

Persistent problems, a point of inflection, and a prescription

12 Jun 2013



We have just posted on our website another must-read article. Written by the acute and perceptive Ahmad Faruqi, a principal in The Brattle Group, “[Surviving Sub-One-Percent Growth](#)” is like a timely and necessary consultation with a seasoned physician.

In this case the patient is the electricity industry – in particular, the electric utility industry. And the bad news is no secret.

- Kilowatt-hour sales growth, robust several decades ago, are trending toward zero.
- Returns on capital investment seem reasonable, but the time lag in cost recovery can put a squeeze on utilities’ financial health.
- Our electricity infrastructure needs a very substantial upgrade to harden and modernize the grid, so rates must rise.
- And higher rates put more downward pressure on usage, as customers find ways to economize with investments in energy efficiency and distributed generation, mostly rooftop solar.

Even partial bypass of the utility – much like the transformation that wireless communications forced on the seemingly secure telecom industry – adds to the downward growth spiral in the electricity industry. A negawatt is now a familiar term; nega-growth lacks something in panache. Perhaps “groanth” would be more apt.

And all this contributes to nervousness in the investment community. What’s a utility to do?

Dr. Faruqi, a thoughtful and caring diagnostician, suggests some strategies and tactics that might improve the patient’s health.

He doesn’t offer an instant cure, mind you, but does suggest the beginnings of a path, or several paths.

Utilities still need to improve their diet (more greens), lose some weight (get trim), and get lots of (mental) exercise. Most of all, they need to choose a trajectory for the future: What kind of a utility do they want to be?

This isn’t a sprint. It’s a marathon. So relax. Get in stride. As the kids say, “It’s all good.”

—Robert Marritz



ELECTRICITY POLICY
Technology. Efficiency. Leadership.

Surviving Sub-One-Percent Growth

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Electricity Policy – the website ElectricityPolicy.com and the newsletter [Electricity Daily](#) – together comprise an essential source of information about the forces driving change in the electric power industry.

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What Caused the Slowdown?

This is a time of monumental change for our industry. Thunderstorms, ice storms and tornadoes during the recent past have exposed the vulnerability of the power grid.

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Unable to face these extreme weather conditions, the grid has broken down in many places, plunging large numbers of people in darkness and forcing them to un-live the life they have been conditioned to living not just for hours but sometimes for days.

As an industry, we will have to invest heavily in the grid, all the way from the meter to the distribution lines, circuits, feeders and transformers to the transmission network. In a report that was completed a few years ago for the Edison Electric Institute, the Brattle Group estimated that nationally investments to the tune of \$1.3 trillion will need to be made to modernize the grid and to make it resilient to adverse conditions arising from nature (bad weather) but also newer threats arising from human intervention such as cyber-attacks.

On top of that, additional investments will be needed to connect renewable energy resources to load centers.

Furthermore, as an industry we will have to deal with the long-standing problem of having poor load factors. Nationally, the number is under sixty percent.¹ For some utilities, it is even lower. This forces utilities to invest in peaking power plants which run for only a few hundred hours a year and are idle during eight thousand plus hours a year. The upshot is higher average costs for all customers.

All of this would be routine business if sales growth produced sufficient revenue to allow the investments to be made. Unfortunately, some would say tragically, these large investments are needed at a time when sales growth has dropped by half. At the national level, the US Energy Information Administration is predicting growth in the sub-one percent range, down from the pre-recession average of two percent. We have talked to load forecasters at a cross section of two dozen utilities around North America and learned that they are seeing similar drops that so far have defied description. The consensus projection is for growth in the 0.7 to 0.9 percent range in the years to come. While some parts of the country may grow faster

¹ However capacity factor, the energy production from existing generation, declined from 54.9% in 1999 to 44.9% in 2009. Energy Information Administration, Electric Power Annual 2009 at 48, Table 5.2, Average Capacity Factors by Energy Source, 1998 through 2009 (released: Nov. 23, 2010; rev'd Jan. 2011, Apr. 2011).

than that, other parts will grow even slower. One utility, in fact, is not expecting electricity sales to reach pre-recession levels for another decade. Unsurprisingly, similar trends are being observed in areas as far away as Australia and as close as Canada (in the province of Ontario).

