

Mike Sandler
msandler1@ucla.edu
March 9, 2009
Smart Growth Case Study

Cap & Share for Water in California

New laws, such as California's SB375, utilize compact development and other Smart Growth strategies, requiring fewer resources to accommodate a growing population. Unfortunately, over the next 50 years, California's resources may not keep up with population growth. Despite the increasing likelihood of resource limitations including drought and overstrained water supplies, most local governments rely primarily on voluntary conservation efforts until a crisis hits. This case study discusses capping water use in California at 2005 levels, and distributing a tradable "Share" of the water under the cap to residents on an equal per capita basis. The Share could take the form of a line item on a utility bill, or a value on a debit card. Smart Growth and other efficiency measures may delay the need for a statewide resource rationing program, but eventually 21st century planners may need to consider a program such as Cap & Share for water.

Outline

- I. Introduction: California's growing population, shrinking resources
 - a. Water-Energy Nexus
- II. Water
 - a. The Current Drought
 - b. A Smart Growth Response to Increasing Water Scarcity
 - c. Water rights and Rationing
 - d. Pricing as a rationing strategy, and its limitations
 - e. Agencies' Current Rationing Plans
 - f. Statewide Targets for Water Use Reduction
 - g. Cap & Share for Water
 - h. Policy Questions
 - i. Conclusion
- III. Cap & Share for Electricity
 - a. Rolling Blackouts
 - b. Causes of Future Energy Scarcity
 - c. Cap & Share for electricity
 - d. Conclusion

I. Introduction

The promise implicit in the term “Smart Growth” is the ability to accommodate more people using fewer resources. In general this refers to a more efficient use of land (i.e. dense development instead of sprawling), but Smart Growth may also imply development utilizing sustainable water and energy resources and incorporating greater water or electricity efficiency. A region that is practicing Smart Growth would be expected to be able to better provide residents with water and electricity into the future than one that is not.

Planners in California are using Smart Growth as a means of reducing the resource requirements of a growing population. New laws, such as California's SB375, encourage regional metropolitan planning organizations to incorporate compact development, pedestrian-friendly design and other Smart Growth strategies in order to reduce vehicle miles traveled and assist the State with its AB32 goals of reducing greenhouse gas emissions back to 1990 levels. Such efficiency measures will play a role in reducing the vulnerability of Californians to the future resource constraints, but may be insufficient to accommodate the projected growth in the state. The efficiency savings of Smart Growth and voluntary conservation measures may be overwhelmed by the state's growing population in the next few decades.

Local governments should be prepared for times of severe water and energy restrictions. Most local governments rely primarily on voluntary conservation efforts until a crisis hits. This paper describes some of the factors contribute to the increasing likelihood of water and energy limitations in California including climate change, drought, overstrained water supplies, energy transmission bottlenecks, and new laws changing energy portfolio and performance requirements. After describing current ad hoc (emergency) restrictions including water rationing and rolling blackouts, it proposes a form of resource rationing called "Cap & Share," which provides a tradable per capita allocation that encourages conservation and rewards low users.

California's growing population and shrinking resources

Over the next 50 years, California's resources may not keep up with population growth. California's population is predicted to increase from 36 million to 60 million people by 2050.¹ Can our existing water and energy resources accommodate an additional 24 million people? Los Angeles County alone is projected to grow from 9.6 million to 13 million by 2050, an increase of 27 percent. Since the State's last drought in 1991, population has grown by 9 million people. On average, each of those people uses 183 gallons of water a day for drinking, cooking, washing, flushing, cleaning, and watering, although less than 5 percent of that is for drinking and cooking combined.

¹ California Department of Finance. Press Release, July 7, 2007.
http://www.dof.ca.gov/html/DEMOGRAP/ReportsPapers/Projections/P1/documents/P1_Press_Release_7-07.pdf

The Water-Energy Nexus

Before discussing water and energy separately, it should be noted that the two are intertwined.² Water use entails energy use, because it takes water to pump, move, heat, and treat water. Water also generates energy, through hydroelectric power. The Association of California Water Agencies estimates that approximately 20% of California's total electric use and 32% of total natural gas use is used in the supply, treatment, distribution, end-use, collection, treatment, and discharge of water.

