

Eastern Region Energy-Water Needs Assessment Workshop Real Time Notes

GROUP B BREAKOUT SESSION (Facilitator: Scott Hasse; Note taker: Michael Ross)

Participant List

John Brellenthin, Tennessee Valley Authority

Jack, 26 years, largest power public company in US, how do we spend the water we have for all uses, how to balance – is major concern.

Paul Ziemkiewicz, West Virginia Water Research Institute

Coal mine water, reverse 100 years of mining in putting items in the water, better management.

Kenneth Kimball, Appalachian Mountain Club

David Hutton Delta-H Systems, LLC

Evaporative cooling systems, water conservation, find alternative water sources

Daniel Macuga, Los Alamos National Laboratory

Manager of water portfolio, Energy-Water Texas Team,

Robin Newmark, Lawrence Livermore National Laboratory

Leader of the water/energy work, climate impacts local and regional,

Andrea McNemar, National Energy Technology Laboratory

4 months with program, need to address the public and inform them

James Debrowolshi, USDA CSREES, attended second day.

Harold Reed, American Water

Researcher, largest private water, we can treat any water – but not a good job not contaminating

Richard Schafer, Maryland Public Service Commission

George Gross, University of Illinois at Urbana Champaign

Reg. Policy, hydro scheduling, transmission, Alberta has oil shale – but no water

Diana Pape, ICF Consulting

Run EE programs – energy star, leverage EE programs for water efficiency.

Hal Cardwell, USACE

Alexandria, VA, a thinktank, POC for ORNL/ACE collaboration, competing uses of water, hydro gen,

Kamau Sadiki, USACE

Peter Pandolfini, John Hopkins University

Engineer, civil and mech and aerospace, rocket engineer, developing alternative energy concepts – like ocean energy,

Arthur Rogers, Environmental Scientific Instruments

Detect contaminants in water. Only attended morning session on first day.

Pierre Glynn, USGS

Bob Hirsch is boss. Manage water discipline portion. How watershed systems are connected and how they evolve (water flow, ecosystems). Did not attend second day.

Earl Greene, USGS

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Bill Horak, BNL, attended second day.

Charles “Chuck” Hennig, US Bureau of Reclamation, attended second day

December 13, 2005

Energy Supply (how water impacts energy supply)

Extracting issues

- [We can] take good water and turn it into bad water.
- Limit items to US... [like] dealing with saline from off shore production... Coal bed methane.
- We get a lot of coal from Montana and Wyoming.
The interrelationship between energy supply and water [is] – extraction and generation.
- Education to the public for conservation. This is more for demand.
- Does it include acid rain drainage? Yes.
- There are reg. policies for acid drainage.
- *Asks many questions to Paul.* How much water can be put back? Follows Clean Water Act.
- OCM also has policy on how to deal with drainage. There are legacy issues and well as current ones.

How are current companies dealing with legacy problems?

- There is a fund for cleanup for a range of priorities. There are taxes that are collected for this fund.
- From utility perspective, is there a trend in coal production shift from east to west? Low sulfur coal is bought from the west – due to regulation issues for the air. Will this shift [the] problem from east to west? There is already a strain for water, but then quality will be affected.
- Maybe there is a balance in where the coal comes from and added technology to scrub the dirtier coal. Water would be affected. Clean air rules will impact extraction from the east to the west, so thus a factor on water.
- This may be temporary, since it is not a long term solution. Any new source would be welcomed. Alt. energies become competitive as the costs go up to meet restrictions. Not necessarily dealing with new technologies.
- 25 years in the future, we must think how sources will shift – the distribution of sources.
- No picking and choosing, all sources will be used. It is not linear.

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-- Harder to get resources, thus less and less returns. It may not be an energy source when it gets too hard to obtain. We are steady state now, but things can change suddenly. RE has not been seriously developed in recent years. What will we do next?

-- How do we have alternatives for the future?

-- We have shifts already in the last 25 years depending on cost, nuclear problems, [and] air/water standards. Companies must adapt quickly – seamless to the customers. Water cuts across many areas, not just energy. All technologies will have a water requirement. All companies assume that the water will be there without cost.

--We have energy balances that are negative – using water for agr fuel.

-- Devel [oping] alt sources, we have long lead times.

-- By 1984 we were to be energy independent.

