Desalination
Offers Drought-Proof New Supply of Drinking Water

Background
Desalination of the ocean or brackish groundwater is rapidly becoming a reality in California. The largest ocean desalination plant in North America went online in Carlsbad, California in December 2015. Several other coastal communities are investigating ocean desalination to add to their water supply portfolio. Major industries in California, such as agriculture, aerospace, bio-tech, and computer manufacturing, require highly reliable supplies of high-quality water. California residents also expect a reliable water supply at affordable rates for home uses.

Desalination has the potential of being a very reliable supply of high-quality drinking water for local and regional systems because it does not depend on variable weather and hydrologic cycles. Desalination will not typically replace traditional water supplies, but augment them to accommodate growth or shore up reliability. As traditional water supply options become strained and unreliable, desalination helps by providing a "drought-proof" reliable drinking water supply. Developing more desalination plants is one of the strategies Australians used during their Millennium Drought. Although not all plants are operating at the moment, Australians are much better prepared to meet the next drought cycle or population expansion through diversifying their water assets.

The Process of Desalination
About 97% of all water on Earth is saltwater. Water that can be desalinated includes seawater and brackish groundwater. Desalination generates less than 0.4% of the water used in the United States, but desalination capacity nationwide increased by 40% between 2000 and 2005. Desalination plants (mostly for brackish groundwater) now exist in every state.

One desalination process is distillation, which involves turning water into steam, then condensing the steam back into water. Reverse osmosis, widely used in the United States, is another process in which saltwater is forced through a membrane with holes too tiny for salt molecules to pass.

Seawater desalination affects the environment in two main ways: entraining fish and other sea life through the intakes of water into the desalination plant; and the discharge of brine back into the ocean after desalination. These environmental effects must be taken into account in the design of a desalination plant to reduce and mitigate impacts. Every plant location is unique, with a different combination of factors, including resident species and currents.

Developments in fish screens and intake designs have helped to lessen the impact of intakes on sea life. Different outfall designs help to diffuse the brine as it is discharged, preventing concentrations of salts and other minerals that could be detrimental to sea life.

Economics of Desalination
When California began developing its water supply in the late 19th and early 20th centuries, little thought was given to environmental impacts. Infrastructure such as dams and canals was built with the sole intent of producing the greatest yield of water. In the 1970s, however, environmental concerns began to take prominence in the Legislature. In addition, the state's rapid population growth was outstripping supplies even as they were being developed.

Water supply development impacts on fisheries and on water quality required an adjustment in the way water supplies were viewed. Dedicating water resources to the environment and to water quality caused shortages that increased the cost of water to agricultural, urban and industrial users. The 1987–1992 drought created additional shortages that forced water suppliers to consider diversifying supplies. Water use efficiency, conjunctive use of groundwater, and integrated regional water management flourished in the 1990s and 2000s as water suppliers sought innovative solutions to supply problems.

Throughout this period, desalination generally was regarded as too expensive to be of much economic benefit. The rising cost of traditional supplies, however, has changed this perception in recent years. Compared with other "new" water supply options, desalination is indeed cost competitive. For example, West Basin Municipal Water District is investing in producing high-quality water through both ocean desalination and recycling. In 2009 dollars, the district calculates that desalinated water, assuming a 20 million gallons-a-day project, would cost $1,700 per acre-foot. The average cost for similar high-quality recycled water would be $1,638 per acre-foot.

The cost of desalination will be blended into the overall costs of the water supply. Overall costs to water users will rise, but only in proportion to the share of the supply from desalination. When this share is relatively small, costs will not increase significantly.

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For example, San Diego County Water Authority ratepayers pay an additional $5 per month for water from the Carlsbad plant.

Desalination in California

According to the Department of Water Resources, 26 desalination plants were operating in California in 2013. Twenty of the plants desalt brackish groundwater; six plants desalt seawater. The production of desalted water in 2010 was 79,942 acre-feet per year for urban use.

In 1991, Santa Catalina Island established a desalination facility that provides 200,000 gallons of potable water per day. Santa Barbara built a desalination plant in the early 1990s to ensure against drought shortages. Due to the extended drought, the plant was rehabilitated and came back on line in May 2017 to help meet water needs.

In 2012, the San Diego County Water Authority signed a water purchase agreement with Poseidon Resources for a 50 million gallon-per-day facility in Carlsbad. The plant went on line in December 2015. The City of San Diego is currently looking at a $3.5 billion plan to recycle treated sewage into drinking water to further bolster its local supplies. Poseidon Resources is trying to get its Huntington Beach facility through the permitting process. It just received a State Lands Commission permit, but still must go before the Coastal Commission. A proposed ocean desalination facility serving South Orange County would utilize state-of-the art "subsurface slant" wells off Doheny State Beach to draw as much as 30 million gallons a day of ocean water for reverse osmosis treatment, yielding up to 15 million gallons of local potable water a day.

In Northern California, there has been discussion of a 65 million gallon-per-day plant in Marin to supply water to the Bay Area, but it was sidelined by local opposition. Regional desalination facilities are being proposed and studied in Monterey County to make up for the loss of water from the Carmel River. The West Basin Municipal Water District is operating a pilot facility for seawater desalination in Redondo Beach.

Desalination Hurdles

Under current California policy, siting a desalination plant is challenging. It requires many permits, such as a local land use permit, water discharge permit, drinking water permit, Energy Commission permit, State Lands Commission permit and, if in the coastal zone, a Coastal Development Permit, just to mention a few. Of course, an environmental impact report also has to be completed. Current federal law requires permits under the Clean Water Act and, given the locale, permits under the River and Harbors Act, at a minimum. The California Water Plan, 2013, estimates as many as 30 department or agency permits are needed.

Desalination faces hurdles that traditional water supplies have not confronted, although that may change. Desalination has to meet 21st century environmental standards for intake of the ocean water and discharging the brine back into the ocean. The State Water Resources Control Board amended its California Ocean Plan to set new rules for ocean water desalination intakes, mitigation and brine discharge early in 2015. The amendments provide for a uniform permitting process.

Naturally, there will be land use-related issues depending on the location of an ocean desalination facility. Many project proponents have investigated co-locating their facility near a power plant that uses the ocean to cool the plant. The power plants' existing intake and brine disposal outfall would be used to also make drinking water. However, power plants that currently use the ocean for cooling will need to upgrade facilities or stop using the ocean for cooling due to the State Water Board's once-through cooling policy.

CalChamber Position

The California Chamber of Commerce supports a balanced approach to securing a safe and reliable supply and conveyance of water for all businesses and residents of California. Desalination, like recycling, water reuse, water use efficiency, conservation, conveyance and new storage, should be pursued to help increase water supply. Permit streamlining amongst the various agencies should be undertaken to expedite the approval process.

Desalination is a viable option for the state's future water supply picture. In order to meet its water supply challenges, California needs to pursue desalination where appropriate and feasible. Desalination will provide an invaluable addition to a well-balanced local or regional water portfolio with a reliable drought-proof component.

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