California has relied on energy imports to meet approximately 25% of its electricity needs. A major source of imports comes from hydroelectricity from the Pacific Northwest. Less rainfall reduces energy production. Droughts in the Colorado River's lower basin have shown that a 10 percent decrease in runoff can reduce hydropower production by 36 percent.³

Southern California imports much of its water from Northern California. The California Energy Commission (CEC) estimates that urban water uses in Southern California are more than three times as energy-intensive as those in Northern California. The State Water Project, which delivers water from Northern California to the Central Valley agriculture and Southern California households, is the largest single user of energy in California, consuming an average of 5 billion kWh/yr and accounting for an estimated 2 to 3 percent of all electricity consumed in California. The CEC estimates the State Water Project uses about 8,900 kilowatt hours to deliver a million gallons of water (kwh/MG). An NRDC report estimates it uses 3,000 kwh/acre foot, and water delivered to Southern California from the Colorado River Aqueduct uses 2,000 kwh/acre foot. Once that water is used, then it must be disposed of. The Metropolitan Water District of Southern California estimates that the wastewater facilities in its service territory consume between 1,470 to 3,840 kWh/MG.

II. Water

The Current Drought

Spring 2008 was the driest since 1921 in the northern Sierra. California's Department of Water Resources stated that January 2009 was the eighth driest on record.⁴ Although more rain had fallen by March 2009, because of several dry years in a row, 2009 precipitation and snow would have to be 120 to 130 percent of normal in order to

² California Energy Commission. "California's Water – Energy Relationship." Prepared in Support of the 2005 Integrated Energy Policy Report Proceeding. November 2005.
<http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF>

³ Ronnie Cohen, Barry Nelson and Gary Wolff, "Energy Down the Drain: The Hidden Costs of California's Water Supply," Natural Resources Defense Council and Pacific Institute, Oakland, California, August 2004.

⁴ Associated Press, "California Facing Worst Drought in Modern History," USA Today, January 30, 2009, http://www.usatoday.com/weather/drought/2009-01-30-california-drought_N.htm.

replenish reservoirs, which is unlikely. As a result, on February 27, 2009 Governor Schwarzenegger declared the third consecutive year of drought constituted a state of emergency, and all urban water users were to immediately increase their water conservation activities in an effort to reduce their individual water use by 20 percent.⁵ News articles declared it “a step closer to mandatory water rationing.”⁶ Also in February, Los Angeles Mayor Antonio Villaraigosa called for implementation of shortage-year water rates. “Water shortages are becoming permanent realities,” the mayor said.

Recent water scarcity has been apparent in three notable areas: the Sacramento-San Joaquin River Delta, the Colorado River, and the watersheds of Sonoma County.

As mentioned above, water in the Sacramento-San Joaquin River Delta is pumped into the State Water Project and a major source for Central Valley agriculture and Southern California households. However, in December 2008, a judge limited Delta water transfers, and new rules to protect smelt in the Delta permanently reduced Delta water deliveries by 20 percent to 30 percent. The restrictions were due to the collapse of several endangered fish populations, including the Delta Smelt. The Chinook salmon fishery had the lowest spawning numbers on record. Republican Congressman George Radanovich introduced “The California Drought Alleviation Act,” a bill that would suspend endangered-species protections in the Sacramento-San Joaquin Delta. At the State level, Governor Schwarzenegger has given support to Republican State Senator Dave Cogdill’s SB 371, “the Safe, Clean, Reliable Drinking Water Supply Act of 2009,” which would attempt to build more dams and a peripheral canal around the Delta similar to the one rejected by voters in 1982. Democrats and environmentalists prefer conservation measures over more dams.