-- Not only planning for energy, but also for technology. Water is not considered a constraint on technologies, but may be in the future.

-- With enough energy you can make bad water better.

-- Must deal with waste products when cleaning the water. [There is] always a legacy problem.

-- We are always reacting and not planning.

--What are the impacts (air, water)? They are concerned with health effects, but not for all processes. Maybe it is better to put it in the air, than to the ground or water. The end game may not be to keep things out of the air.

-- If you change the constraints, you change the problem.

-- We put ash in the water, how do we deal with nitrogen oxides and ammonia? What is the cost for the problems it causes? All should be considered in holistic management.

-- Power production is the biggest water user in W. Virginia.

-- It may be harder to distribute water across the country. Now we distribute energy.

-- Oceans are the biggest source of water – we must place plants near the resource.

-- If we talk about the grid, we can spend a month talking about the problems. Plants are located at crossroads of pipeline and grid.

-- We don't talk about interdependence and trade-offs. Water was never a factor, but it will be.

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-- A big issue at TVA is interbasin transfer (Atlanta and Birmingham are asking for water out of the Tennessee River valley). What are the issues (supply, econ. Envir)?

-- The whole issue of siting is an issue in itself. Where are things located? There are places that have lots of water, but not power generation. No one has taken a lead for regional planning.

-- The NE grid was not designed as a grid from a top down design. They are done by service areas, not by the best place to put a plant to meet a need. TVA does not have a need for new plants for base load in the near future. There are many “peaker” plants out there that are not running due to the cost of Natural Gas. TVA is confined in service area.

-- Alberta had a long term vision for their oil shale long ago. Now, things are paying off. We have a lack of long term planning.

-- We have mostly investor owned utilities, thus 6 months is the term – not longer.

-- Market forces have an impact. Two new Saudi fields are open now, but in the past it was not worth it.

-- We should put a number on water.

-- We don't value water.

-- It is good to hear about the value of water from the other side. Water companies are always complaining and squeaking by.

--Water law.

--Water law is very popular in the western US.

--Two laws. If water runs across my land, I can use it as long as I put it back. If water is on your land, I have ...rights to it.

-- Water in the west for initially for mining. Now it is [for] agriculture. How much do we know about water demand and supply – we don't know. Do we know how much energy we have? YES.

-- There is a lot known on the energy side, but not the water side.

--We should have been accounting and keep track of changes.

-- Are there tools to be able to adequately do accounting?

-- Monitoring is a big part of what we do. The technologies are there, and they are changing. It is a deployment issue – costs to deploy. There is a lack of data and knowledge. The other issue is modeling. We know how to model. There is no lack of tools. There must be an integration of models and tools.

-- No one is in charge of water supply. To do the integration you need demand side information – and supply side.

-- ACE is in talks with USGS to get such information.

-- If you can't measure it, then you can't manage it.

Jack. TVA has an advantage since they manage all and know all in the basin. We have sophisticated tools. The Corps is working on such tools for their management.

-- Will TVA lose a resource giving water out of the basin?

-- Yes. We use all the water. Losing water would have effects.

-- Do models exist?

-- Yes. Water is not quantified, thus there is not a cost on it.

-- Sometimes it is not the cost of water, but the process equipment for the water. The lower water using technologies are more expensive. Dry cooling has an efficiency that is lower.

-- The plant that is less expensive is the one that gets built. Plant costs are based on air regulations.

-- So the decision is not based on how much water is used.

-- Hydro power is an issue for down water resources. It is an issue. It is becoming more and more of a constraint for hydro power use.

There are concerns that need to be balanced: power, boats, rafting, etc. We had a study of how to deal with the water. Jack-- It is published.

-- There is an environment issue with fish.

-- A study on the desalination for the west coast, but it was so expensive, it is not used.

-- There are RETs that are becoming competitive.

-- Energy storage is a focus.

- It becomes an economic issue. As costs go up, things nixed before will become popular in the future.
- Ship energy by lines or barge. Ship water as well.
- RO membranes are now 1/10 the cost from years ago.
- Biomass is being considered. Biofuels are neg. energy producers.
- Ocean thermal resource is the best Renewable Energy (RE) source in the world. As a byproduct you can get water with the other products.
- Wave? It's not efficient.
- Not wave, but thermal. [We] must invest in capital equipment. [You] must look at the economics.
- Waste water solids have the heat content of soft coal.