The great recession ended in 2009. Yet normal growth in the sales of electricity has not resumed even 41 months after the recession ended. There is definitely something different about this recovery.

According to Dr. John Caldwell of the Edison Electric Institute, based on the experience of the past five recessions, normal growth usually resumes within five months after the recession ends. The longest it has ever taken has been twelve months.

The EIA's March 2013 *Short-Term Energy Outlook* projects that aggregate electric retail sales will grow by ~0.7% this year and next year. In the residential sector, sales will grow this year at ~0.3% and at ~0.8% next year. The EIA also projects that total electricity sales will not return to weather-adjusted pre-recession levels until 2014.

Of course, declining growth has been the norm and not the exception since 1950, as seen in Figure 1 on page 3 But something is different this time around. Three forces appear to be the primary cause of the slowdown.

*The impact of energy efficiency
on reducing utility sales is projected
to range from 5 to 15 percent.*

- First, consumer psychology has shifted as a new generation of consumers has arrived with new values and norms. New technologies are pushing them to explore the frontiers of technology on their own. (Note my anecdotal evidence on page 11.) At the same time, the older generation of consumers, the baby boomers, are engaging in an unprecedented level of belt-tightening, cope with continued economic uncertainty and anxiety. This becomes evident when one looks at the drop in the consumer confidence index, which is shown in Figure 2 on page 4.
- Second, many utilities are stepping up their spending on energy efficiency, often prompted by energy efficiency directives and legislation.
- Third, states and the federal government continue to push ahead with aggressive revisions of codes and standards, driven in many cases by concerns about the environment.

What does the future portend? To get an answer, after the recession ended we reached out to 50 energy experts in North America and asked: How much will energy efficiency programs reduce energy sales and how much will demand response programs reduce peak demand by the year 2020? Unsurprisingly, the experts differed in their projections, with some seeing big impacts and others less. But even the small impacts were significant. The impact of energy efficiency on the sales forecast was

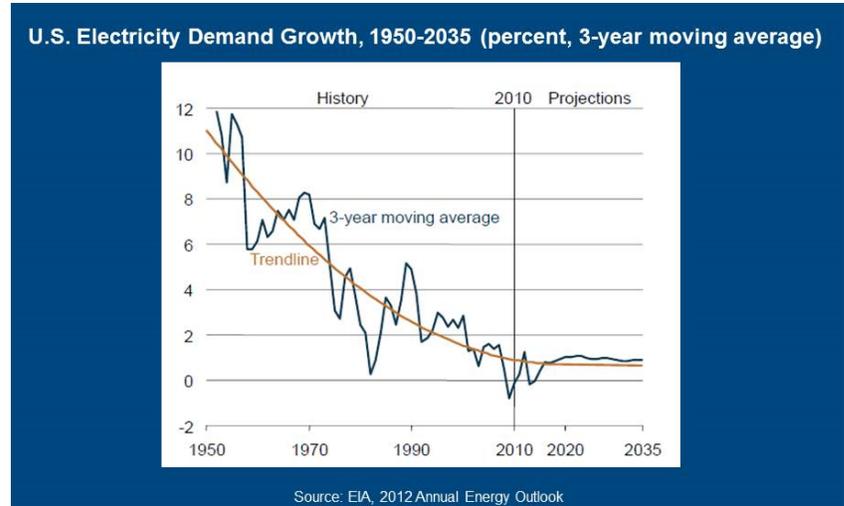


Figure 1 - US Electricity Demand Growth

projected to range from 5 to 15 percent less compared to what it would have been in the absence of these programs. The corresponding reduction in peak demand was projected to range from 7.5 to 15 percent, compared to what it would have been in the absence of these programs.