The Colorado River has had an 8 year drought.⁷ Even if it were not a drought, California has agreed to reduce its allocation from the River. The 2003 Colorado River 2003 Quantification Settlement Agreement (QSA) requires that California recipients of Colorado River water reduce their use over the next 14 years to California’s basic annual allocation from a high of 5.3 million acre-feet to 4.4 million acre-feet, also called the “4.4 Plan.”

In Sonoma County, Lake Sonoma, a major reservoir for a half million people north of San Francisco, is 21 percent below 2008's levels. The Sonoma County Water Agency, which controls much of the water rights in the Russian River, and is a wholesaler to several cities, has stated that water use reductions of 30-50% may be necessary this year. Dr. Robert Eyler, director of the Center of Regional Economic Analysis at Sonoma State University has estimated that a 30 percent water shortage could cause a loss of over \$5

⁵ California Governor’s Office, Press Release, “Gov. Schwarzenegger Takes Action to Address California’s Water Shortage,” February 27, 2009. <http://gov.ca.gov/index.php?/press-release/11556/>

⁶ Environment News Service. “California Faces Water Rationing, Governor Proclaims Drought Emergency,” February 27, 2009. <http://www.ens-newswire.com/ens/feb2009/2009-02-27-093.asp>

⁷ Tim P. Barnett and David W. Pierce, “When will Lake Mead go dry?” Water Resources Research, 44, Scripps Institution of Oceanography, University of California, San Diego, March 29, 2008. See: <http://scrippsnews.ucsd.edu/Releases/?releaseID=876>

billion in the local economy's gross product and loss of 37,000 jobs, in part due to the local agriculture and wine industry's reliance on Russian River water.⁸

A Smart Growth Response to Increasing Water Scarcity

California has begun to integrate water scarcity into land use planning. Two California laws that became effective in 2002, Senate Bill 610 and Senate Bill 221, require that projects of 500 houses or the equivalent produce proof of a 20-year supply of water and that cities have an adequate water supply for existing and planned future uses for a projected 20-year period.⁹ In February 2007, the California Supreme Court ruled in the case *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* ("*Vineyard*") that EIRs for new developments must address concerns around potential insufficient water supply in order to comply with CEQA requirements. The Court stated that EIRs must contain written verification that adequate water supplies will be available for the proposed project as well as other existing and planned future uses for a projected 20-year period.¹⁰

Those laws are meant to address the problem of "paper water," water that exists only on paper as a result of overallocation of water rights. Actual supplies may be less than water rights on paper when local governments extrapolate future water supplies based on past years, but do not account for drought years, or if the baseline assumes greater than average rainfall.

Water Rights and Rationing

Water rationing is implemented differently depends on whether the user of water is an urban household serviced by a water agency, or a rural landowner that has water rights. The State can set requirements for water agencies serving urban users, but the State would follow a different process to regulate rural users that hold water rights.

Riparian rights, which allow the landowner to extract water from waterways adjacent to the land, are the most senior form of water rights. Riparian rights are a common form of water rights east of the Mississippi River where water is less scarce, and are typically held by rural landowners. According to California's water rights system, adopted in 1914, water rights have a seniority ranking, depending on when they were applied for. Importantly, riparian rights apply to surface waters, but not groundwater. Groundwater follows a separate regulatory process. For decades in many areas there were few restrictions on groundwater pumping. Starting in 1993, some jurisdictions in California began to adopt Groundwater Management Plans.

⁸ Sonoma County Water Agency ENews. "Water Storage Levels Projected to Reach Uncharted Territory," February 2009.

