Multi-State Salinity Coalition
2005 National Salinity Management and Desalination Summit
"Policies for Successful Desalination Programs"
December 8-9, 2005
Albuquerque, NM

Summary

DISCLAIMER

This summary is comprised of notes from an attendee of the 2006 Annual Summit and has not been reviewed by the Summit presenters.

MSSC Member Agencies:

Albuquerque-Bernalillo County Water Utility District
Central Basin Municipal Water District
City of Phoenix
City of Scottsdale
Coachella Valley Water District
El Paso Water Utilities
Inland Empire Utilities Agency
Metropolitan Domestic Water Improvement District
Metropolitan Water District of Southern California
Northern California Salinity Coalition
Salt River Project
San Antonio Water System
Southern California Salinity Coalition
Southern Nevada Water District
Tucson Water
West Basin Municipal Water District

Other Agencies or Organizations in Attendance:

Alameda County Water District
American Water, Monterey
Arizona Municipal Water Users Association
AWWA Research Foundation
Brownsville Public Utilities Board[1]
Bureau of Reclamation
California Energy Commission
California Public Utilities Commission
California Water Institute
Canadian River Municipal Water Authority
CERM-UTEP, El Paso
City of Corpus Christi Water Department
City of Dallas

[1] Genoveva Gomez stated that she recently spoke with HDR about work in Brownsville, TX

City of Goodyear, AZ
City of Henderson
City of Phoenix
City of Rio Rancho
Colorado River Basin Salinity
Colorado River Commission of Nevada
Committee on Appropriations, Subcommittee on Energy and Water Development
Committee on Energy & Natural Resources
Culligan Water of North Los Angeles County
Delta Diablo Sanitation District
Dublin San Ramon Service District
Irvine Ranch Water District
Las Vegas Valley Water District
Long Beach Water Department
Metro Water District, Tucson
Monterey Regional Water Pollution Control
Municipal Water District of California
New Mexico Environmental Dept., Surface Water Quality Bureau
New Mexico Interstate Stream Commission
New Mexico Water Resources
Orange County Water District
Pacific Water Quality Association
Pinellas County Government
San Francisco Public Utilities Commission
San Joaquin Department of Water Resources, Fresno
Sandia Labs and Water Assembly
Sandia National Laboratories
Santa Ana Watershed Project Authority
Santa Clara Valley Water District
SWCA, Albuquerque
Tucson Water
USEPA
USGS
WateReuse Foundation

OVERVIEW

There was very high attendance from agencies at this conference. The conference addressed both the brackish water and ocean water desal opportunities. Presentations by agencies who have completed projects, presentations on the technical aspects of desal projects, government agency perspectives on desal work, senatorial representations on how government needs to be working with industry on the issues related to desal and funding opportunities, environmental organization perspectives, and power company interest in joint energy/desal projects indicates that this is an area of growth for the water industry. Increased drought conditions across the southwest and dwindling water sources are driving the interest in desal projects. It appears that brackish water desal projects are being implemented and appears to be the immediate market need. There are more environmental issues related to ocean desal projects.

SUMMARY OF PRESENTATIONS

Keynote Speaker, Bill Hume, Director of Policies and Issues, Office of New Mexico Governor Bill Richardson – Discussed issues such as water rights of removed water, disposal issues, public opposition to removal from groundwater, transportation to end user. Government needs to pass laws for equitable balance resolution of issues. R&D needed for new water supplies. Drought is driving projects now, may be other drivers in the future. Need to build on turn key or design-operate and attract funding. Governor is insisting that extraction be supported with extensive data and analysis.

Federal, Regional and Local Actions to Facilitate Desalination/Defining the Challenges

Mike Gabaldon, US Bureau of Reclamation. Opportunities in rural and Indian drinking water, metro, industrial, and agriculture. Sources are brackish and sea water. Need to reduce cost of desalination.
Research centers:

- Water Quality Improvement Center, Yuma Plant – Colorado River water and brackish water
- Tularoo Basin National Desal Research Facility – Brackish, renewable, small (rural and remote)
- Expedition Unit for Purification, Mobile Unit – Used in Katrina relief efforts, developed by Office of Naval Research
- Desal & Water Purification R&D Program – Increase water supply, lower cost

Challenge – Many programs; fund pieces of programs, not one larger program.

