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Update on the National Desalination Research Roadmapping Effort

Multistate Salinity Coalition Summit
Las Vegas, NV
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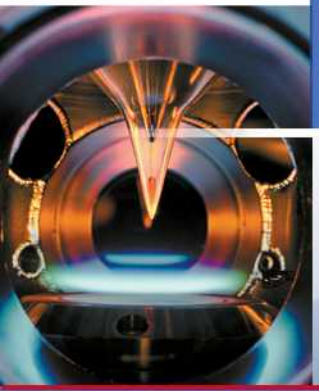

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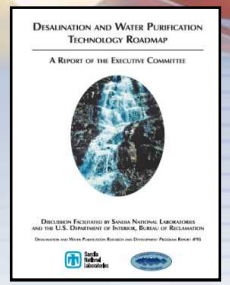
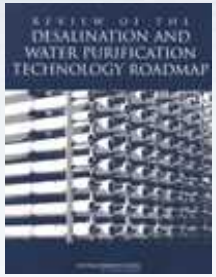
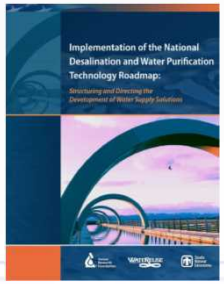
National Desalination Research Roadmapping Effort







- 2002 – Congress requests Desalination Roadmap
- 2002 – BoR and SNL initiate roadmapping effort
- January of 2003 Desalination Roadmap is Issued
- 2004 - Desalination Roadmap Reviewed favorably by NRC
- Late 2004 – JWRDTF is formed to develop the Implementation Roadmap
- Early 2005 – Desal Roadmap Implementation Effort is begun
- Late 2005 – Critical Desal Research Targets Identified
- Early 2006 – BoR grants NAS request to perform Desal Study
- 2006 – California-DWR joint funding of priority Desalination Research as identified by the Roadmap Implementation effort
- Winter 2008 – NAS issues *Desalination a National Perspective*
- Winter 2010– Roadmap Implementation Report issued

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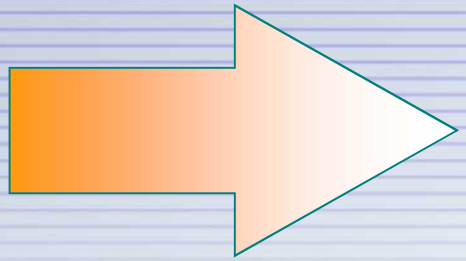
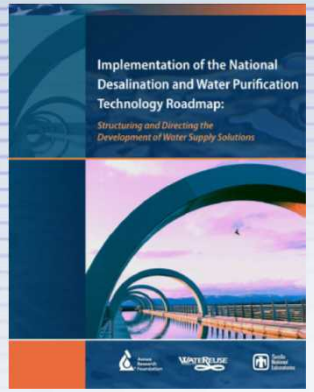
Implementation of the National Desalination and Water Purification Technology Roadmap





- Summarizes water challenges facing US and charts the course of R&D to meet these challenges
- Defines critical objectives to reduce cost and increase performance and energy efficiency
- Quantifies needs and defines five broad technology areas to meet these needs
  - Membrane Technologies
  - Alternative Technologies
  - Thermal Technologies
  - Concentrate Management Technologies
  - Reuse/Recycling Technologies

- Objectives of Implementation
  - Hasten the Rate of Technological Advance
  - Reduce the cost of desalination technologies
- Organized into 4 broad National Research Areas with a total of 25 Research Agendas and 58 Research Projects
  - Membrane Technologies
  - Alternative Technologies
  - Concentrate Management Technologies
  - Institutional Issues

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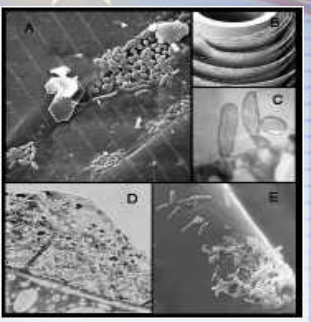
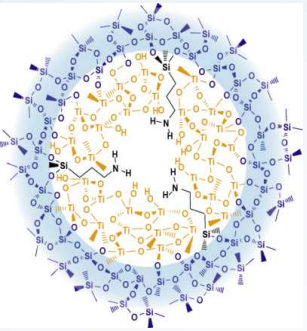
Implementation of the National Desalination & Water Purification Technology Roadmap