The future is likely to be shaped not just by the three forces mentioned earlier but also by two new forces that are currently in an embryonic stage. The fourth force is distributed generation, led by the revolution in rooftop solar and supplemented by micro-turbines. Experts agree that rooftop solar is approaching grid parity in many locales, spurred on by a buildup in public demand that was brought on by heavy upfront taxpayer funded subsidies and propelled by net metering tariffs that over-compensate solar customers by paying them not only for the energy they feed into the grid but also for the transmission and distribution services they do not provide. As to why some are switching to solar, see the conversations in the sidebar on page 10. The leasing model

pioneered by Solar City, in which the customer does not make any cash outlay, has changed the paradigm. It is being copied rapidly by others. According to some experts, the fourth force alone can eliminate all load growth.

Net metering enables distributed generation to expand. In 2003, there were less than 7,000 U.S. customers on net metering. By 2010, there were 156,000, of which roughly half were in California. In 2010, that number amounted to 0.1 percent of total U.S. electricity sales. In California, the 5 percent cap in net metering is predicted to be reached by 2015.

With distributed generation, net-zero energy homes become a reality. In Austin, Texas, the Zero Energy Capable Homes program requires that new single-family homes be net-zero energy capable by 2015. The largest community of net-zero homes in the U.S. is rising in West Village on the grounds of my alma mater, the University of **California at Davis**. **The California Energy Commission** has called for all new residential construction to be zero net energy by 2020 and for all new commercial construction to be zero net energy by 2030.

The fifth force is fuel switching. For years, fuel switching favored electricity. Now it is poised to switch sides and work in reverse. The revolution in shale oil and gas is pushing fuel prices downwards, making them more

competitive in customer end-use applications than electricity. The use of gas for commercial air conditioning and in industrial processes, long a theoretical possibility and proven in demonstration sites by the Gas Research Institute, may become economic, leading to significant inter-fuel substitution away from electricity in the commercial and industrial sector. Even the residential sector will not be immune to such trends. Gas-fired residential heat pumps will begin making inroads into the home HVAC market.

The Survival Toolkit

All of this puts electric utilities in a bind. They need to invest at a time of a significant slowdown in sales growth which is reflected almost proportionately in a slowdown in revenue growth, putting an enormous pressure on their bottom line. Last year, according to the latest financial report from the Edison Electric Institute, both sales and revenues of electricity fell, the third full year after the recession ended.

How should utilities respond to the challenge?

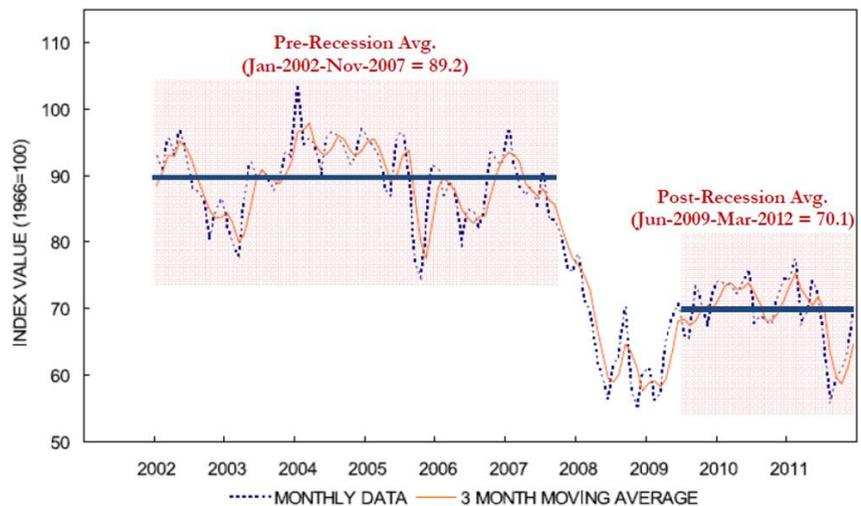


Figure 2 - Decline in Consumer Confidence

Few doubt that the old “tried and tested” strategies will not work in a business environment which bears no resemblance to the past. Companies that start with a clean slate, dismissing the old strategies as passé, may survive what is obviously a grim transition period and redefine their future.