<http://scwa2.computergrafixco.com/eNews/index.asp?issue=2/1/2009&campaign=Enews&article=2044>

⁹ SB610 (Costa). http://www.groundwater.water.ca.gov/docs/sb_610_bill_20011009_chaptered.pdf

SB 221 (Kuehl). http://www.groundwater.water.ca.gov/docs/sb_221_bill_20011009_chaptered.pdf

¹⁰ *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (Sunrise Douglas Property Owners Association), S132972, SUPREME COURT OF CALIFORNIA, 2006 Cal. LEXIS 14549, November 1, 2006, Decided 40 Cal. 4th 412, 53 Cal Rptr. 3d 821 2007

The State Water Resources Control Board has the power to limit riparian rights, although it has rarely done so. State regulators do have the power to cut off water diversions in the public interest in order to protect the environment or to account for supply constraints during a drought. Environmental groups have petitioned the Board to enforce policies to preserve instream flows for fish and aquatic life. As a result, the State Water Board released the Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams in December 2007. Recently, due to the current drought, the State Water Board sent out letters to 7,000 water rights holders, including every city and farm with state water rights in the watersheds of the Sacramento, San Joaquin and Russian rivers as well as the central coast and the Tule Lake region of Lassen County, stating that their water rights may be curtailed due to the current water scarcity.¹¹

Pricing as a rationing strategy, and its limitations

One potential solution to the overuse of environmental resources is to raise the price of the resource to reduce demand to the optimal level. Pricing has the potential to internalize environmental externalities of overuse. Water is heavily subsidized. Subsidies increase consumption and counteract incentives for conservation. Subsidies have distorted the price of water, especially for agricultural users. As this is more widely recognized, artificially low water prices are rising as subsidies are phased out.

However, the elasticity of demand for water can limit the effectiveness of pricing-only strategies. One economic model showed that San Diego would have to double the price of water to achieve a 20 percent reduction in consumption. For that reason they are going to allocation restrictions rather than only pricing.

Agencies' Current Rationing Plans

The Metropolitan Water District (MWD) of Southern California provides 85 percent of the region's water supply to 26 cities and water districts serving 18 million people, and raised its wholesale price by 14.3 percent starting January 1, 2009. In February, the L.A. Department of Water and Power adopted a plan to make homes and businesses pay a penalty that nearly doubles normal prices for any water they use in excess of a reduced monthly allowance. A similar rationing system was put in place in March 1991.¹²

On May 13, 2008, East Bay Municipal Utility District set out reduction goals, prohibited certain water uses and declared a water-shortage emergency across the district's system,

¹¹ Weiser, Matt. "California farms, cities warned they may lose access to state's creeks, rivers" Sacramento Bee. March 3, 2009. http://www.sacbee.com/378/story/1666458.html?mi_rss=Environment
Fikes, Bradley J., "Met price hike to float local water rate increases." North County Times, March 15, 2008. http://www.nctimes.com/articles/2008/03/16/business/news/8_48_983_15_08.txt

¹² Gorman, Steve. "Los Angeles nears water rationing" Reuters. Tue Feb 17, 2009.
<http://www.reuters.com/article/environmentNews/idUSTRE51H0AL20090218>

which serves 1.3 million residents between Oakland, Alameda County, Danville, and Castro Valley.¹³

The City of San Diego has held hearings on a plan to allocate water to customers based on their usage in 2006 and 2007. Michael Shames executive director of the Utility Consumers' Action Network in San Diego opposed the plan, saying, “The city should be targeting the 'wasters' and getting them to tighten their belts.” Shames proposes a “savers” rate that “rewards people who don't use much on a per-capita basis and makes those who do use more water pay for that privilege.”¹⁴

The Santa Rosa City Council declared a Stage One water shortage on Tuesday Feb 24, 2009. Stage One entails a voluntary 15% reduction in water use. The next three Stages increase restrictions up to Stage Four mandatory restrictions of 60%. In Stage Four, a family of three that uses 12,000 gallons a month would see their normal monthly water bill of \$53.12 jump to \$138.39, the result of water shortage and excessive use surcharges.¹⁵

Statewide Targets for Water Use Reduction

In a letter to the California State Senate on February 28, 2008, Governor Schwarzenegger suggested “a plan to achieve a 20 percent reduction in per capita water use statewide by 2020” as part of a comprehensive solution to problems in the Sacramento-San Joaquin Delta. In March 2008 the 20x2020 Agency Team was convened to develop a plan to achieve **a 20 percent reduction in per capita urban water use statewide by 2020.**¹⁶ This goal was incorporated as an overall objective in the Bay-Delta Workplan. To support this objective, the State Water Resources Control Board (State Water Board) began a public process to consider development of an urban water conservation regulatory program. Then, on December 1, 2008, Assemblymember Mike Feuer (D-Los Angeles) introduced Assembly Bill 49, which will reduce California’s urban per capita water use by 20 percent by December 31, 2020.