LUNCH

Impact on Surface Water for Urban Use

- Interbasin transfer is an issue. Georgia looks at the mass amount of water flowing in the Tenn. River to the N and W of them and they want it. Energy, environment, political, social, policy issues are associated with this. TVA has the authority on the water and how to manage it. State governments will be part of the process. The Corp is not part of the process for permitting. Charge is based on the water is for energy loss (lost hydro generating power).
 - [You] must have pre-existing rights to document your rights to water. Documentation is important for water allocation. WV does not have good documentation.
 - With USGS we did a water-need assessment.
 - It is a national issue for allocations.
 - Yes, now is it is a piecemeal process.
 - Reservoirs affect wetlands, this affect urban water use. It affects hydro, recreational, etc. plans. Effluents from urban [create] a problem. Urban use is going up. Problems are not getting less.
- Urbanization affects water, but not necessarily water supply.
- Management of water is an issue for loss of water in urban systems.

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-- 30-35% of the water is lost. We have not been paying attention to underground infrastructure. Rates have not been increased to maintain the systems adequately. Social engineering must be done for politicians to tackle the problem. \$500B investment is needed to upgrade infrastructure (it is a deferred maintenance). EPA cannot enforce communities when they pollute the water, since they cannot get blood from a stone. We are too used to paying next to nothing for water and wastewater.

-- Are there technology solutions to do it?

-- Yes. It is a matter of money to pay the fair cost.

-- Subdivision goes in and then all of community must pay. Developers pay the politicians to get things passed – even poor water plans.

-- Aging and nonexistent infrastructure are equal issues.

-- A foot a year dropping of water table? Well, it depends on where you are in the Midwest for the A...& aquifer.

-- On the issue of leaks, ground water recharge is a good thing – in California!!

-- Should we be looking at the energy side of this? DOE will not touch this if it doesn't. [In] Santa Cruz [they] are re-doing their cast-iron system.

-- Water costs are going to go up and up. Disinfection costs will go up and energy is part of the equation.

-- We are going to have more and more RO units. It will require energy. Electricity is easier to move around, not water.

-- Communities worked together on the Potomac to have a good interconnecting water system.

-- What is the effect of fixing water infrastructure?

-- Agriculture is the dominant use of water in the west, not the east. [The estimate for ag is] 81% compared to 7% consumption for residential.

-- In Colorado, 90% of water went to Agric and the economic impact was 4%.

-- There used to be a nitrate problem in the river due to Agriculture, thus things change over time.

-- We are placing more attention on recreation and aesthetics now as compared to the past.

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- You are not charging for the water services. People value the water systems, but they are not paying.
- One argument is that water transportation should be charged.
- If we talk about economics, the government should look at costs.
- Doing econ analysis, the variables are always changing.
- Energy production processes should require less water and re-use water effectively. There are water streams going to the waste streams. The economics must look attractive to the industries.
- Climate change will have an impact (sea level rise, increase of salinity, temperatures), so develop technology to anticipate these problems.
- People are already experiencing such problems. We can use the current systems more effectively to anticipate the long term climate change.
- Changes have been documented (snow pack, melt dates, stream flow, floods,). We also have some knowledge of what has happened in the last 1000 years or more. We should look at the variability and be ready for it. It will work for any further changes due to climate change. Also, better forecasting tools are needed.
- I disagree with the cost and pricing. If related to production, then it will be under priced. It should be based on demand. It should be value to the consumer, not the cost of production.
- There may be a problem with monopolies (even if the government takes over the system).
- Sending power from Alberta to California – it was impossible due to Bonneville Power. It is not exactly a free market. Deregulation has caused higher prices and lower quality in some states.

