

California Energy Commission

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Docket No. 12-EBP-1: AB 758 Comments

3. Utility System Optimization (“USO”) has made price an effective policy lever

Situation

It is widely recognized that most utility systems in residential and commercial structures waste enormous amounts of the utility services they consume (electricity, gas, water and other services including propane, wood, etc.); by some estimates 50% to 70% of input resources. Whilst the elimination of all waste in existing structures is unlikely to be an economically attractive proposition to owner/operators, a considerable portion of the waste (40% in IOU service areas) may be eliminated in a way that is economically attractive.

Utility service prices play a pivotal role in the economic attractiveness of utility system upgrades to consumers; of course, the higher the price of the utility service, the more attractive are demand reduction investments (as savings/returns are higher). For this reason, the dramatic increases in non-baseline residential gas and electricity price tiers since 2003 in California’s IOU service areas have done much to make upgrades significantly more viable/attractive, particularly for consumers with heavy usage.

Problem

Unfortunately, the increases in utility service prices have not rendered correspondingly substantive reductions in demand that would normally be observed in other service markets. There are two reasons for this lack of consumer action:

- (a) Utility costs have historically been relatively trivial relative to consumer wealth;
- (b) Consumers cannot readily link bill increases to actions they feel are in their control

As utility service price increases have cumulated since 2003, the first issue (a) appears to have reversed itself. For example, the top 20% of consumers in California's IOU service areas are now spending over \$4,800 on their utility services annually, which makes utility spending a salient, annoying, even serious concern – even for wealthy consumers.

It is the second issue (b) that remains as the principal factor disconnecting price increases from normal corresponding reductions in demand. Consumers are simply unable to navigate their way through complex tiered pricing structures (across multiple utility services), and through the complex technical issues of their utility systems, to things that they control – such as changing/installing equipment and altering behaviors.

Game-Changer

A Utility System Optimizer (“USO”) resolves this disconnection and helps consumers by a making a direct connection between their utility spending (both ongoing bills and upgrade-related) and actions that are within their control.

USO's are software algorithms that rapidly prescribe how a utility system may be adjusted to optimize to each consumer's circumstances and objectives (such as maximizing net savings, minimizing carbon, improving health/comfort, etc.). Indeed, when a utility system is optimized using USO software, the net economic upside that can be delivered to the owner/operator is estimated to be 3 to 10 times greater than the upside gained from a reconfiguration planned by a human professional.

Identifying what waste may be eliminated in a manner that is economically attractive to owner/operators has historically been the role of 'auditors' and contractors. However, the computations needed to find the optimal combination of measures that, when undertaken, would deliver the greatest economic benefit to the owner/operator are very complex. Such computations must include all possible measures/opportunities, properly exploit marginal tariffs, properly weigh the cost/benefits of every opportunity, and address many other factors (such as application of incentives, local market costs, and many more). It is not possible for this to be done by a human professional efficiently in less than several weeks. In addition, the sheer scale of the problem involves millions of individual utility systems within millions of structures; making widespread and rapid development of individualized action plans by human professionals prohibitively expensive and time consuming.

Curiously, the more that is included in the optimization scope, the greater the net economic upside. That is, when multiple utility services are included (electricity, gas, water, etc.), the potential economic upside increases dramatically. Moreover, when the full panoply of all action types are included (operating behavior changes, efficiency retrofits, and generation installations), and when multiple financing options and other factors are included, the economic upside further increases substantially. Of course, the greater the economic upside, the more consumers will be attracted to demand reduction, and a greater amount of actions will be undertaken.

With optimization, the net economic upside to taking action is relatively substantial for most consumers. Although only half of all single family households, the top segments of utility service consumers account for over two thirds of all consumption (Figure 1). Moreover, since the top half of utility service consumers (in Figure 1, the “Heavy-Consumers” and “Mid-Consumers”) pay marginal prices and consume at rates that are so much higher than the median, the magnitude of potential net economic gains for these consumers are salient for even the highest income groups.