Table 1: A 20 percent reduction in per capita water use statewide by 2020

Current gallons per capita per day	192
2015 target (10% reduction)	173
2020 target (20% reduction)	154

¹³ Zito, Kelly “East Bay begins water rationing” San Francisco Chronicle. May 14, 2008
<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/05/14/BA3U10LJKB.DTL>

¹⁴ Lee, Mike. “Rationing proposal may pit super savers vs. wasters” San Diego Union-Tribune, February 7, 2009.

¹⁵ McCoy, Mike. “Santa Rosa declares water shortage” Press Democrat, February 25, 2009.
<http://www.pressdemocrat.com/article/20090225/NEWS/902251112/1033?Title=Santa-Rosa-declares-water-shortage>

¹⁶ State Water Resources Control Board, 20x2020 Agency Team webpage.
http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

The California Energy Commission estimates that California uses about 14 trillion gallons of water in a normal year, with about 79 percent used for agriculture and the remainder (2.94 trillion gallons) in the urban sector. This is about 8 billion gallons of water per day in cities. During summer months, as much as 50-70 percent of residential water use in Central and Southern California is for landscape irrigation.¹⁷ Meanwhile, California's approximately 80,000 farms operate on about 27.6 million acres of farmland, and irrigate about 9 million acres. The Department of Water Resources (DWR) current trends scenario predicts urban water use increasing by 977 billion gallons (3 million acre-feet) per year by 2030 (within a range of 1.4 and 5.8 million acre-feet per year by 2030, depending on factors of population, economic activity, and water use efficiency). Agricultural water use is expected to decline as land is converted to urban uses.¹⁸

Can California meet the 20 percent reduction goal by 2020? Perhaps one method to accomplish this is a rationing program called Cap & Share.

Cap & Share for Water

The Cap & Share concept was developed in 2006 by a non-profit organization based in Ireland and the UK called FEASTA-The Foundation for the Economics of Sustainability.¹⁹ Cap & Share was originally developed as a method to distribute shares of an economy-wide cap on greenhouse gas emissions (GHG) to citizens on an equal per capita basis. The point of regulation is upstream, and fossil fuel producers and importers are required to purchase the shares from people. As people sell their shares to the upstream companies, the companies raise fuel and energy prices, but return the "scarcity rent" of the permits back to households. As the overall cap declines, the shares gain in value. Households that use more fuel than average will end up spending the value back to fuel companies, while households that use less fuel may come out ahead at the end of the year.

Perhaps this model could be applied to water. All households would be provided a base allocation to cover their drinking, cooking, and bathing needs. Customers would pay for this base allocation water under the existing rate structure of their utility. Above the basic allocation, tiered rates would apply. However, when a utility approaches major water scarcity, they could implement Cap & Share for Water by distributing equal tradable rights to limited water consumption within their jurisdiction. These rights (or Shares) are distributed through the water company billing system or through a debit card. The Shares are either paid back through the utility bill as they are used, or sold by

¹⁷ One acre-foot is equal to 325,851 gallons. 2.94 trillion gallons is about 9 million acre feet. Other sources stated that in 2000, California cities and suburbs used about 8.7 million acre-feet of water.

¹⁸ California Department of Water Resources, California Water Plan Update 2005: A Framework for Action, Bulletin 160-05, Sacramento, December 2005.

<http://www.waterplan.water.ca.gov/previous/cwpu2005/index.cfm> and

Morrison, Jason, Morikawa, Mari, Murphy, Michael, and Schulte, Peter. "Water Scarcity & Climate Change: Growing Risks for Businesses & Investors." CERES and the Pacific Institute. February 2009.

http://www.pacinst.org/reports/business_water_climate/index.htm

¹⁹ FEASTA's website is <http://www.feasta.org>. The Cap & Share website is www.capandshare.org. The author maintains a website describing a similar concept called Carbon Share at www.carbonshare.org.

conserving customers to high-use customers through the billing system or through an online exchange similar to EBay.

