Meeting the Energy and Water Needs of the Snake/Columbia River Basin in the 21st Century

Energy Water Nexus

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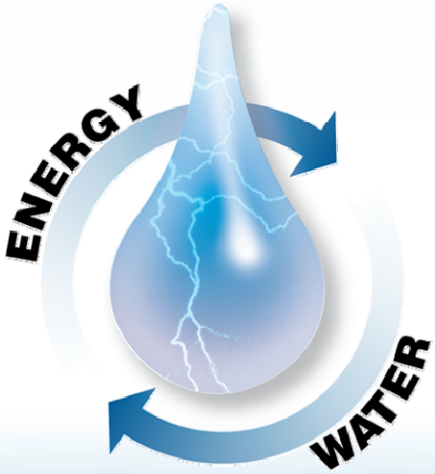


Connections

ENERGY and WATER

Snake/Columbia River Basin Summit

Purpose:

- As the population around the Snake/Columbia river basin increases, so does the need for more energy. Energy and water are inextricably linked, and new solutions to the rising energy problem are needed.
- The Energy-Water Nexus Science and Technology Summit was organized to talk about the growing energy and water concerns.

Summit Background

- Date: June 25-27, 2007
- Location: Boise, ID
- Organizers:

  Center for Advanced Energy Studies (CAES)

  Columbia Basin Trust

  Idaho National Laboratory

  Idaho Water Resources Research Institute (University of Idaho)

  Institute for Water and Watersheds (Oregon State University)

  Pacific Northwest National Laboratory

Focus Groups

- At the summit the participants were split into four different focus groups.
- Each group had a different agenda and topic material.
- The four focus groups were:
  - Energy/Water Storage
  - Environmental Considerations
  - Water Allocation and Use
  - Social, Economic, Political, and Regulatory Considerations

Focus Groups

- Each group discussed the information available and made decisions about research initiatives.
- They then ranked each initiative either critical, important, or nice to do.
- Based on their discussion, they then reported what they thought to be the critical research initiatives.

Snake/Columbia Basin Energy Water S&T Summit was organized to talk about the growing energy and water concerns

Energy/Water Storage

- Off-Columbia River system storage
- Systems analysis tools
- Advanced energy/water storage
- Examine what other countries have done

Environmental Considerations

- Ecosystem effects
- Water quality considerations

Water Allocation and Use Supply forecasting

- Water use/valuation/planning
- Managing with uncertainty

Social, Economic, Political, and Regulatory Considerations

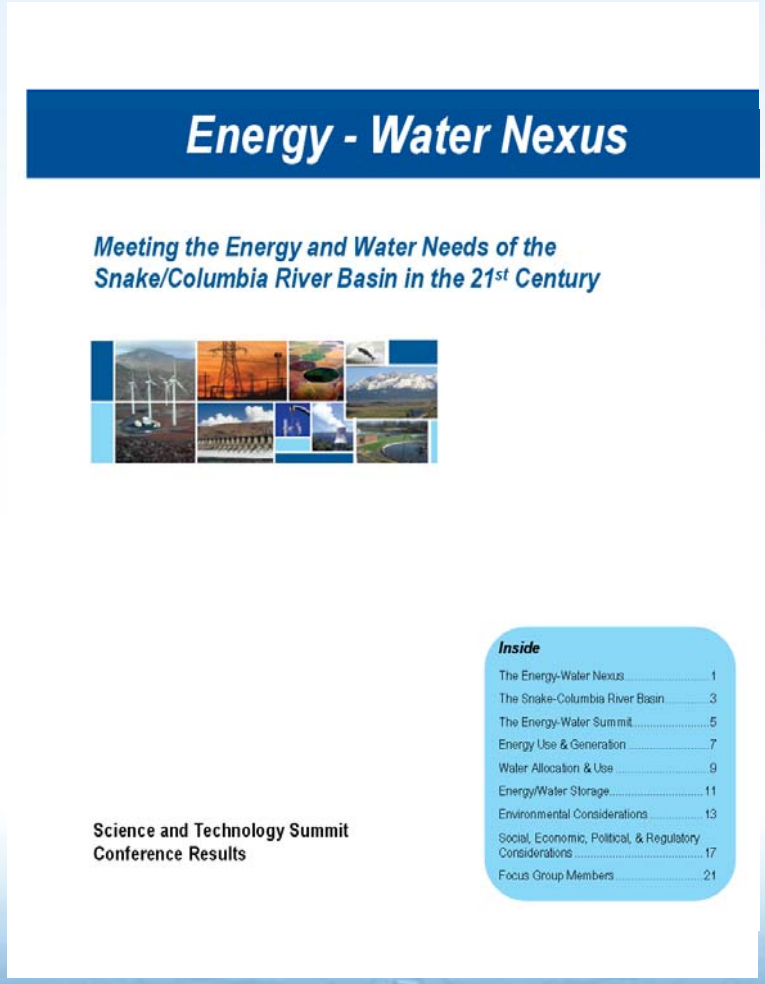
- Develop integrated regional climate change scenarios and compare the impacts
- Identify successful adaptive mechanisms and institutions for water management and measure effects on water quality, quantity, and availability.
- Involve science in public awareness and discourse.

ENERGY and WATER

Summary: A few major themes prevailed

- Advanced watershed scale water forecasting and management tools
- Technology: e.g. energy/water storage
- Water quality impacts and ecosystem impacts of water management

Report is available at:
http://www.iwrri.uidaho.edu/default.aspx?pid=99479



ENERGY and WATER

Water-Energy-Agriculture Integration Demonstration: Yakima River Basin

- Objective: Develop prototype framework for water and energy management that considers
  - surface water/ground water supply and storage
  - hydro/wind integration
  - agricultural demands for water and energy
- Outcomes:
  - Developed preliminary conceptual model of agricultural water-energy supply and demand
  - Validated potential for more efficient utilization and reliability through integrated water and energy planning
  - Demonstrated approach for dispatching wind energy to irrigation pumping to reduce impact of wind on overall system energy generation

Demonstration

- Approach
  - Each irrigation season subdivided into 4-day irrigation windows
    - allow short-term flexibility for water application to utilize wind energy for pumping
    - the 4-day total crop water demand must be met during each window, or a “violation” occurs.
  - Farmers do not reduce irrigated acreage or length of growing season during drought years
  - Evaluate water and energy use for “Base Case” and “Integrated Case”
    - “Base Case”: surface water supply and storage with energy for pumping from the grid
    - “Integrated Case”: surface and groundwater for supply and storage using wind energy supplemented by grid

Integrated Case

- Meet crop water demand at all times during irrigation season
- Use both surface water/groundwater supply and storage
- Use wind power for pumping, supplemented by grid as necessary
- Maintain long-term groundwater reservoir
- Use wind powered pumping from canal/river to recharge groundwater during non-growing season

Summary

- Committing irrigation pumping as dispatchable load for wind can provide effective utilization of significant available wind energy.
  - Reduces impact of wind on overall system operation (e.g., spinning reserve)
  - Reduces demand for other generation sources
- Wind provides alternative energy source for harvesting “off-season water” for future irrigation use
- Integrated use of surface and sustainable groundwater storage increases reliability in meeting crop water demand