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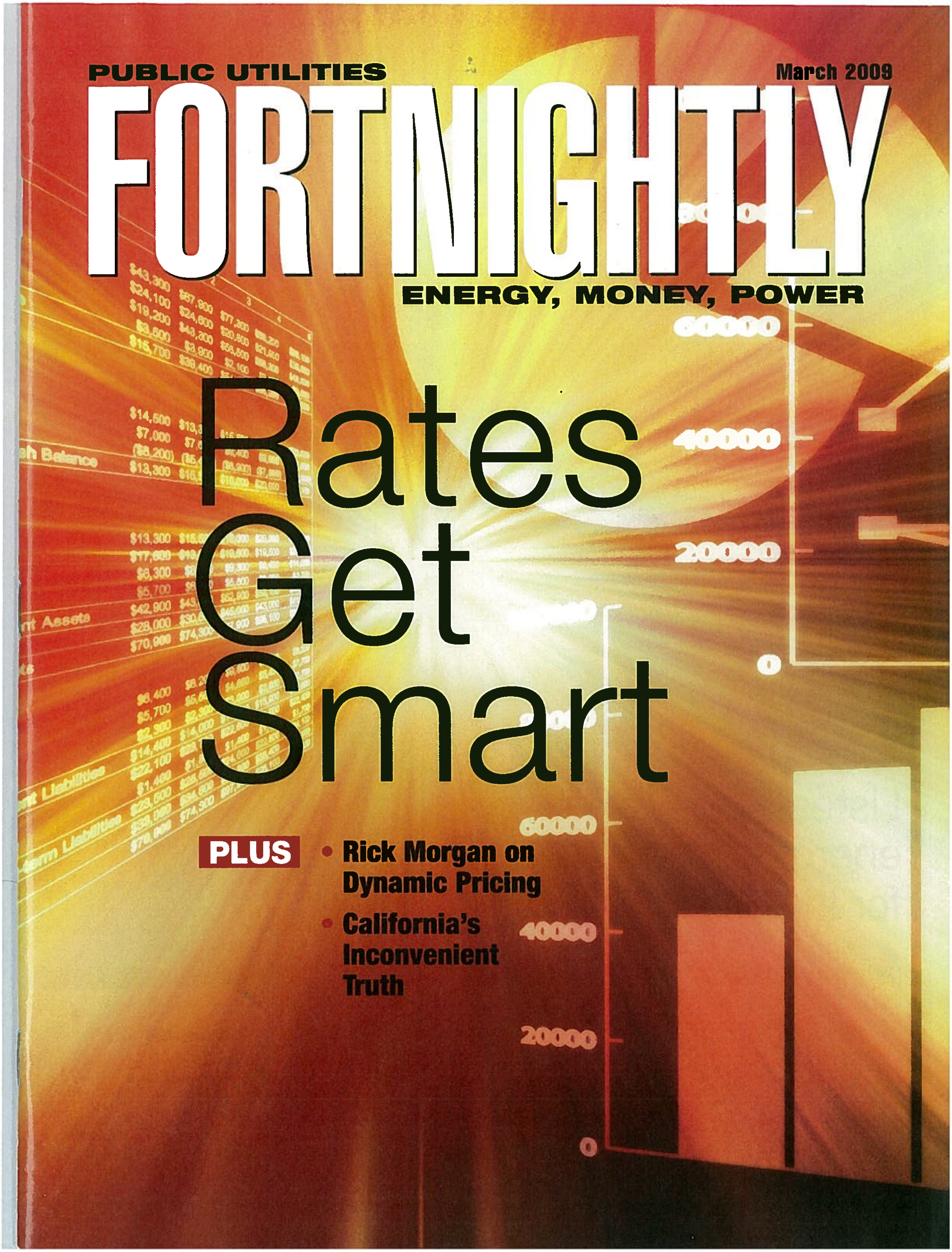