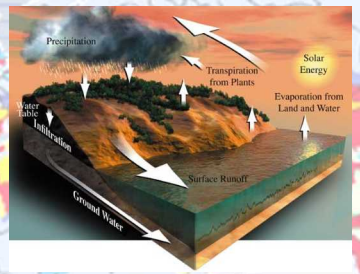


- National Research Area: Membrane Technologies
  - Research Agenda: Fouling
    - Research Projects: Organic Fouling, Biofouling
- National Research Area: Alternative Technologies
  - Research Agenda: Biological Treatment
    - Research Projects: Biological Desalination
- National Research Area: Concentrate Management Technologies
  - Research Agenda: Disposal Fundamental Research
    - Research Projects: Hybrid Techniques for Zero-Liquid Discharge
- National Research Area: Institutional Issues
  - Research Agenda: Understanding Economics of Desalination
    - Research Project: Inventory of Desalination Water Costs for Various Applications

Sandia's Water Program has national and international impact in four focus areas

Treatment Technologies

Modeling & Management



Security Systems

Energy-Water

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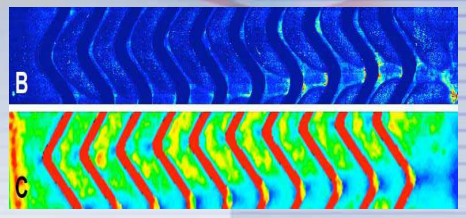
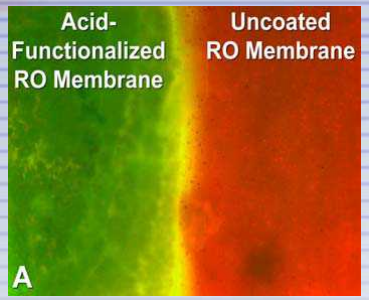
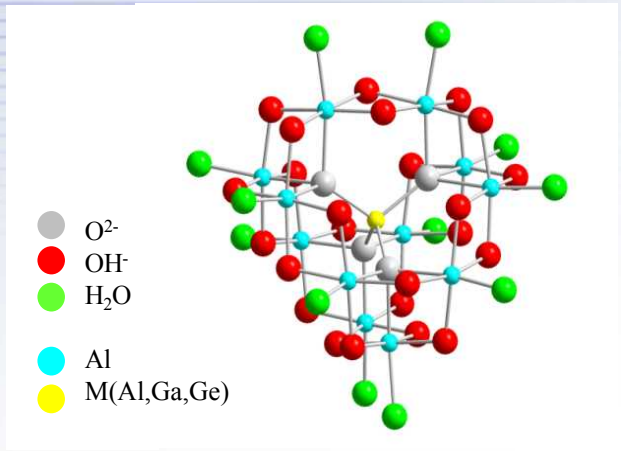
SNL Water Initiative
Treatment Technologies

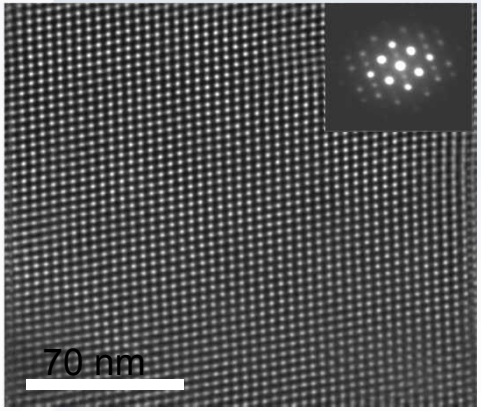




Membrane biofilm control using functionalized coatings & physical modifications for membranes.



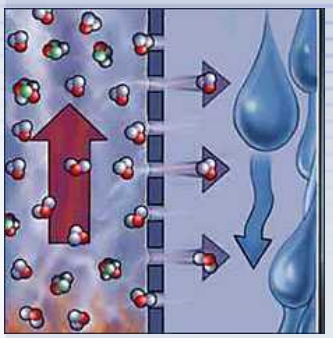
Removal of Microbials Ga-substituted alumina Keggin ion removes of anionic contaminants.