What should be the new strategies and tactics? The possibilities are endless. I focus on four strategies and three tactics in this section. But before going further, let me note that in business, as in war, there is a temptation to put more weight on strategy than on tactics. In boardrooms as in war rooms, strategies get more time and attention than tactics because they are viewed as glamorous, tactics as dull. Utility executives ignore tactics at their own peril. Slightly modifying a military maxim, one can say: “Amateurs discuss strategy; experts discuss tactics.”

The Four Strategies

First strategy: Stay the course. This strategy assumes that the slowdown in sales growth is short lived and not “the new normal.” This strategy draws its inspiration from the fall in oil and gas prices. This fall is presaged to bring about an industrial revival, possibly in the form of organic new growth and the return of manufacturing from off-shore locations. This revival is expected to boost the sale of electricity to the industrial sector. CERA’s Larry Makovitch has put forward a provocative argument along these lines.² At a recent conference I spoke at, one

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http://www.powermag.com/issues/features/Expect-U-S-Electricity-Consumption-to-Increase_5634.html

of the participants said that there was merit in the story. He said he was witnessing a revival in the petroleum refining sector in Texas. It is unclear to me how widespread this revival is might be.

In my view, ignoring the slowdown is a high risk strategy. Our business will never be the same again; to pretend otherwise is dangerous. Take the example of the car industry. It is beset with change arising from technological innovation and the emergence of substitutes. Plug-in electric vehicles represent a big change. Self-driving cars represent an even bigger change. Bill Ford, the Executive Chairman of Ford Motor Company, noted recently: “The car as we know it, and how it’s used in people’s lives, is going to change really dramatically and it’s going to change fast. If we don’t start imagining this future, and then start trying to help shape this future, we’re going to be left behind, because this future is going to happen with or without us.”³

The stay-the-course strategy is predicated on the validity of the Old Normal. It is possible that the Old Normal theory is valid. But I doubt it. Betting the company on a wistful yearning for the past is a high risk strategy. But some companies are likely to make that bet anyway. There are enough examples from other industries in the pages of the Harvard Business Review to prove that point that many companies do not want to venture out from what they regard as their comfort zone. By the time it becomes clear that the comfort

3 <http://www.chicagotribune.com/business/lafi-hy-autos-bill-ford-milken-talk-20130501,0,3825298.story>

zone has actually become the irrelevant zone, it is too late to pull out of the slide. They slip quietly into oblivion, little missed by their customers or their suppliers, barely getting a mention in the press.

Second strategy: Electrification. This strategy concedes that the Old Normal is gone but unlike the first strategy, which is

essentially a do-nothing strategy, it actively seeks to create conditions which will restore the Old Normal.

An obvious example is the industry's efforts, working with the auto industry, to put electric cars in every garage.

The emergence of plug-in electric vehicles, anticipated as far back as 1979 when I was starting my career at the Electric Power Research Institute (EPRI), is finally beginning to bear fruit. A number of new models are on the road, but mostly in states such as California and Michigan. President Obama's goal of putting a million electric cars on the road by 2015 is far from being accomplished. At this point, only five percent of that goal has been realized and there are only three years to go to achieve the other ninety five percent. The Economist in a recent editorial listed a number of electric vehicle companies that have gone out of business.⁴ They are more expensive and have short range, problems that have deviled the concept since its very beginning. Even under the most optimistic scenarios, electric cars won't make

⁴The Economist, "Flat Batteries," June 1, 2013.

much of an impact on electric sales a decade out; perhaps not even two decades out.