Agriculture

- Biomass and biofuels will be a problem, since water is needed.
- The system is self-correcting, except that there are subsidies.
- Surplus grain was why biofuels started. So, it started for the wrong reason.
- We bring value to DOE by bringing actual numbers. The example in Colorado is a good example.
- Tools/methods should be available to make rational decisions.
- Who is making the decision?
- It is not the data, it is the process of how it is used and displayed to the decision maker. You need good data and a good process.
- It cannot be biased.
- There [is] no mercantile for water like there is for gas, oil, etc.
- EE has energy star which has numbers. For water efficiency there is no such symbol. We need a quantitative method.
- There are some programs aimed at this.
- Water is re-used, energy is not.
- Does DOE have a water efficiency group?
- It has been checked, and it should be cross-cutting at DOE on how it will be managed. They don't have anything now.
- Is there another government group interested in the water/energy nexus?
- There is a group looking at water availability and quality items. [There is] federal research to support water availability and quality. All government agencies are involved. It is coordinating body, but does not have funding. They do have persuasion power. Hal is part of this group. SWAQ.
- One report came out and said that 'assessment is key' to start with.
- We are looking at what are the grand challenges.

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-- DOE would have an active role in water recycling, new technologies for efficiency and recycling. Recycling can affect the environment – salination of the soils. Lubbock has a chloride problem.

-- My home has programmable thermostats for energy efficiency. Is there a program that deals with water?

-- CEC has recommendations. It is becoming more important.

-- People are smart. When meters are installed, the consumption drops.

-- The meter costs money.

Are there times when water is more expensive (like the usage of electricity)?

-- Pressure is a problem.

-- So, technology is needed to make that happen?

-- It already exists and it is not expensive.

-- So, DOE can issue guidelines or something like that.

-- Flash Sprayers exist that use less water and less hot water at dishwashers at restaurants. They are sweeping across California.

-- In the home, water heater to the last tap is the issue. This is where efficiencies can occur.

-- The Act assigned Science and not EERE for energy/water.

-- What assessment are we talking about it?

-- ... How we save hot water loss and cost from the heater to the tap... DOE does not have a role of regulations. [It] worked with EPA for energy star.

-- Can DOE work with EPA for water?

-- There is a study now to determine what can be done like the Consortium for EE.

-- One more [observation] for agriculture [involves] the runoff of nitrates – affecting the quality of surface water. [This] impacts the treatment cost and discharge limits by power plants.

-- [Regarding] issues on how to value wild lands around a reservoir... They are hard to measure and to quantify.

-- There is an interdisciplinary group looking at it.

-- A healthy water system can be translated to dollars and cents.

-- Different values may be applied that are case specific.

Impacts to due Energy Production

-- Downstream quality due to hydro plants [is one of the impacts].

-- Are there environmental concerns with ocean thermal?

-- Yes. But, they are positive (and negative in some ways) impacts. Mix of nutrients. Grazing plant moves around. There is a natural energy lab in Hawaii.

-- You have seen the end on once-through cooling. They will be [using] consumption cooling. There is an energy penalty (more energy for cooling and less efficiency on blades) as well. 316B was done by EPA that governs intakes. This was done in 2002. There will be less fresh water withdrawal.

END of DAY Break

December 14, 2005

SECOND DAY

- Why is evaluation an economic tool? You must have a signal. It is need in evaluation and to make decisions. Water is thought to not have value.
- Produce energy without using water, but producing water. Instead of water-energy fighting each other, think of them as a team. Need new technologies or present ones that accomplish this.
- DOE has a project now, [called] “FutureGen”. Industry is involved and it is for a zero emission plant in the future. Maybe water factors into this planning.
- It may be able to say this in the afternoon (for solutions).
- We should think of objectives that would lead to strategy. Even taking low quality and improving it in the process can apply.
- A step further would be to add environmental factors.
- Dual use such as producing heat (cogen) is similar concept.
- Identify sources of water that can be used (low quality).
- Future plants will be located where they have always been. Planning for the future, are they thinking of using alternative water supplies (reclaimed water, mine water).
- Site a plant where impaired water is located. Map impaired water locations and note what it would take to use that water.
- Perhaps not only use the water for energy, but also sell it as good water.
- What do you need today to do that?
- Or, if you have a certain quality of water, you can design the plant to use that water without treating.
- So we are talking about materials?
- If you are using saline, you can take out the salt or use non-corrosive materials at the condenser.
- There is always an environmental impact. People will want to do this when there is a value on it (water). Political decision is needed – they will move things. How can politicians make better decisions?