Rates Get Smart

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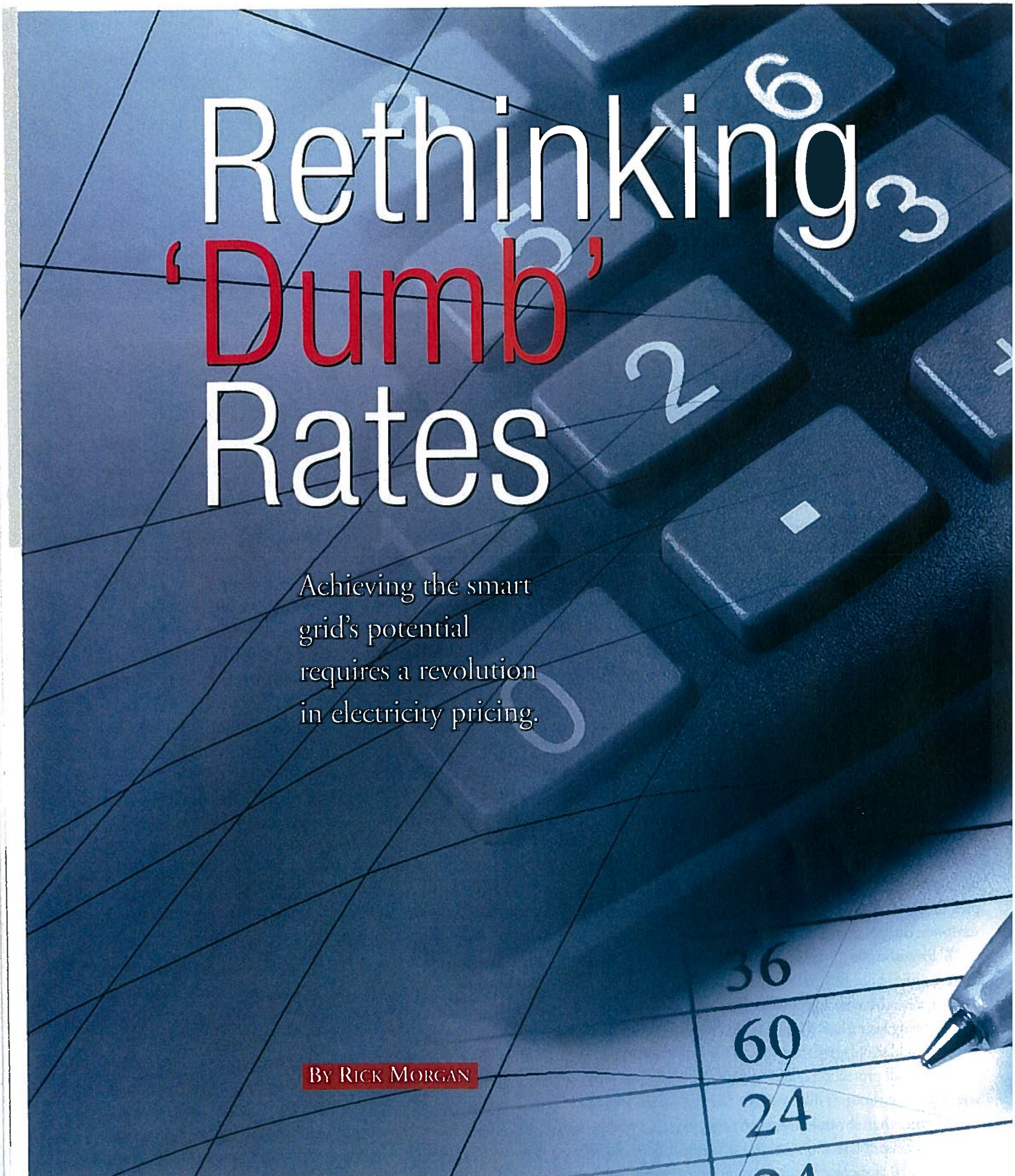
Rethinking 'Dumb' Rates

Achieving the smart grid's potential requires a revolution in electricity pricing.

By Rick Morgan



Change is in the air throughout all segments of our society, and our electric system is no exception.

The smart grid that's beginning to emerge in North America will rely on hardware like "smart" meters, "smart" appliances and thermostats, remote sensors, and sophisticated communications systems. These devices, when linked together, will enable utilities and their customers to respond in real time to conditions on the power grid, thereby creating new opportunities to reduce costs and increase customer value.[1]

Indeed, for the vast majority of customers, electricity still is measured the same way it was in the 19th century: A "dumb" electromechanical meter tallies kilowatt-hours of consumption and is read manually about once a month. With today's 21st century technology, we can do much better!

Achieving the full potential of the smart grid, however, will require a revolution in the way we price electricity at the retail level. This involves replacing flat or "blended" retail prices that ignore variations in wholesale market prices (or generation costs, outside of organized markets). Instead of charging the customer a single price reflecting the average of costs between monthly meter reads, utilities will offer "dynamic" prices that reflect hourly variations in power costs.