Policy questions: urban users only, metering, paper water, and instream flows

A Cap & Share program for water would seem to work best for urban water users. It would become more difficult to implement for surface water due to legal issues around riparian rights. Although groundwater is a true Commons, similar to the climate, groundwater management is not yet developed enough to monitor, implement, or enforce water use across a jurisdiction. Perhaps groundwater could be included in the future.

Real-time monitoring of water meters could alert customers when they used up their base allocation. Then, when they were close to exceeding their additional Shares, they could be alerted. This would provide feedback that their rates would change, or that they would need to buy additional Shares either from other customers or from the utility.

Similar to carbon emissions trading, a pre-existing inventory of supplies is crucial. Otherwise, too many permits or Shares might be allocated, resulting in the “paper water” problem described earlier. Water agencies often know their existing supplies, but in an era of climate change, will not be able to predict supplies past a couple of months in the future. For this reason, the Shares would need a very short expiration date such as one month.

Agencies would have to avoid allocating all the water rights during times of scarcity. Instream flows are important for aquatic life including fish.

Conclusion

A tradable Cap & Share for Water program could complement a tiered rate structure by rewarding conserving households during times of scarcity. A short term goal might be the 20 percent reduction in per capita water use for urban customers. Of course, the most important question not considered in this paper is the political feasibility of a Cap & Share for Water program. Similar to congestion pricing or a carbon tax, current users might prefer to continue to assume that resources are infinite or that resource use should be subsidized rather than paying the full cost. Others may think that they are entitled to a large lawn and those that conserve are merely making a “lifestyle choice.” Although California has begun to include water scarcity issues into planning new developments, water resource limitations due to drought, population growth, or other factors may require economic incentive programs such as Cap & Share for Water.

III. Cap & Share for Electricity

In addition to water, California's energy resources may become stressed by the state's population growth and environmental requirements. New laws such as SB1368 have changed utilities' energy portfolio and emission performance standards. During the transition to renewable energy sources, the grid may face transmission bottlenecks, and time lags in permitting new generation facilities. Similar to policies for water scarcity, most local governments rely primarily on voluntary energy conservation efforts until a crisis hits. This appendix discusses capping electricity use in California at 2005 levels, and distributing a tradable "Share" of the water or electricity under the cap to residents on an equal per capita basis. The Share could take the form of a line item on a utility bill, or a value on a debit card. Smart Growth and other efficiency measures may delay the need for a statewide resource rationing program, but eventually 21st century planners may need to consider a program such as Cap & Share for electricity.

Energy Scarcity and Rolling Blackouts

In January 2001, California experienced rolling blackouts, notoriously associated with the state's energy crisis in what has been called a "failed deregulation." A rolling blackout was defined as taking 550 megawatts offline. A megawatt can power around 750 homes, so each rolling blackout takes about a half-million homes offline. Areas are divided into blocks listed on utility bills. For example, Northern California is divided into 14 numbered blocks. The rolling blackouts occurred following the imposition by the Federal Energy Regulatory Commission (FERC) of a "soft-cap" on the wholesale price of electricity sold in state. According to Stanford Professor Frank Wolak, a lack of forward contracts enabled generators to exert market power on the spot-market price of electricity. Power generators declared forced outages in order to raise the spot-market price, which when it exceeded the soft-cap caused the state to assume there was not enough power on the grid, and declare a Stage 3 power alert, which means power reserves are extremely low, rolling blackouts are possible and Californians are asked to conserve electricity.²⁰

California experienced electricity scarcity due to weather conditions in the abnormally hot summer 1998. During hot weather, more homes use air conditioners. At the same time, hydroelectric power from the Pacific Northwest was lower than normal.