Rod Pittman, Texas Water Development Board. Appointed by Governor, confirmed by Senate; 200 experts on staff. Moving forward with desal drought-proof source of water. They are now in drought in Texas. One-half of population in Texas lives along Gulf. Need to help overstressed water sources (lakes, aquifers). Fixed water quantity, fixed dollars, but growing population. Challenge is funding (capital and O&M costs, disposal of concentrate). 2000 study to locate large sources of brackish water in areas where the need is greatest (no transportation). Oil and Gas has 400 million gallons per day of salt water production – opportunity as source of water. Energy saver –already pumped to surface. Will continue to develop initiates for future, promote forums to discuss issues and develop strategies, and address brine disposal. Brownsville – develop engineering guidelines for future plants, address concentrate disposal, and long-term effects on the aquifers.

Erik Webb, Sandia National Labs and Staff to Senate Energy and Natural Resources Committee. Main debate at federal level is role of government in water resources. Government is not clear on role of paying for water infrastructure. Senate bills addressing new grants – debates $10 billion/year, desal specific $200 million/year until when? Backlog of projects under Title 16 program. Bureau of Reclamation – approved projects, but not funded. Dept. of Energy – fund desal projects.
Needs include:

- Acquisition of information. Office of Science and Technology and subcommittee USGS 2004/2005 list of critical water resources activities – baseline understanding of issues to facilitate long-term decisions.

- Investment in research and development – Office of Naval Research – 3 years to develop mobile water purification units, DOD funded. Best technology for military and humanitarian efforts (Katrina mobilization).
- Bureau of Reclamation – Array of programs
- DOE through Sandia Labs – $4 million/year for roadmapping activities. Five or more years to technology maturity.

Who should be doing what? Partnerships need to be developed with states. Federal investments – partners required. Technology transfer must be improved. Legal rulings in place but no mechanism in place. Regulatory issues managed at state level. Taking waste and making product not well developed, release standards not clear, water rights vs. commercial taxable product, federal government hesitant to rule on state issue. Large commercial company capacity of moving forward does not see business opportunity and Energy Information Agency – helps energy not water. Federal government can create and help – more discussions.

Dr. Fawzi Karajeh, Water Recycling and Desalination Brand of Office of Water, CA Dept. of Water Resources. CA water supply challenges: 36.5 million population in 2005, expected to be 48 million by 2030. Two-thirds of surface water runoff north of Sacramento, while two-thirds need south of Sacramento. New sources: water conservation, water reuse, desal, and water transfer. Integrated resource management needed to improve statewide management. High investment for ocean water desal: $1-2 billion capital investment for 2 million acre-ft/year. Desal Task Force formed in 2002. Department of Water Resources recommended 29 projects in 2003; grant program with $100 million (50 treament, 50 studies); 2005: $25 million committed to desal; 2006: $21 million. Collaboration and coordination needed between CEC, US Bureau of Reclamation, US Desal Coalition, university research, and non-profs.

<u>Creative Financing, Creative Ways of Securing Funding</u>

Ed Archuleta, Multi-state Salinity Coalition and El Paso Water Utilities – EWPU/Ft. Bliss project in El Paso. Forty percent Hueco Bolson – fresh and brackish. Five to six years – NM USGS inventoried Hueco Bolson. EWPU and Army joint project – economy, efficiency, and water resource management. EWPU construct, own and operate. Army provided EIS, injection well exploration, provided land under long-term lease (see CDM handout). Made it a learning facility for education. Geology optimum for waste injection at 2,200 ft. Dollars: 55% grant with 45% local match. Texas Water Development Board interest-free loan of $1 million, EPWU bonds $56.7 million, Army $3.3 million. Army base was able to expand due to this partnership. Per acre-ft/day costs: $163 groundwater, $300 surface water, $508 desal, $786 reclaimed, $1,400 imported water.