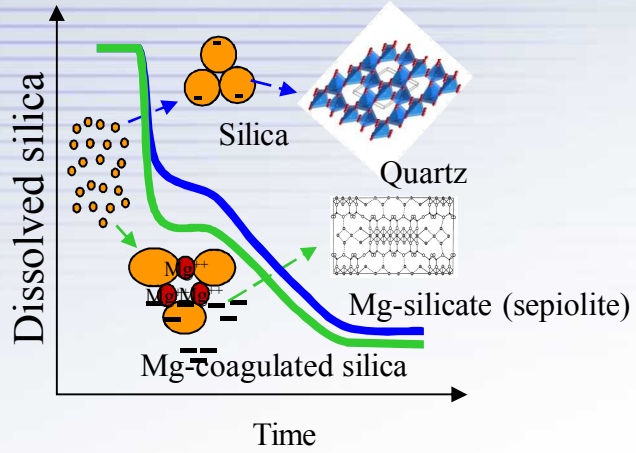
Biomimetic Membranes fabricated using evaporation-induced self-assembled silica

SNL Water Initiative
Energy And Water

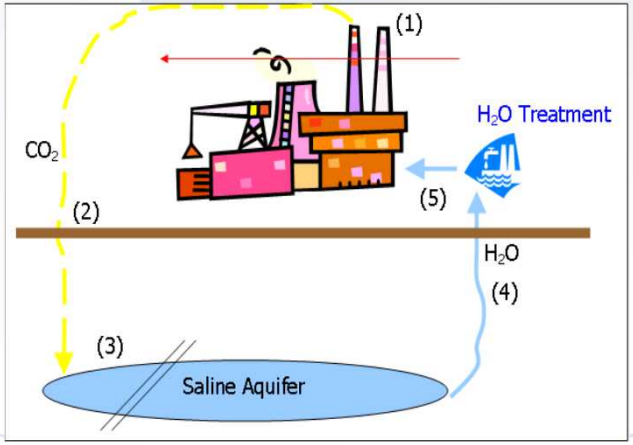
Impaired Water & Waste Heat to Produce Water via Membrane Distillation



Controlling SiO_2 Precipitation in Cooling & Process Waters



Systems Modeling of CO_2 Capture Storage and Water Treatment



Nanofiltration Technologies for Power Plant Cooling Water

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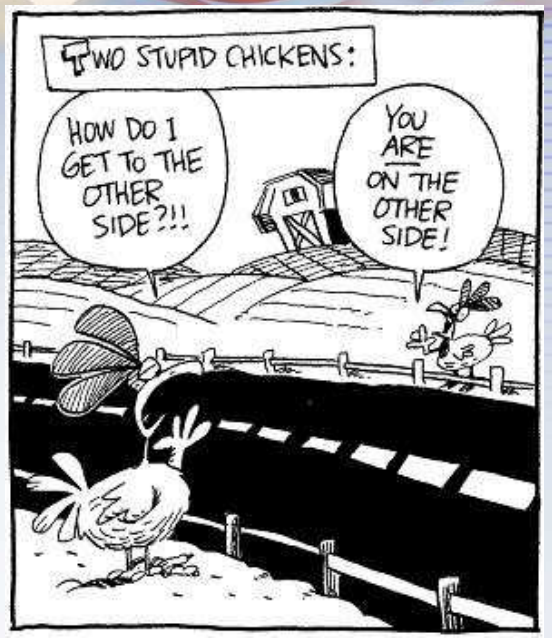
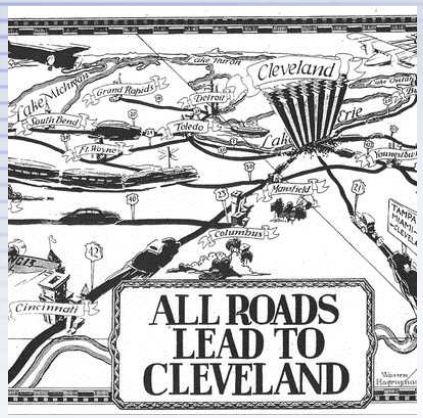
The Future and Next Steps