Dynamic pricing assigns costs more fairly, whether or not an individual customer responds to price signals.

Dynamic pricing offers customers new options to manage their utility bills, as well as the potential to reduce wholesale power costs as customers respond to high peak prices. Illinois regulator Bob Lieberman calls it "value pricing," which is perhaps a better nomenclature.[2] Without dynamic pricing, we will forego some of the greatest benefits of the smart grid. As I'm fond of saying, "There's no point in having smart meters if you're still going to have dumb rates."[3]

Dynamic pricing is made possible by relatively recent developments in metering, particularly the availability of cost-effective advanced metering infrastructure. AMI typically includes: 1) interval meters, capable of recording customer consumption at least hourly; 2) an integrated two-way communications network that can transmit variable price signals to the consumer and detailed customer usage data to the distribution utility; and 3) a sophisticated data management and billing system that keeps track of multiple rates and time periods. Importantly, AMI offers a number of collateral benefits as well, which can help bolster a business case for AMI deployment.[4]

Dynamic pricing can be structured in a variety of ways, but typically is classified into three different approaches:

- **Critical-peak pricing (CPP)**, whereby prices increase by a factor of five or so during peak hours when electrical capacity is stressed, with such peak periods typically limited to 100 hours per year. In exchange for paying high peak prices, the customer receives slightly lower rates the rest of year than those charged to non-CPP customers.
- **Peak-time rebate (PTR)**, whereby the customer is retained on the traditional blended rate but is offered a generous rebate for reducing load during critical peak periods. This necessitates the calculation of a baseline usage level for each customer.
- **Real-time pricing (RTP)**, whereby retail customer rates reflect hourly variations in wholesale markets. Economists consider this perhaps the truest retail price signal.

What all three methods have in common is temporal variation that reflects actual deviation in costs. All three methods of dynamic pricing currently are being tested in the Nation's Capital through a pilot program called PowerCentsDC.[5]

Dynamic pricing can be coupled with remote controls, for example through the Internet, and can be enhanced via enabling technologies including smart thermostats, smart appliances, and other emerging technologies such as plug-in hybrid electric vehicles (PHEVs). In fact, besides taking advantage of low off-peak rates to charge their batteries, PHEVs also could serve as a valuable source of distributed generation when the grid is under stress.[6] The right kind of pricing, integrated with these emerging technologies, has the potential to revolutionize the way electricity is generated, delivered, and consumed.

How do customers respond to dynamic pricing? Well enough to make it a very potent pricing tool. Empirical evidence consistently demonstrates a significant response, although its magnitude varies across different types of customers. Some customers respond substantially and others not at all. Overall, dynamic pricing produces a measurable decrease in peak load, and customers usually save energy while reducing their bills.

How much do peak loads decline due to dynamic pricing? Customer response is typically in the range of 12 to 20 percent of peak.[7] Results depend on several factors, including rate

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design, local climate, and the availability of enabling technologies. The impact of enabling technologies can be quite significant, accounting for results at the upper end of this range.

Consumer Benefits

What about consumer benefits of AMI and dynamic pricing? Do they justify sacrifices customers are asked to make? And do they justify the cost of a full-scale roll-out of AMI? On these questions, there is great diversity of opinion.

Advocates (particularly utilities) may argue that AMI deployment is cost-effective, citing operational savings such as reduced metering costs and more efficient outage restoration. They also cite the ability of customer demand response to dampen price spikes, thereby reducing bills for all customers. Finally, they point to intangible benefits, such as improved customer options.

The real sleeper among the benefits of dynamic pricing is its potential to free consumers from hidden charges.

Critics (including some consumer advocates) argue that AMI deployment has not been demonstrated to be cost-effective and may serve as an excuse for utilities to raise rates. They question the long-term customer response to dynamic pricing, noting that some customers, especially low-income consumers, can't respond to price signals. Critics argue that there are better and cheaper alternatives available, such as direct load controls by utilities.[8]

Let's explore some of these issues in more detail. AMI is credited with producing operational savings, some of which readily are quantifiable. These include reduced meter-reading costs (via remote metering); more efficient outage management and storm restoration; and savings achieved through remote connection and disconnection of customers.