Dr. Fawzi Karajeh, Water Recycling and Desalination Brand of Office of Water, CA Dept. of Water Resources. Proposition 50 approved provides grants for desal projects. Benefit from earlier desal work. Costs are lower now, more environmentally friendly. Issues to address: brine disposal, feedwater intake, regulatory (water rights, growth induced issues), energy use, environmental impacts, cost of construction and ops. Costs per acre-feet: brackish $130 - $540, sea water $700-$1300, distribution costs $100-$300, O&M 50%-70% additional. Desal must be included in planning alternatives for water agencies. R&D funded at state level now. CA experience – must have public support and work with them for success. Twenty percent of water projects will be desal. $0.2-$0.6 billion for brackish, $0.7-$1.3 billion for sea water capital cost.

$50 million to start program; $71.3 million in requests. Studies 8%, construction 36%, R&D 2%, pilot 32%. 50% share from local agencies. Guide book development needed.

Bob Raucher, Stratus Consulting. Financial (revenues, cash flow) versus economics (benefits, social costs). New water – is it worth the expense? High cost and revenue is unsure. Reuse still lower than raw water. Benefits – preserve instream flows, diverse eco systems. What are benefits, who benefits? May not be rate payers. Disconnect between those who benefit and those who pay – hard sell. Define baseline – with or without project. Supply reliability – diversify risk across water supply options, surface water (weather dependent) and desal (drought insensitive). Positive externalities – find outside funding. Benefits not well recognized. Positive externalities are preserve/enhance fresh water, wetlands restoration or creation, recreational use, wildlife, etc. Improved quality of water bodies: higher instream flow, salt water barriers, groundwater improvements. Negatives: coastal zone impingement, brine disposal. Opportunities to offset costs: trades for equivalent areas and improvements in same area. Energy source is closely linked. Decouple if possible for future control, offset reduction in energy costs from other water sources (e.g. pumping). 50% possible premium reclaim versus river water. High reliability of water support. $100 per year/household, $4000 per acre-foot. Recreation income and ecological services. Adopt broader economic perspective to fund desal projects.

Getting Your Policy and Community Planners on Board. Desalination and Salinity Management Case Studies

Jerry Maxwell, Tampa Bay Water. Need 191 mgd new projects; 25-50 mgd desal plant, and surface water projects. Drought and environmental stress due to demand is outstripping expansion. Sea water desal plant – estuary located. Cumulative impacts: salinity impacts, operation, technology. Challenge: turn questions/concerns into achievable study objectives. Analysis to resolve issues: environmental study – cumulative impacts, individual impacts. Their one-year operation better performance than study predictions. Lots of presentations to board, media, public. $2.52 per 1000 mgd. Pilot study: pre-treatment, desal, post-treatment "A to Z". Experience with chemical feed, eliminate some trains. Information open – solid data, open discussion, thorough understanding of cost.

Dave Mansfield, Water Resources, Scottsdale, AZ. Look for community opportunities for area improvements. Chaparral WTP – Dog Park, Xero Scape demonstration garden.

Paul Piraino, Alameda County Water District. Desal facility in Newark, CA. Ten percent of demand. Historical – overpumping groundwater, intrusion of saltwater, and imported water. Aquifer Reclamation Program started – pumped brackish water out. Drought 1987-1992. Long-term strategic plan: desal feasibility introduced, integrated plan approach began and completed 1995. Cost-effective, environmental solutions, public involvement. 2001-2003 plant construction. $2.8 grant received. Previous discharge permit amended to include concentrate disposal.

Genoveva Gomez, Brownsville Public Utilities Board. Drought driven. 2001 had 0 projects; 2006 have 30-60 projects. Brownsville: 100% dependent on river water. 20 wells, 250' deep. Desal plant: 14 contracts, $21 million construction. Lower capacity had poor initial results. Next 2 mgd – still poor results. $1.80/1000 gallons delivered, $1.30/1000 gallons treated from plant, $1.50 to $1.12/1000 gallons on Phase 2. No injection – waste to drainage ditch and eventually lake. Trying to get permit changed.