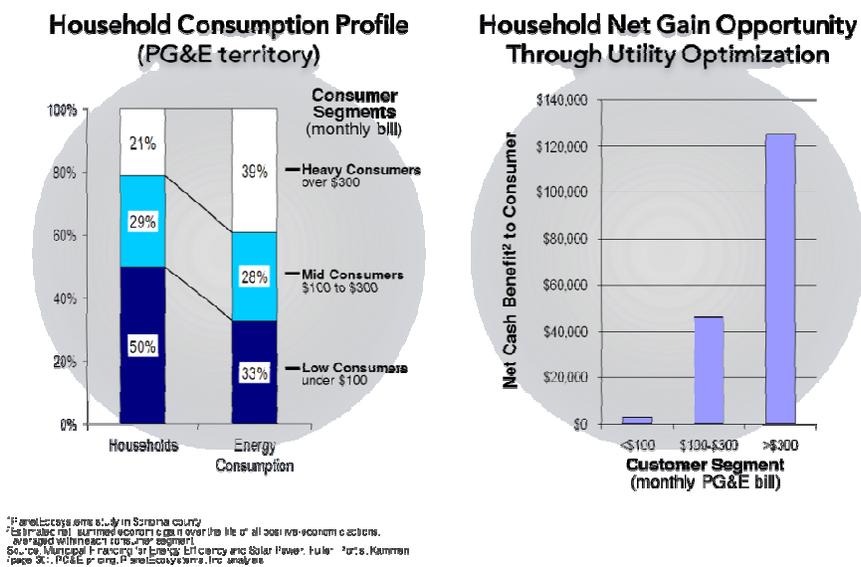


Figure 1: Consumption & Opportunity Profile, By Consumer Segment

Significant amounts of utility demand can be eliminated in way that is economically-positive for owner/operators – particularly for the top half of utility service consumers (See results of

trials in Figure 2). “Economically-positive” demand reduction actions are those actions that, after all retrofit, financing and other costs over time have been properly accounted for, together with reduced utility service payments, applicable incentives and the time value of money, deliver a positive gain in wealth for the owner/operator of a utility system.

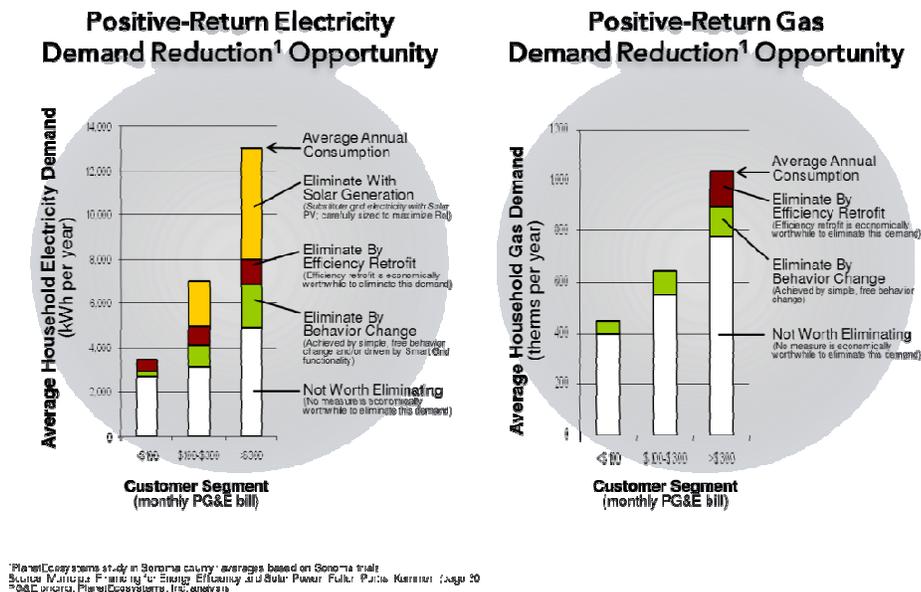


Figure 2: Economically-Positive Demand Reduction Opportunity, By Consumer Segment

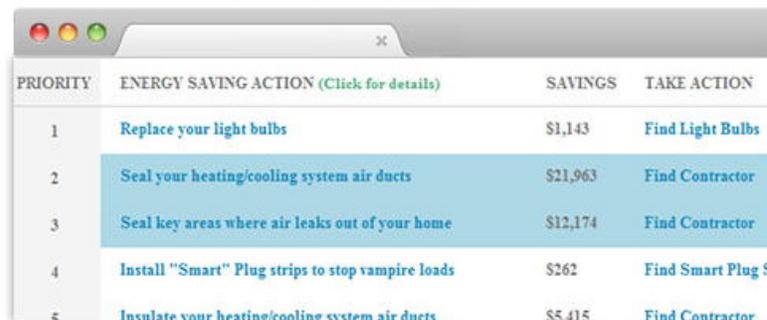
USOs may be programmed to deliver to several consumer objectives:

- Maximize economic savings in their utility spending, net of all costs (any equipment, installation, financing and other costs over time, and incorporating rebates and incentives) – thereby maximizing their gains in wealth
- Maximize their comfort at home for the least in net spending (or for the most in net savings, as appropriate) – thereby improving their living conditions
- Maximize their home’s ‘healthiness’ for the least in net spending (or for the most in net savings, as appropriate) – thereby improving their living conditions
- Minimize their utility system’s carbon footprint for the least in net spending (or for the most in net savings, as appropriate), or getting the consumer to ‘net zero’
- Evaluate any specific action to maximize economics (such as properly understanding the full-life benefits of an efficient refrigerator)

The output is simple; a set of actions (usually <10) with the net lifetime value of each action.

Consumer's Bill Optimizer

Figures out what changes will maximize the consumer's financial or other gain. Customized to each consumer's situation; adjustable to their preferences. Only 2 minutes to complete. Fully integrated with other tools that make it all so quick and easy; Rebate Finder, Contractor Finder, Financing Market, and many more.



PRIORITY	ENERGY SAVING ACTION (Click for details)	SAVINGS	TAKE ACTION
1	Replace your light bulbs	\$1,143	Find Light Bulbs
2	Seal your heating/cooling system air ducts	\$21,963	Find Contractor
3	Seal key areas where air leaks out of your home	\$12,174	Find Contractor
4	Install "Smart" Plug strips to stop vampire loads	\$262	Find Smart Plug S
5	Insulate your heating/cooling system air ducts	\$5,415	Find Contractor

Figure 3: Example Prescription Screen From Consumer Bill Optimization Tool

Figure 3 shows an example USO prescription; in this instance it is presenting the maximized wealth reconfiguration plan. The technology is readily integrated into demand reduction program activities, and is manifested in three basic tools:

- **Campaign Tool:** This tool is for use by program administrators in mass-customized messaging, and requires no consumer effort or time to be operated. The tool scans utility service consumption information and other publically available data to derive each/every consumer's most likely key motivators and develop an action plan that each consumer will find most attractive. The output is subsequently utilized in outbound messaging to engage the consumer.
- **Consumer Tool:** This tool is principally made available on the web, and may be used on a tablet by consumers and canvassers. The tool is pre-filled with each consumer's estimated information (see Campaign Tool, above) and made available to every consumer and utility solicitors to develop optimized action prescriptions, together with the estimated net upside for each consumer, to motivate action. This tool requires one to two minutes of input limited to adjusting the pre-filled information, as appropriate.
- **Pro Tool:** This tool is principally made available on a tablet to professionals (i.e. 'auditors' who, in this application, may be better characterized as 'message sales people'). Again, the tool that is pre-filled with each consumer's estimated

information (see Campaign Tool, above) and used to inspire utility system upgrade action. This approach is particularly productive for consumers having opportunities that are ‘big-ticket’ – in-person in-depth advisory visits provide heightened levels of consumer reassurance and confidence. This tool requires approximately 20 minutes of input, excluding certain investigative activities, though is capable of receiving inputs from other audit tools (such as EnergyPro, etc.), and of being attached to such tools to provide optimization functionality.

Policy Implications/Opportunities

Utility System Optimization makes the price lever a much more potent tool for California to use in its efforts to reduce utility service demand.

With a rapid and widespread deployment of USO tools, even existing price levels will inspire substantive demand reduction actions, particularly in IOU service areas. However, given the disparities between the heaviest and lowest utility service consumers in throughput and ability to self-fund upgrades, USO technology actually opens the door for substantive additional increases in the upper tiers of utility pricing. The situation has changed or heavy and mid consumers with USO technology; now, for the first time, they are empowered to moderate their utility spending and mitigate rising prices.

Finally, and perhaps as importantly, the data collected by software that incorporates USO tools are providing powerful insights into (a) the effectiveness of tariff levels, rebates, etc., and (b) the status/configuration of existing utility equipment stock, consumer break-fix and other behavior.