Some of the other electrification efforts being undertaken by organizations such as EPRI on new industrial processes that are electricity-intensive may bear fruit sooner than electric vehicles. But such research and development initiatives have been going on for as long as I

can remember and have limited success in the marketplace. The tilt in the price equation in favor of natural gas will stymie their adoption.

I don't anticipate that electric utilities will

realize much benefit from electrification in the near-term.

Third strategy: The safe haven. This epitomizes a strategic retreat. The electric utility concedes the business of selling electricity to the competition, whether it originates from new entrants such as SolarCity or the buyers themselves, in the form of energy efficiency. The utility withdraws into a safe haven and becomes simply a wires company. That preserves its status as a natural monopoly.

Of course, many electric utilities in the northeast, eastern Midwest and Texas are already wires companies. So are electric utilities in Australia and the European Union. But that was not because they made a strategic choice. It was because their state decided to restructure the power industry. In this strategy, utilities will find a way voluntarily to become a wires company. This strategy is less risky than the two prior strategies, but it is not risk-free. All wires

companies face the risk of collecting insufficient revenue, since the bulk of distribution charges are tied to sales and as sales growth slows down, they may not be able to cover their fixed costs.

The fourth strategy: Go on the offense.

This strategy is premised on being able to out-sun Solar City by creating a non-regulated affiliate that operates in other service areas. It requires the creation of a new enterprise culture that is nimble and customer centric without which competition with mainstream solar companies will remain a fatal conceit. The payoff from this strategy might be significant. But this strategy does not fit well with the core competency of most electric utilities and therefore it is high risk. The last time utilities ventured into the world off diversification, they failed spectacularly. This strategy assumes that this time it will be different. Another risk is worth noting. If traditional utilities are able to convince regulators and legislators that net metering is unfair and represents a transfer of wealth from less affluent customers to more affluent customers, then the value proposition for utilities that venture into the solar leasing business will be diminished.

When all is said and done, each utility has to pick a single strategy, or perhaps a hybrid of strategies, knowing that it will have the opportunity to change later on. The choice of strategy will vary by utility and depend on a number of variables. First and foremost, what are its earnings goals? Second, how much risk is it willing to tolerate? Third, what will the future look like? It will be delusional to define a single future. To quote Churchill, “The future, though imminent, is obscure.”

So it will be prudent to lay out a few alternative futures.⁵ In each, the nature of the business environment will have to be characterized: what will tomorrow’s customers look like, who will be the competitors, what will be the size of the business, and so on. And fourth, how will each of the four strategies fare in each of the business environments? Once it has answered these questions, it will be able to construct a decision matrix in which the rows are strategies and the columns are alternative futures.

Each cell of the matrix should now be populated with an estimate of earnings. These can be obtained by gathering intelligence about customers and competitors, and estimates of how much it would cost to pursue each strategy; the utility would be able run its corporate financial models to estimate how much each strategy would yield by way of earnings. The utility will then have the task of populating each cell with its estimated earnings.

At this point, the objective part of the decision has been completed. Now comes the subjective part: management’s preferences for risk versus reward and its perceptions of cultural and organizational fit. Two bookends can be imagined. In one, management would circle the worst case for each strategy and then pick the strategy with the “best” worst case. This

⁵ This journal has published a similar argument, albeit one that takes a different tack. See D. Boonin, *Utility Scenario Planning: ‘Always Acceptable’ vs. the ‘Optimal’ Solution*, at <http://www.electricitypolicy.com/Boonin-3-17-11-cc-rom4.pdf> (March 17, 2011).

is called conservative gamesmanship. In the other, the best case is circled for each strategy and the strategy with the best “best” case is picked. This is called aggressive gamesmanship and also sometimes called the “bet-your-company” strategy. Various in-between combinations can be defined. And so a strategic choice will be arrived at that reflects the analysis of alternative futures and alternative strategies.