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- Water is not finite. It can be expanded.
- People are locating where water is not located. We will continue this until there is a value placed on water.
- There are tradeoffs.
- [Is there an] analogy to oil and gas industry? Saline water is plenty and it is a big resource. Technologies should be looked at to bring this water into play for the energy industry.
- Oil can be purchased, if you have the money.
- It is now economical to use mine water – as our new study shows. It was submitted to DOE.
- We need rough estimates on the costs – the certain types of water.
- I don't see a need for...
- Economic factors solve the problems over finite water supplies.
- Domenici is trying to avoid agricultural communities becoming ghost towns. But, economic factors can make farmers sell the water rights and leave.
- There is no value.
- Yes, they know how much the water is. They know the value to desal water.
- Cold water desal technology would be a great help. It would be good to locate a power plant at such sights. These technology needs to be improved.
- Is there a great desal resource that is untapped?
- We don't know exactly what the resource it, but it exists everywhere.
- If you pull water, you will affect other water. They will not go down to get bad water for water sake, but they will go down for energy sake. Water Follies is a book out there.
- We should consider the oceans, not just ground water.
- Yes, we must understand the sustainability of groundwater.
- There is also a timescale for renewability.
- Politicians do not understand sustainability.

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-- Another source is mine water for sustainability. Water can be used as well as the coal from the energy plant. [We have] 1200 miles of streams that have been damaged by mine water.

-- We are talking about a bundled product.

-- There is an entitlement issue with people.

-- A need is figuring out different social science processes to help with the decision process. Technical is important, but social is important as well.

-- Some farmers are efficient and save water, but must use it – or they lose the right for it. Total consumption is actually higher than it should be. A need is how to deal with this problem. They can have something to sell or rent it. Not to sell the right, just the water. The market is not well formed to do this. It can be a secondary income stream.

-- If the price goes up, that may be the primary income stream compared farming.

-- We pay for water that the company gets for free. The costs are for treatment and movement, not for source.

-- Water is free when it is usable.

-- Ownership is one thing; and treatment/transportation is another thing. On the east coast it is the latter only.

-- Companies know the costs for water in terms of getting it.

-- EPA has a database on impaired water.

Do people know about all these resources? We may need a clearinghouse.

-- EPA may not look at impaired water the same as energy folks. [There are] different definitions.

-- Do we need scale down to [each] county on mapping?

-- In Illinois, [it's] not in my backyard. There is opposition. Water is not entirely the problem.

-- This may be a regional item. Not the same in the west. Source is an issue, but discharge is a larger issue.

-- If you know what quality of water exists out there, then we can develop technologies to treat those supplies.

-- We have a stovepipe situation. Different groups do not talk to one another. DOE must do some crosscutting.

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-- DOE is one of the prime movers to develop new technologies for the future in the energy sector. They are in concert with industry. Opportunity for other groups at DOE to get more items integrated into new technologies.

-- DOE should not reinvent things on their own.

-- Information should be shared and consolidated.

-- Each agency [has its] own information. We should integrate internet, databases and GIS information.

-- There is a need, but not necessary DOE's.

-- We don't need uniformity, we need consistency.

-- There is information out there, but there is always a shortage on the data you need. Information is collected for different purposes. We should identify gaps between what is known and what is needed.

-- Did we say yesterday that we will not put plants nears sources of energy?

-- No. It is best to put plants there, since transportation is the highest cost.

-- [We] need more transmission lines. People think that they need to be shared by all. Transmission system will always exist like the railroads.

-- Can DOE help with transmission lines?

-- We do not have an integrated system for transmission. It is broken out by service areas.

-- Does that specify a need?

-- We are dealing with federal and state crossover.

-- What would [be] needed to solve this problem – leading to an integrated system?

-- Okay, transmission losses and efficiency is not a big problem.

New transmission has problems about who owns, who pays, etc.

-- The main needs that I am hearing: 1) knowing information; 2) increasing the sources;

-- Perhaps cooperation can be coordinated by incentives – federal grants eligibility.

-- Perhaps permitting can control the coordination and the efficient use of resources.

Break

-- We used data for TVA plan.

-- Did customers give projections for the long term?

-- Yes, in many cases. This assessment gives us an idea of how to plan. It can be used elsewhere.

-- We have 4 needs for energy:

1. Characterize the water resource (quality, quantity, location), identify gaps, water quality trading framework (water resource is better, involves quantity),
2. Increase the rate of using impaired water (costs, policy, alternatives)
3. Get the info out to the users.
4. Use of bad water.

Trading program defined: Trade quality upstream to quantity downstream.

