industrial ecology – closing the loop
 - Industrial corridor good idea
 - Industrial corridor bad connotation, need better communication
 - Need better regulations to help that

Economic Development

- Regulations may drive development

Ag

- Runoff issues with livestock, ag
 - Nonpoint source pollution needs to be addressed – manure, pesticides, fertilizer, etc.
 - Widespread across area, water shed specific
 - Causes eutrophication of lakes and streams
 - Regulation change and practices vary by state and regions within states
 - Accentuates already occurring problems, adds to contamination i.e crypto from Ag causing new problems.
 - Impacts both surface water and ground water – groundwater contamination generally localized
 - Bacteria not as much a problem, other contaminants move further
- Water availability
 - Irrigation is localized – but some areas are having problems with ground water declines
 - Energy costs are impacting irrigation and water pumping

EWN Needs Assessment Workshop
Eastern Workshop
Sessions 3 and 4

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xEarl Green	- USGS		

Group C – Session 3 - Needs

Problem: Lack of renewable energy for generation

Needs: Incentives – stable tax policy (production tax credits 10 yr min, accelerated depreciation)

Develop loan guarantee program – based on proposals - externalities are a public benefit, security, reliability – would need way to evaluate proposals from a technical basis, collect technical cost and performance data

Siting for wind and other – streamline permitting process
Baseline ecological surveys - Migratory birds, bats,
Baseline impacts – environmental, biological impacts

Distributed generation
needs to be incentivized (cash incentives),
grid management and control

Off shore wind – Grid integration, cost effective platforms

Biomass

Gasification - (50kw-50Mw) – reduce production and delivery issues and costs, stability and controls, process that can handle variability in feedstocks,

Liquefaction – assess evaluation of net energy control of ethanol,
Cellulose biological conversion – still needs R&D and incentives
for first demo plant, water demand for production and refining

Pyrolysis – lots of new technology needs

Evaluate limitations on energy crops – long term research

Understanding of biomass impacts on water quantity and quality

Low head hydro – Not sure of technical issues, more streamlined regulatory issues, Incentives, develop baseline ecological data

Solar – probably as a distributed resource probably in SE. Solar water heating become more economical as oil and gas go up.

Problem: Refineries

Incentives – stable tax policy (production tax credits 10 yr min, accelerated depreciation)

Streamline permitting process

Baseline ecological surveys - Migratory birds, bats,

Baseline impacts – environmental, biological impacts

Need more pipelines with improved capability

Improve refining process – use less space, less water, less emissions

Look at incentives to look at industrial ecology, i.e. loan guarantee program that encourages this

Need: Transmission

Need large-scale grid upgrades,

National grid – on a regional scale – at a larger size, through improved efficiency

Vehicle to the grid- power control, and power quality (smaller pilot in near term)

Need: Energy Impacts on Environment

Air emissions on water from power plants

CO₂ – move to renewables – carbon tax, CO₂ removal tax credits

Technology for carbon sequestration new power plant designs

Power plants sited with oil refinery to reduce CO₂

CO₂ scrubber technologies

Ways to retrofit coal plants cost effectively

Clean coal – reduces Nox, Sox

Better scrubbers

Assess better understanding of mercury contamination – better mercury removal scrubbers, understanding of how bad mercury really is

Perchlorate problems

MTBE – needs improvement in treating

Need understanding of biomass uses on water quality -near term understanding of problem areas

Need more research on fate and transport issues – to look at unintended consequences

Nuclear contamination issues on groundwater – long term impacts, lots of science and technology concerns

Long Term Energy Needs:

Need to move to scale up to make U.S. self sufficient –

Can we scale up to this liquid fuel demand –

Select a fuel that can meet the supply needed without much impact on other sectors

Consider level of impact on water

System level, integrated evaluation of all energy systems

Hydrogen is an example of where this needs to be considered

Hydrogen processing is a bigger issue

Wind long term-

Trying to move to 6%, actually could go higher levels in certain regions

Identify limits of renewables, what might be doable by region,

Energy Use and production inefficiencies

Identify limits to energy conservation and levels of improvement,

should focus on demand side, increase transportation CAFÉ standards

Long term incentives for energy efficiency

Compare use of renewables with nuclear

Near term water problems:

Infrastructure issues:

Online, realtime sensors for contaminants, rad,

Large systems have money to do this, but small systems have no resources

Need to reduce leaks to reduce cost of energy to pump and reduce water

Competing demands

Better understanding of competing demands, GIS based regional analysis of water and energy issues, regional energy flows and water flows, water supply data by states available but data has wide data variation,

Increase water use efficiency with water storage, improve soil quality improve porosity and to reduce need for irrigation, Do this on a watershed basis depending on water use intensity, Sustainable Water Resources Roundtable interaction,

Regional groundwater impacts

Promote energy and water efficiency use in agriculture – some projects ongoing

Domestic demands are significantly increasing, percapita demand going down, but population still going up,

Virginia down to Florida have supply issues – issues of three main users, municipal industrial, ag, and power

Regs are driving more energy use – reuse will go up

Probably 10% for treatment – 10% to 20%, another 10-20% with reuse

Need better research to see how energy use in plants will change with new costs

Also gives opportunities to synergies of backup power being used to support the grid, also load management and energy optimization opportunities

Hydro power

No incentives to conserve in TVA, need incentives to conserve

Diversions from rivers are causing problems of withdrawals for cooling

Load leveling is causing problems with hydro power management

Cooling towers consume water

Transportation losses of water downstream with using locks (lose 30 mg for each boat that comes by) traffic needs to be better managed, ways to move traffic without losing water

TVA seeing problems in 20 years in 10-15 areas

Power plant uses vs. domestic demands in coastal plain is becoming an issue,

Need better understanding of groundwater and surface water impacts of withdrawals- additional modeling needed and better models

Climate variability –

Negative impact on water availability in NE, SE greater extremes - bigger floods and bigger droughts, driving future power plant withdrawals

Problem: Long term impacts on water quality

Water withdrawals upstream limiting dilution availability – needing more water treatment – no models for TMDL setting or withdrawals coordination

How to expand municipal infrastructure – temperature issues

Moving toward distributed generation with distributed treatment – but not large penetration – need to reduce energy needs because use natural gas

Energy planning beginning to include distributed energy for water treatment as part of emergency supply

Understanding of emerging contaminants – science based process to evaluate health and safety issues and energy issues

Conclusions:

Energy Security long term

System level analysis of renewable/fuels/with impact on water interactions

Energy water implications associated with biomass-production implications on environment and water needs and quality

Energy impact on water quality and environment– mercury, carbon, and water quality

Determine ability and to what level to integrate renewables into energy system

Transmission issues and control

Session 4 - Solutions: