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PACIFIC INSTITUTE

METERING IN CALIFORNIA

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The drought is prompting a closer look at the use and management of the state's water resources. One area that has come under increased scrutiny is the use of water meters. While water meters have been in use for decades in most California communities, they are not yet universal. Even in California, more than 219,000 urban water connections remain unmetered. Additionally, the majority of multi-family units have a single meter for all units. Studies show that metering, when coupled with effective pricing structures, reduces water use by 15% to 20%. Additional water savings are possible through improved management of the water system, particularly the identification and repair of leaks in the distribution system. Water savings from metering all connections in California can produce considerable water savings at the local level, reducing vulnerability to drought and other water supply constraints. Moreover, water savings in previous years would have been left in storage. Metering is an essential water management strategy and expanding and improving metering should be a priority for all California utilities.

METERING IS ESSENTIAL FOR EFFECTIVE WATER MANAGEMENT

Metering is an essential element of effective water management. In the absence of meters, customers are billed at a flat rate – meaning that they pay the same amount regardless of how much water they use. Metering enables utilities to use pricing to encourage water conservation and efficiency. Charging customers by volume sends a price signal to customers to use the resource more efficiently (Renwick and Green 2000; Beecher et al 1994).

Metering data can also be used to manage demand through non-price mechanisms. Meters can help utilities and customers identify and locate leaks and losses from the system. Not only does this reduce overall water losses to the system, it can also reduce the cost to customers who pay for unused water. In addition, utilities can use information on customer water use to target water conservation and efficiency programs to customer classes or individual customers with particularly high water use. Similarly, this information can help customers plan and implement conservation and efficiency efforts.

Despite the known benefits of water metering, there are barriers. For example, meter installation requires a large up-front investment, especially when existing infrastructure must be retrofitted to accommodate the new device. By the time the City of Sacramento completes their meter installation program, the city will have spent more than $416 million to install 110,000 meters and make other related infrastructure upgrades (Morain 2014).

Several new metering technologies provide sophisticated water use measurements, enabling water utilities and customers to improve use and management even further. Automatic meter reading (AMR) systems automatically send real-time water usage data to the utility, without the need for an employee to physically read the meter onsite. Advanced metering infrastructure (AMI) also reads usage automatically and allows two-way communication between the customer and the utility. Utilities using these systems can collect usage data every day, hour, or more frequently, resulting in a more accurate water bill and a more detailed understanding of a customer's water use patterns. They can also help to detect leaks. For example, after

converting to an AMI system, the City of Santa Maria reduced their water losses from 6% to 2% (Godwin 2011). Likewise, an AMI system in the City of Sacramento detected leaks that the City then repaired, saving 236 million gallons of water over two years (DWR 2013). Moreover, these systems enable water utilities to charge customers according to real-time water use[1], manage the system remotely, and provide customers with information about water quality emergencies, demand peaking, or system disruptions.

METERING PROMOTES WATER EFFICIENCY

Several studies have shown reductions in water use after implementing metering and volumetric pricing policies. One of the earliest studies on the impacts of water metering was conducted on residents in Boulder, Colorado, and showed a 36% decrease in monthly indoor household water use (Hanke 1970). A more recent California-based study showed that metering and volumetric rates reduced household water use by 54 gallons per day (gpd) in Bakersfield, 37 gpd in Chico, and 13 gpd in Visalia (Tanverakul and Lee 2013). Similarly, the City of Davis installed meters on nearly 10,000 homes and began a metered billing rate, effectively reducing per-capita water use by 18% (Maddaus 2001). In addition, city officials in Fresno found that installing meters and charging by volume reduced per capita water use by 17% (Haagenson 2012).

Similar levels of water savings are possible with submeters. A national study conducted in 2004 showed multi-family residential units with submeters resulted in 15% water savings compared to properties that billed for water as part of the rent (Mayer et al. 2004).

METERING IN CALIFORNIA

The California legislature has recognized the importance of metering and has passed several bills requiring meters in California. In 1991, the legislature passed SB 229, requiring meters on new connections after 1992. The legislation, however, did not require utilities to actually read the meters or to use that data to bill customers by volume. In 2003, AB 514 required Central Valley Project water users to be fully metered by 2013 and start charging metered users volumetrically by 2010. Then in 2004, AB 2572 (Kehoe) closed the loophole in SB 229 by requiring urban water utilities to meter *all* municipal and industrial users by 2025 and charge metered customers based on the actual volume of water delivered. In 2009, the legislature passed similar requirements for California's investor-owned utilities (AB 975 Fong).

California utilities have made considerable progress on metering in most areas. Fresno, for example, which had passed an amendment to the city charger prohibiting the reading of water meters for billing purposes for single family residential users, is now completely metered and charging customers based on their water use (City of Fresno 2014). Some utilities, however, still have a ways to go. According to data from the California Department of Water Resources (2014) and personal communication with utility staff and the Regional Water Authority, 39 water utilities have more than 219,000 unmetered connections (Figure 1, Table 1). In these communities, unmetered connections account for 30% of all connections, on average. Of the unmetered connections in the state, 14% are in Sacramento County.