Parts of Los Angeles were subject to rolling blackouts on Nov 15, 2008, when a fire threatened high-voltage transmission lines along Interstate 5, causing the Department of Water and Power to orchestrate rotating power outages in some districts.²¹

²⁰ Wolak, Frank. Lessons from the California Electricity Crisis. Center for the Study of Energy Markets (CSEM) Working Paper May 28, 2003

<http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1010&context=upei/csem>

²¹ CNN News. "Winds hinder firefighting efforts near Los Angeles" November 15, 2008.

<http://www.cnn.com/2008/US/11/15/california.wildfires/index.html>

Causes of Future Energy Scarcity

One potential causes of energy scarcity in California include transmission congestion that limits the number of generators able to sell power into the congested region. Some renewable energy projects in Southern California face transmission line issues, notably, a project in San Diego called Sunrise Powerlink that would connect wind energy in Baja, Mexico, to SDG&E (Sempra). LADWP is facing some resistance to a geothermal project near the Salton Sea, with a transmission line called Green Path North. Transmission line delays are not the only factor in the potentially long time lag necessary to construct new generation capacity. Site location and permits for a sizable new generating facility to producing electricity from this facility can take over 24 months.²²

Even though state has built several new power plants since 2001, capable of generating 12,908 megawatts of electricity. In that time the state also shut down 6,134 megawatts, for a net gain of only 6,774 megawatts. Hot weather contributes to high energy demand. During the summer of 2006, the state was still close to energy shortage partly due to population growth in the state's Central Valley, where air conditioners in new homes use a lot of electricity. California now has over 44,000 MW of installed capacity and 10,000 MW capacity of transmission to import electricity from out-of-state. In 2000 Northern California had 5.167 million customers (PG&E and SMUD) and Southern California had 7.057 million customers (SCE, LADWP and SDG&E) representing 92 percent of California's electric customers. The customer allocation was 42.3 percent in Northern and 57.7 percent for Southern California.

The move away from coal and to natural gas may also leave the state vulnerable. In dry years, reduced hydroelectric production in the Western states leads to increased gas-fired electric generation to meet electric demand. Natural gas provided about 30% of state's electricity in 2006. However, in-state production of natural gas has fallen from 33% of gas used in 1987 to only 13.5% in 2006. Most natural gas used in California, about 85%, is imported from out-of-state, across four large interstate pipelines. As the nation considers climate change legislation, more states are expected to move away from coal-fired electricity and towards natural gas. Natural gas demand is expected to increase 5.5% per year across the country.²³

Pricing as a potential solution

Professor Frank Wolak of Stanford believes that real time pricing is a potential solution to the state's energy problems. Real-time pricing would force businesses and other consumers to pay more when electricity demand is highest.

²² Baker, David R. "Phew! Power use soars -- California barely dodges rolling blackouts Energy on brink: State has added only 6,774 megawatts since '01." San Francisco Chronicle. July 25, 2006.
<http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2006/07/25/POWER.TMP>

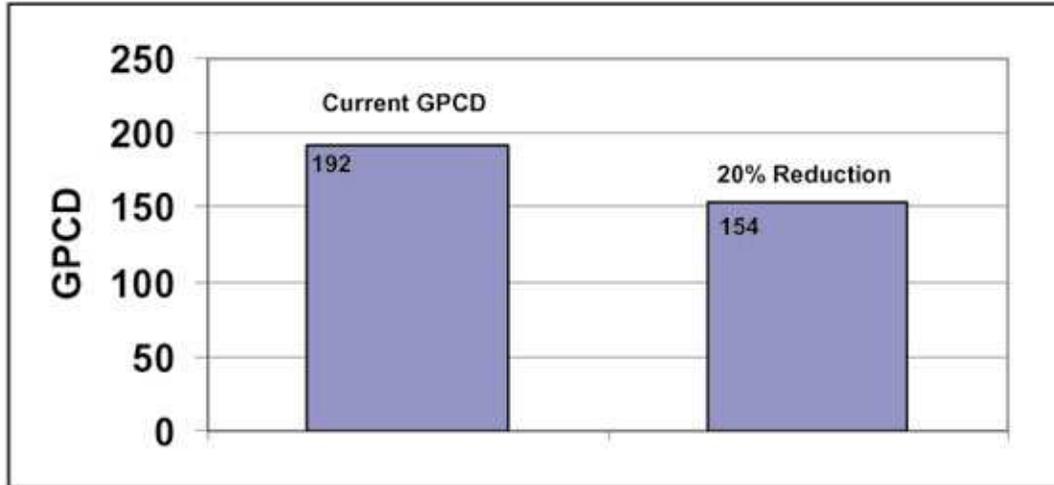
²³ California Energy Commission. An Overview of Natural Gas in California.
<http://www.energy.ca.gov/2008publications/CEC-180-2008-005/CEC-180-2008-005.PDF>