-- Create a market mechanism. It will regional by nature.

-- EPA has a quality program that is similar.

-- Modify the air program to water.

-- Example, clean mine water upstream to get quantity downstream.

-- We should add the objective to the solution.

-- It also applies to time periods during the year. There are examples of water-energy trades. Clean water in exchange for energy. Trade mine drainage in lieu of cooling.

-- You are not buying credits here so that you can pollute.

-- Not really. This is trading one pollutant for another. There is a common currency.

-- Do what is environmentally and cost positive.

-- Get the information out to the policy makers, utilities and the users.

[There is a] problem with the terminology for utilities. Stakeholders [are] too general.

-- Are we just disseminating information? Are they collecting it? Information must be how it can be used.

-- Get information out and have it available.

This afternoon [we'll deal with] how we get the information out there...

-- We need research on how to change behavior.

Do we want to have specifics on technology?

-- For long term needs, changes in climate will need technologies to deal with the rises in sea level, rises in salinity, etc. We need technologies that use saline water or deal with it...or how to cool hotter water. Someone has to define impaired water first. Match technology to the forecasts.

-- DOE is starting such things and it is at the local level.

-- Once you have the data and forecasts, then [you] match technologies to deal with the forecasts.

-- It could be a problem, like weather forecasting over the long term. It may not help the industry.

-- It is a need. Can we do it, [however], is another story.

-- In Europe, they are using forecasts to plan for their capital needs.

-- We need something on sharing of technologies – as with Europe. Why [re] invent the wheel?

International and interagency should be the language. Good point.

-- I want to go back to the needs – we need something on conservation. A market will drive conservation and efficiency. This is for the markets. Develop tools for water use efficiency options. You can always reduce consumption by not using the process. Use less to get the same output. Improve water utilization. It covers industry and residential.

-- This applies to cooling towers. [You use] less water, but [get the] same effect.

-- We had a need for drought management. Maybe DOE needs tools for drought management.

-- Perhaps drought preparedness?

Are there such plans?

-- There are responses at the state level. The response is how to plan and deal.

-- Plans and strategies.

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- We never take it to impact.
- It can also apply to flood conditions.
- In New Orleans there was an effect on supply, but the resource did not go away, the costs went higher.
- Cold water desal is important. It is not advancing money to R&D [only].
- Well water here for 99 cents and desal water in Bahamas for 79 cents!!!

LUNCH

Bill 1860 - Amendment to energy. No money associated with it. Energy Policy Act, Section 970.

- Perhaps cold temperature desal can be combined with ocean power engineering.
- There should be a re-examination of alternative energies due to the recent economics change. The technology is there.
- We should not select a specific technology. General is fine.
- New sources of energy [require] new sources of water.
- We need policy to make things happen.

Does MARCAL solve any of these problems?

- Increase supply, reduce demand and reduce costs.
- We should start with the need for getting more data of the resources.
- Policy may decide, not people. I want to know what the metric is.
- We addressed how we spend our water.
- Right now it is willy-nilly on how we use the water.
- How do we balance them against one another?
- How [do] we balance water and energy?
- Balance the competing demands to the scarce resources.

- We need a NEEDS statement.
- We need the data first before you can balance.
- I don't see the nexus with energy on the sheets.
- It seems that the water industry must bend to provide water to the energy industry. There is nothing that the energy industry should do.
- I like to know all the processes on how water impacts energy, energy impacts water. How this impacts the cost, supply, quality, quantity, etc. I like to see this in an integrated process. There is no model that takes both into account.

(Side discussion)

- There are major watershed owners that are talking to one another in a forum.
- On a basin level they do look at population, with energy demand, and how much water is needed. It ties in [to] agriculture.
- Yes, it ties it all in.
- How would a political map be drawn for a basin? There is a water basin and an energy basin and separate states.
- Congress gives the political authority (such as with TVA). Now TVA does not have many issues, they manage it all. No interactions, although they to involve state reps.
- Maybe DOE should be represented here. They should reach out to the commission.
- There is a shortage in communication between all the players.
- We must look at the global issue. That is why we are here. We cannot focus [on just the] region. Regional does not focus on technology development, for example.
- Each region is optimized, but the country is not.
- One thing we lack is drought management. We are fortunately both Peter and Paul in terms of water and energy.