Some utilities may wish to take this approach a step further. They would want to interject probabilities into the strategic calculus. The estimate of earnings in each cell of the Decision Matrix will not be regarded as a definite number; rather, uncertainty in that estimate will be recognized and will be regarded as the mean of a probabilistic distribution. These values would be estimated either objectively, if data exist to make such a determination, or subjectively, if pertinent data can only be gathered through expert opinion. Management will then be interviewed and its attitudes toward risk quantified in the form of risk-reward trade-off curves. These curves will then be used with the Decision Matrix to zero-in on an optimal strategy.

In all but the simplest examples of future uncertainties, it is impossible to find a final strategy that will yield the best outcome under each future. The electric utility environment is marked by “deep uncertainty,” to use a term coined by the RAND Corporation. But the optimal strategy will represent the best outcome under a range of possible futures, consistent with management preferences toward risk.

The Three Tactics

Regardless of which strategy is chosen, success will require the selection and deployment of complementary tactics. Three essential tactics are discussed below.

The first tactic: Rethink rate design. For most utilities, revenues from residential and small business customers are collected through volumetric charges. However, many utility costs are fixed, so there is a discrepancy between cost recovery and rates in their business model. This does not pose a problem when sales are growing, as in the Old Normal: “a rising tide lifts all boats.”

But this model falls apart when the New Normal kicks in. The way forward will require a fundamental change in rate design toward one that relies on straight-fixed and variable designs. The fixed charge should recover the costs of investing, operating and maintaining the grid. Anecdotal evidence suggests that the national average is around \$8 per customer per month. But in states like California there is no fixed charge, despite studies showing that distribution costs range between \$25-45 per customer per month. Raising the fixed charge has become imperative, but making the transition will not be easy. Regulators and customers will have to be convinced that this is fair and equitable. And some temporary buffers may have to be created to protect small consumers who may see their bills rise as a result of this change.

The second change that should be made is to move the volumetric charges to a time-based character, following the time-based character of costs. It will also encourage customers to reduce their peak loads and to shift their peak

usage to off-peak periods. That will improve system load factors and lower average costs.

The second tactic: Re-imagine

forecasting. Many utilities have told me that their sales forecasting models have been over-forecasting sales for the past three to five years, creating doubt in their management's minds about the credibility of the models. No one seems to know what is causing the models to mis-forecast. I suspect the culprit is a missing link in the math that underpins the models, which have no way of capturing changing customer tastes and behavior. A way has to be found to incorporate those insights. A new generation of models have to be built, possibly as adjuncts to the existing models and ultimately as replacements. The new models can build on the techniques firms in competitive industries use to do their sales forecasts. In those industries, the forecasters don't just rely on historical data to forecast the future, which is essentially an exercise in trend projection. These models incorporate insights from observational market research which involves frequent and ongoing interactions with consumers. This will require that new data be collected and factored into the econometric equations.

The third tactic: Reinvent the load and market research functions. Both functions have existed in electric utilities for decades, but most of the studies are embarrassingly outdated. Budgets have been cut and it shows in the poor quality of the findings. Another problem is that the customers who are surveyed in market research studies are not the same ones whose hourly load profiles are tracked in the load research studies. The latter were designed primarily to support cost-

of-service studies for rate making; the former to gain insights in how many customers owned which appliances. This unfortunate bifurcation of samples prevents the drawing of deep insights which are necessary to execute future strategies. A new approach is required which is based on systematically tracking customer behavior over time using a common sample of customers. Economists call this a panel data set.

But the measurements need to focus not just on the "hard" variables, such as loads and demographics, but also on the "soft" variables that track tastes and perceptions. Often these are called psychographic variables because they have to do with the mind of the customer. Such data allow the gleaning of insights about changing tastes and about customer perceptions of competitor offerings. The end result is insights not just about the past and current patterns of use but about likely future changes.

In closing ...

It is my opinion that the slowdown in sales growth is not an aberration but very much in line with the downward trend we have been seeing over the past six decades. However, this slowdown is unique. It is being driven by five forces, three of which have already manifested themselves and two which are beginning to emerge.