Environmental Issues

Mike Fahy, El Paso Water Utilities. Water Commission formed in 1999, Watershed Council for sustainable water projects. Initially provided review and technical expertise. Pursued own project. Volunteer plus paid project time basis. Database GIS project – hot links to other organizations with data they need: historical and real time data. 2025 grant program – Bureau of Reclamation – improvements and shared data. Additional data needed: salt mass balance, flow measurement stations, temperature, pH, pressure. Use recreational lake as regulating reservoir.

Joe Geever, Surfriders Association. Interest in ocean desal only. 50,000 members, leadership role in community. Issues include cooling water intake – biggest problem. Desal late addition to 3 decades of discussions. Source water alternatives – need more evaluation. Brine discharge – displace marine habitats, mix before discharge. Need more discussion before implementation. Cumulative energy impacts needed – not seen yet in any proposals. Better coordination on regional level, better information. Desal Committee results: CDWR web site. EPA still trying to decide how to respond to all issues on permits. 316B federal regulation on cooling water: Phase 1 new; Phase 2 existing; Phase 3 all others.

Martha Davis, Inland Empire Utilities. Need to have more dialogue, ask questions on all projects coming up, recognize technical issues that need to be addressed in joint forum. Better project when facing hard questions. Water Resources Foundation Board Report for Indirect Potable Reuse Projects – what worked, what didn't. Worked well on communicating. Sold only as water support – community does not understand other links. Generation of renewable energy – build up of salts in groundwater needs to be addressed. Water Cleanup Project – 1st desal, 2nd recapture water supply. Community behind this. Local area continues to grow. Have to develop water supply or will have to import. Energy – link solution to problem. Dairies have organic material – digestors process to develop energy, send methane to desalter. Close loop story – greenhouse gas credit. Environmental community – experts do not always talk to each other. Brine line to treatment plant prior to discharge to ocean.

Jared Huffman, National Environmental Defense Fund. Attorney for Western Water Program and official of Marin Water District. Bay Delta System collapsed because of extreme diversion to San Joaquin Valley agriculture. Their water way is dry 6 months of the year. Chronic water quality problem. Desal project used to put water back into streams. Ran out of water in 1976 due to drought. Constructed emergency pipe to get imported water. They are aggressive on water conservation, recycling. Import water from Russian River area. 1996 SWRCB gave up 15% water to restore fish population. 70% rationing if another drought. Need supplemental water or build new pipeline to next watershed. Forced desal evaluation. Cost of imported water going up, desal going down. Pilot desal project on SF Bay – successful. Educated media and stakeholders. They are coming around. State Grant – good evaluation process. #1 ranked - $3.3 million. Purpose not growth induced, but to reduce imported water. Salmon population, good conservation/recycling history, provide supplemental/backup supply in dry years, and publicly owned and operated. Marin – no coastal power plant needed. New intake meets 316B, fine screening, low velocity. Not cooling water intake and can blend water with brine before discharge.

Managing the Energy Component of Desalination. Managing energy component – energy to pump brackish water to plant, treatment, pump to pressure zone, and brine waste.

Michelle Chapman, US Bureau of Reclamation. $1.50/Kgal 30-40 mgd seawater desal in Spain, $1.25/Kgal 0-20 mgd brackish desal, $0.59 - $6.38/Kgal imported water, $4887/Kgal bottled water, EUWD - $300/Kgal Desal. Financial variability – subsidization by government, tax breaks, assumption of risk. Site specifics – difference in feed water, construction differences, methods, technology. 6.5 kwh/Kgal Port Hueneme pilot project in 2005. Energy is 20 kwH/Kgal 1990. Report #78 USBR Improving Efficiencies - University of Nevada, Reno. 2 mg/l feed velocity – recovery % optimum 6.5 kwH/Kgal, 45% recovery. ADC – 78% efficiency high pressure pump/motor. Unique membrane combination – restrict production in early element, highest production in last element. Seawater desalting 34% cost, indirect costs 32%, power 9% of annual cost. Brackish desalting 42% of cost, indirect costs 24%, power 10% of annual cost. Optimize costs: price break in larger facility, fewer large pumps, smaller train size, larger diameter modules, off-peak operation, keep clean, on-line performance monitoring. Twenty-five staff needed for 10 mgd facility, at $40/hr on average. Heavy instrumentation – cut labor cost. Current technologies – diminishing returns in energy efficiencies.