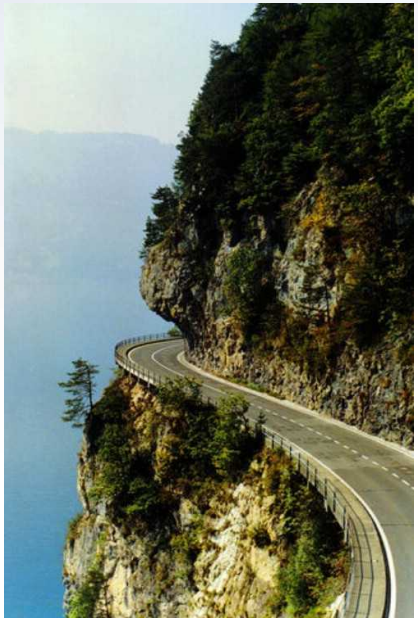
No National Water Program yet but…

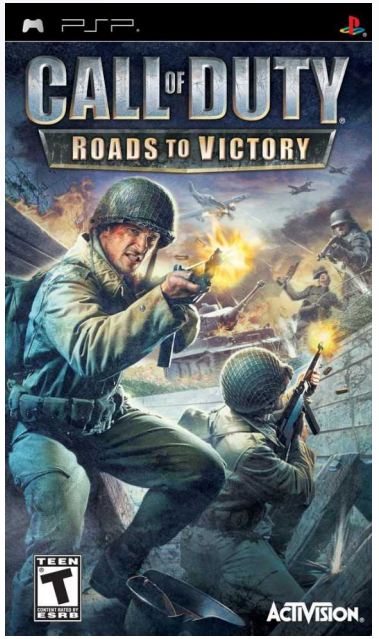
- Roadmap and Son of Roadmap represent a national effort to guide research and create a sustainable water future for the nation and can continue to be a guide for research.
- Develop and enhance key institutional collaborations between organizations doing research in water treatment nationally and internationally.
- Sandia continues to develop technology and address challenges identified in the national roadmapping effort with a focus on energy-water issues.

National Desalination Research Roadmapping Effort









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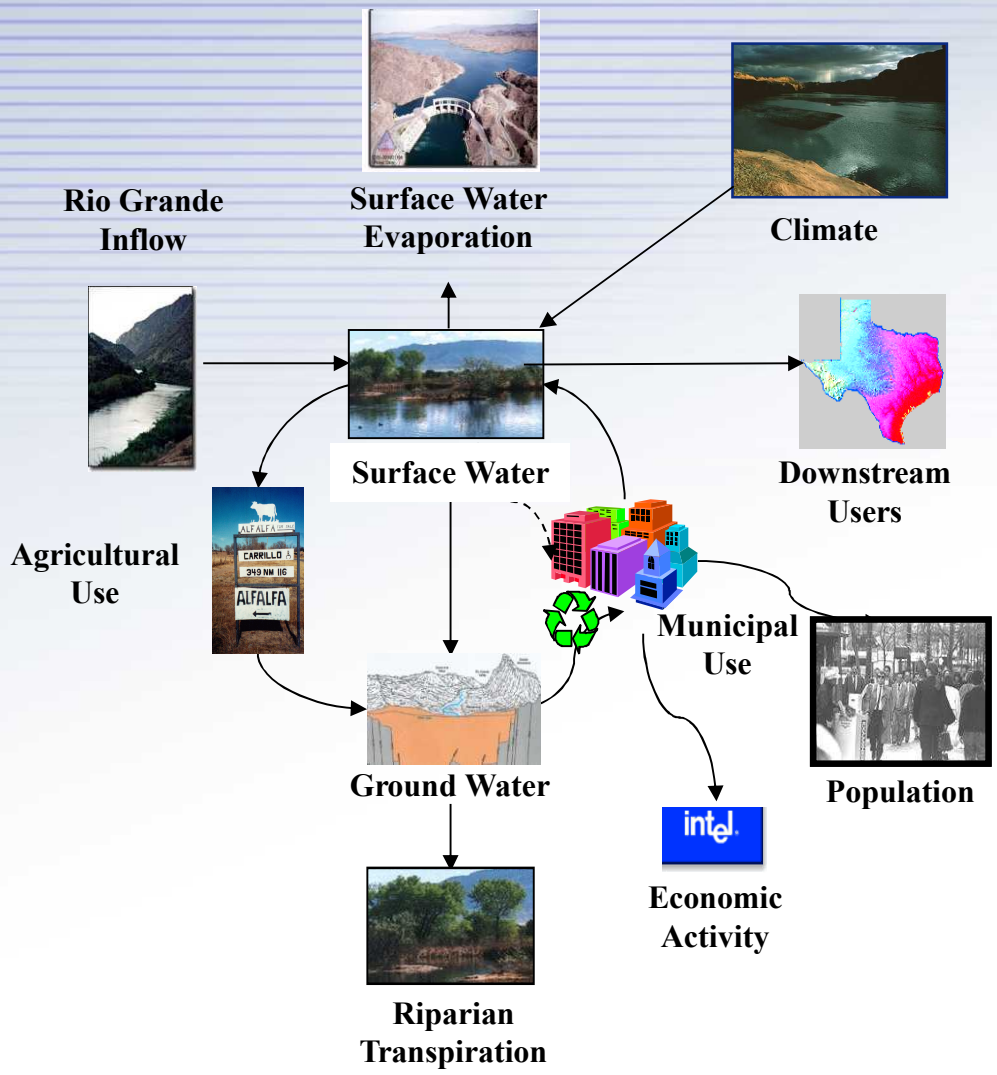
SNL Water Initiative
Modeling & Management