In addition, the majority of those living in multi-family units are not yet metered. According to the U.S. Census Bureau, roughly 12 million Californians live in multi-family housing. These residences account for approximately 31% of California's total housing units, higher than the national average of 26% (US Census Bureau 2012). A report prepared for the California Urban Water Conservation Council in 2006 estimated that submetering these residences would save about 96,000 acre-feet per year, or about 20 gallons per housing unit (Koeller et al. 2006). The potential statewide savings are likely higher today because additional multi-family units have been built without meters over the past decade.

Cities and utilities in California are requiring or incentivizing submetering for multi-family units. In 2010, the San Diego City Council passed an ordinance that requires submeters on all new multi-family residential and mixed-use developments with three or more units, as well as in existing buildings when interior water plumbing is being replaced. This was an important move for the city to help reduce water demand, as multi-family units account for 44% of the housing units in the area (IBA 2010). The ordinance also outlines how the property owner should bill their tenants. Other utilities incentivize submetering through rebates. East Bay Municipal Utility District, for example, offers a rebate to multi-family property owners of up to $250 per meter (East Bay MUD n.d.).

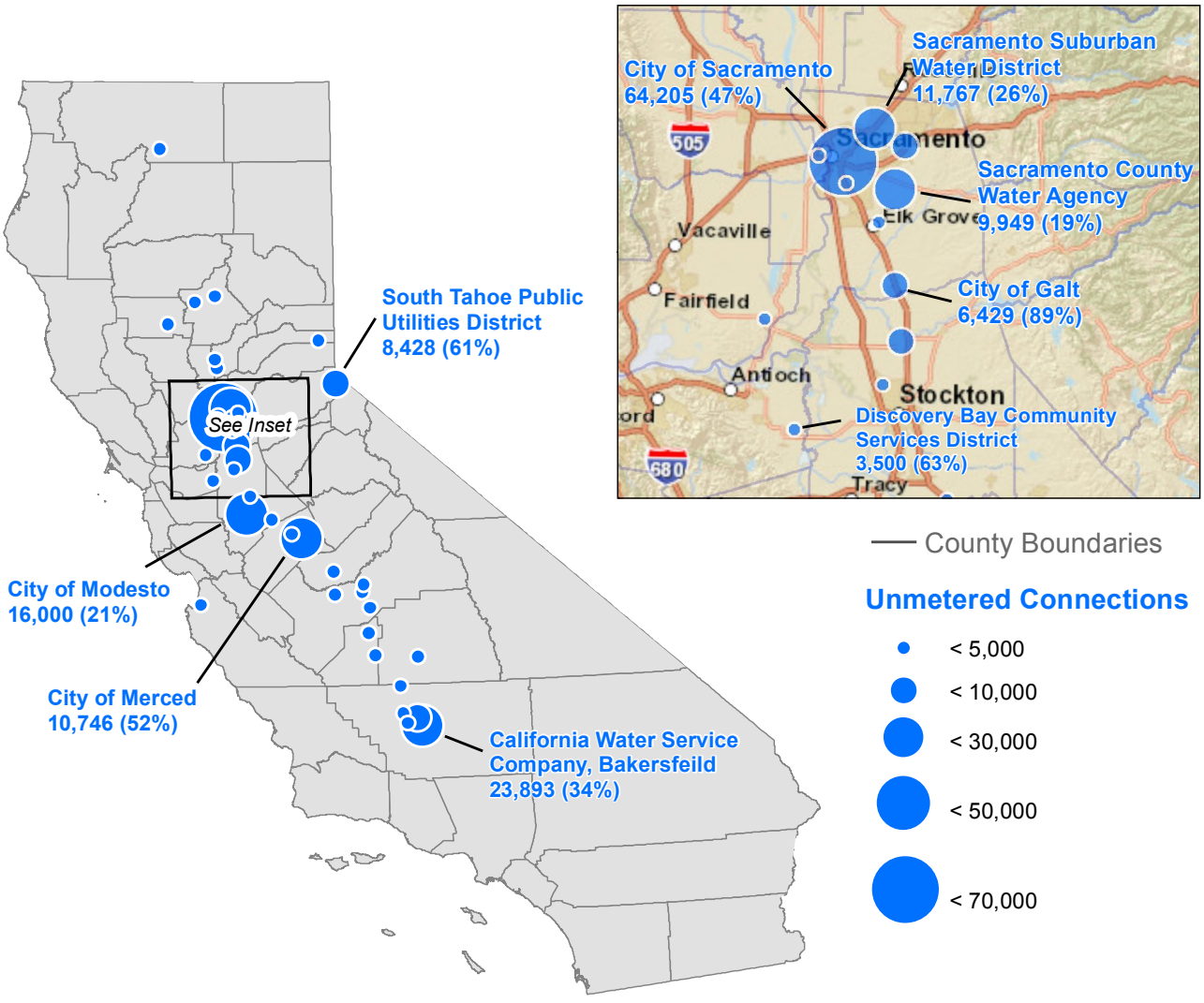

Figure 1: Map of unmetered connections in California

Credit: Gabriel Perez

Table 1: List of utilities with unmetered connections in California

Agency	Number of Connections	Number of Unmetered Connections	Percentage Unmetered	Source
Atwater, City of	8,000	3,500	44%	[1]
Bakman Water Company	2,234	1,775	79%	[1]
California Water Service Company, Bakersfield	69,980	23,893	34%	[2]
California Water Service Company, Chico	28,500	250	1%	[2]
California Water Service Company, Marysville	3,612	1,045	29%	[1]
California Water Service Company, Selma	6,229	2,139	34%	[1]
California Water Service Company, Willows	2,550	45	2%	[2]
Clovis, City of	31,000	500	2%	[2]
Corcoran, City of	3,277	1,656	51%	[2]
Del Oro Water Company	7,968	514	6%	[1]
Delano, City of	9,097	3,343	37%	[2]
Discovery Bay Community Services District	5,600	3,500	63%	[2]
Elk Grove Water District	12,256	305	2%	[3]
Fruitridge Vista Water Company	4,709	3,976	84%	[1]
Galt, City of	7,187	6,429	89%	[1]
Golden State Water Company Arden Cordova	16,252	2,569	16%	[3]
Hanford, City of	15,923	2,462	15%	[1]
Kerman, City of	3,318	1,277	38%	[2]
Lodi, City of Public Works Department	18,675	5,425	29%	[2]
Madera, City of	15,133	2,980	20%	[1]
Marina Coast Water District	7,816	1,090	14%	[2]
Merced, City of	20,733	10,746	52%	[2]
Modesto, City of	77,000	16,000	21%	[2]
Mount Shasta, City of	1,700	1,700	100%	[2]
Oildale Mutual Water Company	8,120	6,060	75%	[1]
Olivehurst Public Utilities District	6,483	1,209	19%	[1]
Porterville, City of	14,820	480	3%	[2]
Rio Vista, city of	4,046	3,720	92%	[1]