John Geesman, California Energy Commission. Plan for energy needs. Prior to 2002 energy crisis, most did not really understand link between water and energy. 10-year plan: 1.2% growth in population; per capita energy use growing by 1.4% each year. 13-15,000 mWatts new capacity needed. Existing, aging steam plants less efficient/more pollution. Need to replace by 2012. 7-8000 mWatts permitted, not operating. Factor – least amount of confidence in contribution from water. Water is 19% of consumption. If water conservation put in place, 95% savings, 58% cost. Water agencies need to be self-sufficient and generate own sources of energy. Need to change laws to support source of money flow, integrate with energy companies to fund projects.

Nikolay Voutchkov, Poseidon Resources. Conventional surface water: 1.5–2.2 kWattHours/Year. Temperature has a significant effect – lower temperature, high energy need. Deep water intakes: 5-8 degrees F, takes 3-5% more energy, devoid of oxygen. Back into ocean, add oxygen. Brackish water: lower energy costs than sea water. Co-location with power plants, better desal costs by lowering pumping costs, and cost savings because water is warmer. Use power plant for emergency energy generation plant and avoid power grid connection tariffs. Membrane improvements: unique design – smaller pressure ratio, 5-8% energy savings.

Johnathon Tom, California Public Utilities Commission. Co-location locks in source of water. Collaborative process to resolve differences between energy company and water industry. Regionalization: averages costs. Interconnectivity between systems: adjudicated basin. More efficiency: run at off-peak times to minimize costs. Energy customers will not subsidize water customers. No separate agreements to share facilities. Cannot generate and sell to others. Go to state agencies to work out issues. Use transparent, technological innovation to lower cost.

Congressional Initiatives

Keynote Speaker: Jeff Bingaman, New Mexico Senator. Issues are too complicated to place on each individual state. S1860: R&D related to water issues. NRC: population is increasing, stagnant funding (30% decrease), progress in desal in spite of lower funding. $20/Kgal to $3/Kgal. Achieve environmental goals, lessens stress on surface waters. Data gathering and analysis needed across international borders. Do not undermine water rights, environmental issues. US-Mexico border initiative for characterization. S214 passed in Senate, in House now –

transboundary aquifer bill. Greenhouse effects, global warming, more rain, less snow – affects agriculture, fish, power generation (hydro). Need to increase research/modeling.

Mike Connor, Committee on Energy and Natural Resources. Proper federal role under discussion. Shift in politics – focused on differences to build agreement. On committee, lot of agreement to start with. R&D programs need to be in place to address progressively important issues. Pure science or applied science – more focus on latter. Cannot agree on issues. Need to engage DOE to support water research. Water resources in coastal areas clear. Need to characterize inland brackish water is very critical. Political water rights issues. If tied up in court, cannot construct. Project assistance bills needed to get projects funded. Cost-effective requirements: desal option needs to be included. Larger and larger queue of projects not getting funded. Title 16 program: oversight meeting trying to get things moving. Congress not in sync on needs – priorities for water resources agenda. Discretionary domestic spending (non-defense) expanding under Bush. Cutting proposals for Corps of Engineers, EPA, Bureau of Reclamation. Not in areas really needed. 17% cutbacks now being proposed in general. 11% cut in State Tribal Funds. USDA: rural water cut 20% over past 5 years. USGS: 4% cut, ended up with 2% increase. Bureau of Reclamation: past 5 years plus 30%; big winner. Security and reliability issues 6% cut proposed; may end up in plus. Water 2025 not funded; covers desal. Desal agenda – have to find other ways to cover funding.