- "Holistic" approach to quantitatively assessing water resource sustainability
- System dynamics provides framework for modeling multiple, interdependent subsystems each varying in time and space
- Focus is on intermediate to long-term interdependencies between resource supply and demand
- Major areas of interest include interdependencies of <u>energy, water, and agricultural</u> sectors since energy and agriculture are large water using sectors



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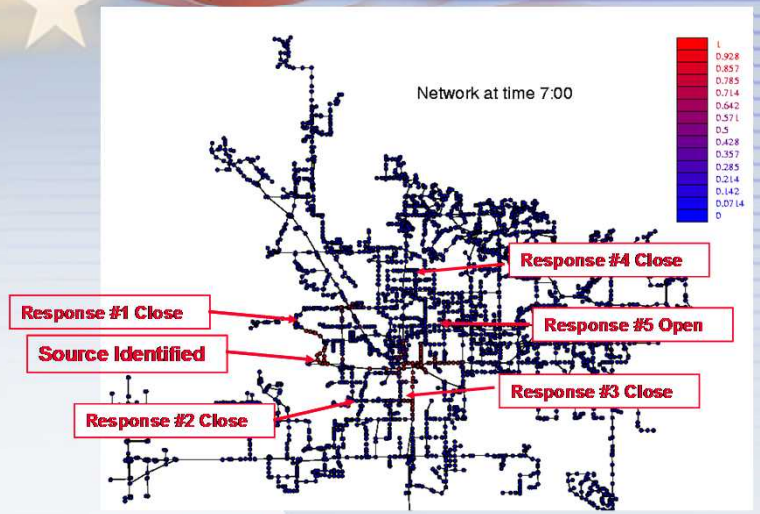
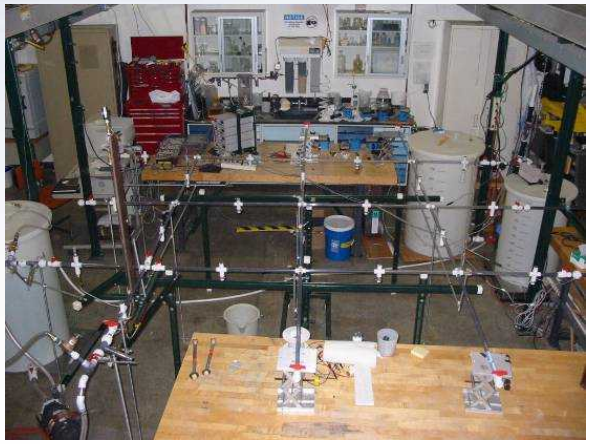
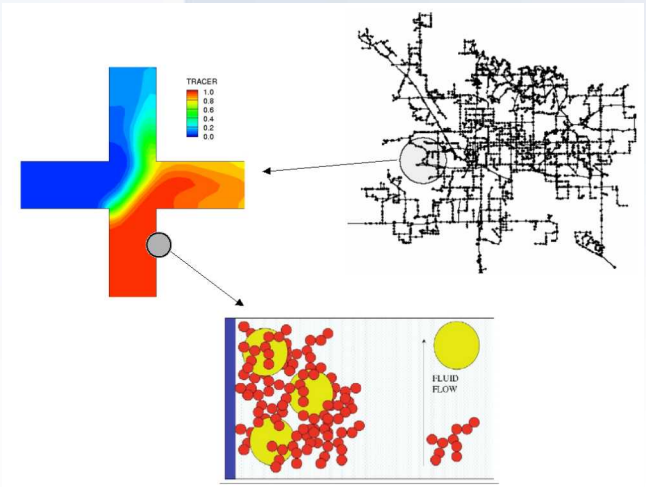
Sandia Water Initiative
Water Security



Algorithm for optimization of sensor locations



Lab-scale testing and model validation



CFD of water system components including chemical & biofilm reactions

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