Cap & Share for Electricity

Another potential solution is Cap & Share for Electricity. Cap & Share, described in this paper, was initially developed to reduce greenhouse gas emissions, but could be applied to electricity. The program distributes equal tradable rights (or Shares) to electricity consumption within a jurisdiction. The Share is distributed through the utility company bills, or through a debit card, and is either paid back to the utility through the utility bill, or sold by conserving customers to high-use customers via the utility or through an online portal similar to EBay.

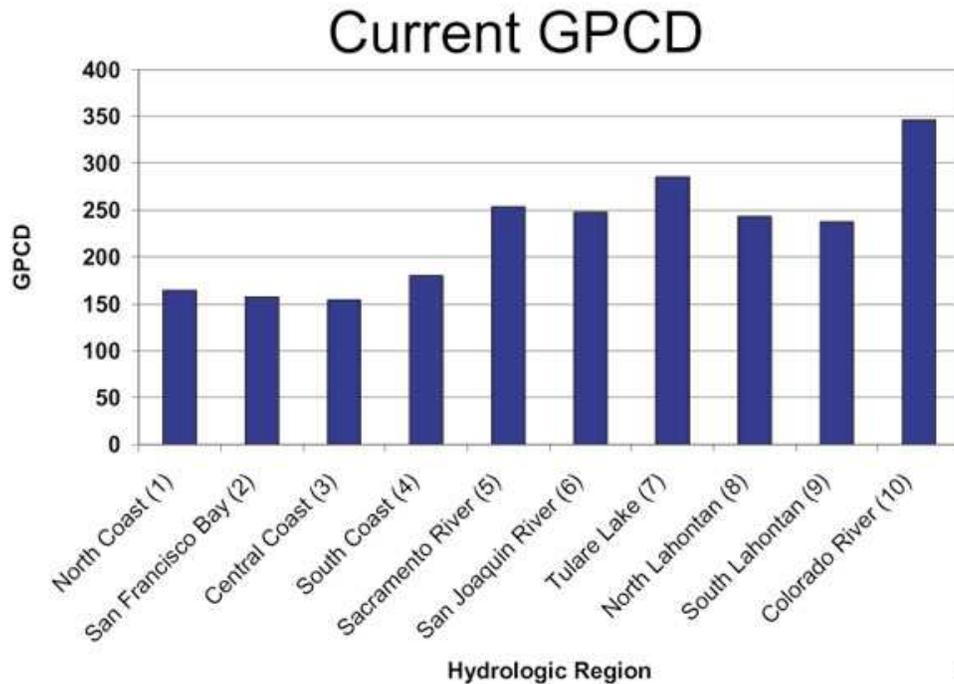
A future paper could assess policy implications of such a program, and perhaps look at data from 2005 to estimate how a Cap & Share program could work for California's electricity sector. In an era of climate change and water and electricity scarcity, this sort of program could assist jurisdictions facing serious resource constraints, and deal with events including drought or blackouts, by using a system that encourages conservation and rewards low users.

Statewide GPCD



GPCD = Gallons Per Capita Per Day

Source: 20x2020 Agency Team (cit. 16)



5