Ripon, City of	4,774	2,316	49%	[2]
Sacramento County Water Agency	51,381	9,949	19%	[3]
Sacramento Suburban Water District	45,853	11,767	26%	[3]
Sacramento, City of	135,580	64,205	47%	[3]
San Joaquin County	5,971	3,718	62%	[2]
Shafter, City of	4,303	3,833	89%	[1]
South Tahoe Public Utilities District	13,930	8,428	61%	[2]
Truckee-Donner Public Utilities District	12,549	912	7%	[2]
Turlock, City of	18,908	705	4%	[2]
Vaughn Water Company	9,590	667	7%	[1]
West Sacramento, City of	14,670	4,345	30%	[3]
TOTAL	729,727	219,433	30%	

Sources:
[1] DWR 2014
[2] Personal communication with utility
[3] Personal communication with the Regional Water Authority

As California cities and utilities replace old systems and move towards universal meters, some are choosing to make the shift to automatic or advanced metering. The San Francisco Public Utilities Commission, for example, installed smart meters in 180,000 homes and businesses, representing more than 96% of their customers. In June 2014, the utility released a new web-interface that allows customers to view their water use in real-time (Alexander 2014). A 2010 survey of California water utilities conducted by the Association of California Water Agencies[2] showed that half of the respondents had installed some form of AMR or AMI meters, although 42% have AMR meters installed in less than 10% of their systems. Thirty-two percent of surveyed utilities use AMR as the primary meter type. Although more than 60% of respondents cited initial costs as a concern, nearly 80% cited reduced meter reading costs as an expected benefit (House 2010). Analysis of the costs and benefits would be beneficial to utilities that are considering implementing AMI or AMR programs.

SUMMARY

Water metering in California is an important tool to help customers understand their water use in order to use the resource more efficiently. Coupled with effective pricing structures, water meters can send a price signal to customers to reduce excessive or wasteful use. Water meters can also help water utilities manage the system more effectively and identify leaks. While most California utilities have installed water meters, more than 219,000 customers remain unmetered. For those who have not completed their meter installation program, additional water savings can be realized by expediting meter installation before the 2025 deadline, reducing vulnerability to drought and other water supply constraints.

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ENDNOTES

[1] Time-variant pricing structures charge customers different rates according to when the water is consumed. These structures more accurately reflect the temporal variation in costs, providing the customer with an incentive to avoid consumption when marginal costs are relatively high. Although these kinds of pricing structures have not been shown to reduce overall demand, they have been shown to shift demand to off-peak periods (Levin 2012).

[2] AWWA sent the survey to 450 water agencies in the state and 73 provided complete responses

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