To use a term coined by Andrew Grove, the former CEO of Intel, the electric utility industry is at a strategic point of inflection, "a time in the life of business when its fundamentals are about to change. That change can mean an opportunity to rise to new heights. But it may just as likely signal the

beginning of the end.” To survive, companies will need executives with the ability to recognize that the winds have shifted and “take appropriate action before they wreck the boat.” The worst thing they can do is to “fritter away their valuable resources while attempting to make a decision. The greatest danger is in standing still.” □

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A RANDOM-WALK THROUGH SOLAR GULCH

I live in the East Bay Area of San Francisco. Over the years, more and more PV panels have appeared on the roofs. They now also cover some parking lots, such as that of the high school where my daughters studied years ago. The area has long hot summers. Maximum temperatures are commonly in the high 90s and often exceed 100 degrees. Summer usage can be above a thousand kWh a month and cost a few hundred dollars.

My house sits on a court with 10 homes. Two of them have installed roof-top solar, one recently and one a while back. I have been analyzing the economics of solar through spreadsheets for a long time but nothing beats talking to the homeowners who have actually made the decision to go solar. So I dropped my economist inhibitions of engaging with consumers (we are taught not to generalize from a few observations) and started talking to neighbors and friends about it. The sample was not random by any means.

Person A is an eye-doctor who is married to another doctor. Her husband does the math about their energy decisions, she tells me. He's into green energy. They have just bought a Tesla. They invested in rooftop solar 14 years ago, before the leasing model existed. She does not know how much she saves but trusts her husband to make the right decisions when it comes to energy matters.

Person B is a pediatrician with a very successful practice who also sits on the board of an investment fund. She and her husband have put drought-resistant landscaping in their yard. Her husband stays at home and is a technology enthusiast. They installed solar more than 15 years ago, before the leasing model, and did it for the greater good of the planet. They also feel good about saving money but that was a secondary objective.

Person C is a top-producing salesman for a company that produces healthy foods for athletic people. On weekends he is often working in his yard, which has drought resistant landscaping. They have just purchased two Lexus cars, both hybrids. He decided to go with the leasing model for his rooftop solar system a couple of years ago. The solar system meets all their needs and they get a few hundred dollars a year back from the local utility. The solar

company has locked in their monthly payment but they only save about \$10 a month. He said he did not do it to save money but for "conservation."

Person D is a retired consultant. She and her husband, also a former consultant, went solar because it was the right thing to do. They spent \$29,000 on the system but she does not know if that was before or after the cash incentives. The purchase was made about 15 years ago before the leasing model. Their property does not get much sun. Both husband and wife drive Porsches.

Person E is a retired utility executive who lives in an upscale neighborhood. He drives a small hybrid and invests in clean energy firms. He went with rooftop solar because it is the wave of the future. And he also did it before the leasing model was introduced.

Finally my curiosity got the better of me and just had to find out how solar was being sold in the marketplace. I stopped at a kiosk in my local Home Depot set up by one of the leaders in leasing rooftop solar. The sales representative asked me for my address. Armed with that information, he immediately pulled up a picture of my house using Google Earth. It was a much sharper image than I had ever seen with that software. He said they had a special arrangement with Google. He said my rooftop was ideal for solar installation. Then he asked me for my typical summer electricity bill. When I mentioned \$300, the pitch was immediate: we will halve your bill. Now that got my attention. So the consumer in me asked: how will you do that? He said that we will help you avoid paying the upper tiers (my rate schedule, like that of most Californians, features an inclining block rate structure which begins with some 12 cents per kWh for "baseline" usage and ramps up to 34 cents per kWh for usage that exceeds 300 percent of the baseline). When the analyst in me said to him that this sounds too good to be true, he told me that I won't save half of my bill right away. In the first year, I might just save \$10-15 a month. He said the savings will become more pronounced as utility rates continue to escalate. — A.F. ▣