Erik Webb, Sandia National Labs and staff to Senate Energy and Natural Resources Committee. Albuquerque example: 30% increase in population since 1995; primary source of water is groundwater, decreased 20% same time. Surface water 70% shift - diversion from Rio Grande. Groundwater will go down 1%/year for next year. $1 billion to shift source. Higher pumping and replumbing required. Sustaining groundwater supply and providing water for next 7, 10, and 50 years have to come from desal/reuse, but they are not looking at this yet. California example: 2-4 million acre-ft/year, not including energy requirements. 1 million acre-feet of water needed to produce marginal energy is needed. Energy-water relationship: water withdrawals for energy equals just agricultural water draws. Government has not measured energy-water relationship well. Energy Policy Act 2005, Section 979 explicit responsibility for DOE to quantify energy-water relationship. Hesitation by DOE to do this. 1860 Senate Bill grant program to anyone: individual/government/agency moving dollars to partnerships. $20 billion budget for DOE: 20% contracted externally primarily to national labs or commercial contracts. Proposed move to external programs to jump start research. Need to hold hearings to broaden exposure of goals and progress.

Technology Transfer and Implementation

Thomas Hinkebein, Sandia National Labs. Planning is not fully comprehensive; cannot think of everything. Predicting costs in future is difficult. Sandia Labs is partnering with Bureau of Reclamation and AWWARF. Roadmapping project to identify needs of water technology supplies and users. Blending users and suppliers to come up with better technology. What are the future needs and how do we meet them? Needs based on 3 categories: seawater, reuse, brackish. Brackish concentrate disposal costs more than sea water disposal; limited resources in inland US. Novel membrane mimics how kidney works: organic structure 100 x more effective at transporting water across structure than existing membranes in industry. Self assembling membrane used for electro dialysis increases salt flux, increase flux of salt through membrane. Desalinating using common fuels: diesel engine is 5% efficient; show more efficiency than current.

Dr. Christopher Gabelich, Metropolitan Water District of Southern California. Concentrate minimization technology: look for low-cost solution for brackish, agricultural drainage, and municipal reuse. Desalter: 60 trucks per day high cost; disposal still an issue. Increase recovery elimination rate limiting using calcium carbonate (plus TDS, high cost), sulfate scales. Accelerate precipitate. Biological sulfate reduction. Modified Lime Clarification. Coprecipate soluble salts – raise pH to force salts out of solution, drop pH and filter. Bench pilot done; moving toward production. Sodium hydroxide used; calcium, barium, strontium, all 3 at once remove better than 95% plus. 92% water recovery at 50% removal, up to 1,100 mg/l of sulfate concentration. pH controlled anaerobic reactor, used organic carbon, stripper used to remove gas. 80% removal of sulfide. Slow process; ramp up to grow organisms; better electron donor than carbon, less expensive.

Mark Beuhler, Coachella Valley Water District. Interface needed between policy and research. Near Salton Sea, $1000/acre-ft and $4K - $5K kwh energy. Not "green" type of desalter. 7 permits required for seawater desalter on average, only 2 for brackish. Can we eliminate permits? Target is agricultural drainage as source water. Membrane $250-$500/acre-ft and 1000-2000 kwh/acre-ft of energy. Brine disposal is an issue. Pretreatment is highest cost: 45-50%. Brine disposal is regulatory issue. Pilot plant use microfiltration now, new soil filtration which worked at other plants. Non-membrane technology: thermal, freeze/thaw, dew evaporation. Use solar energy to heat water, lots of land. Test side by side with membrane. Dispose water in canal – using agricultural water, skip one permit. Zero liquid discharge to Salton Sea; 45,000 ppm already. Build wetlands before discharge to sea.

Robert Reiss, American Membrane Technology Association. Focus on desal research, tailored to short- and long-term goals. Short-term goal utilizes existing technology for new applications. Long-term goal is to find new technologies. Intakes: near shore, offshore, open, onshore wells. Warm vs. cool water intakes. Difficult to do bench evaluations. Pretreatment filtration: element size (larger is better), surface roughness (rougher better), capacity-based, light-activated, indirect freeze. Lots of organizations for partnering: American Membrane Technology Association, AWWA, US Desalination Coalition, USBR, Sandia Labs, Universities, Agencies, MSSC.