Another oft-cited benefit of AMI is its ability to reduce market prices through customer demand response. In this respect, the greatest potential is likely to occur where reserve margins are tight, leading to price spikes when the system is stressed. In 2007, the Brattle Group analyzed this issue in the Mid-Atlantic region for state regulators and the PJM Interconnection. Brattle examined a hypothetical 3-percent peak reduction in five key PJM zones during the 20 most costly five-hour periods. The study concluded that load curtailment could save as much as $182 million per year by lowering locational market prices.[9] It's because of this ability to control peak prices that FERC Commissioner Jon Wellinghoff calls demand response the "killer application" for the smart grid.[10]

Does it matter if some customers are unable to respond to dynamic prices? Not really! A small percentage response can have a big impact on wholesale market prices (*i.e.*, the cost of generation and transmission). Furthermore, demand-response benefits tend to spill over to other customers. Such recurring customer savings could help to offset any rate impacts associated with AMI deployment.

Furthermore, low-income customers are among likely winners under dynamic pricing, since they tend to have favorable usage patterns. Under traditional blended rates, larger customers with big air conditioning loads often are subsidized by other customers, especially those with little or no air conditioning. For many customers, dynamic pricing provides a long-overdue credit for their economical use of the electrical system! In any case, dynamic pricing assigns costs more fairly than traditional blended rates, whether or not an individual customer responds to price signals.[11]

One of the most important benefits of dynamic pricing and AMI may be the most difficult to quantify: empowering customers via more options. There clearly is value in providing customers with more choices through enabling technologies. For example, a dynamic-pricing customer with a smart thermostat has the opportunity to choose between comfort and economy, simply by adjusting the controls on her smart T-stat. What a difference from conventional load-control programs where the utility controls the switch! Intangible benefits like this help to explain dynamic pricing's typically high retention rates.

Perhaps the real sleeper among the consumer benefits of dynamic pricing is its potential to free consumers from hidden charges for the privilege of rate stability. Even though blended rates are the norm for most retail consumers, utilities and other service providers typically include a premium in customer bills reflecting the cost of retail rate stability when wholesale prices fluctuate.

Under blended rates, retail customers are spared the burden of price volatility, while utilities and competitive service providers are compensated for absorbing the cost of hedging the uncertainty associated with volatile wholesale prices. This so-called "hedge premium" implicitly is passed along to consumers in traditional blended electricity rates and rarely is quantified by utilities or their regulators. Furthermore, retail consumers aren't normally given the opportunity to avoid paying this hedge premium—except perhaps when they are offered a dynamic-pricing option that involves taking on risk associated with price volatility.

By and large, retail electricity consumers don't realize they're paying for a premium product—a hedged, blended rate—that's more expensive to provide than a dynamic rate. The hidden "hedge premium" reflects the costs of guaranteeing a flat rate around the clock. Quantification is difficult, but an ISO New

England study estimated this hedge premium to be about 15 percent of customer rates, and other estimates even are higher.[12]

The advent of competitive wholesale markets and the unbundling of consumer rates for residential and small commercial customers in some jurisdictions offers the potential to reveal the true value of this hedge premium. In theory, consumers who take on this added risk of price volatility should be relieved of the burden of the hedge premium to the extent that their electricity provider no longer is incurring these costs.Even though dynamic pricing may not be suited to all customers, there clearly is substantial value left on the table when price signals are masked by a blended rate. Those customers who are willing to take on added risk should be compensated for the savings incurred by their service providers.

There's no point in having smart meters if you're still going to have dumb rates.

Regulatory Decision-making

State regulators will need to weigh all of these factors in making decisions about the deployment of AMI and implementation of dynamic pricing. And because every utility service area is unique, these decisions must be made on a case-by-case basis. Critical assumptions must be made about penetration rates and levels of customer response. Regulators also must make judgments about the functionalities of advanced meters and communications technologies, as well as the standards for interoperability. Above all, if AMI is approved, regulators must ensure that AMI and dynamic pricing deliver their intended benefits and not just higher customer costs.[13]

After a thorough examination, California regulators approved mass market AMI deployment for residential customers and are moving toward making dynamic pricing a default tariff for the state's three major electric utilities.[14] Meanwhile, deployment of AMI and/or dynamic pricing is moving forward in states such as Alabama, Delaware, Florida, Illinois, Maryland, Michigan, and Ohio.[15] Nationwide, U.S. utilities are planning deployment of 52 million advanced meters over the next five to seven years, representing more than one-third of the nation's active meters.[16]

If it were just a question of whether or not the benefits outweigh the costs, making a decision about rolling out AMI might seem relatively simple. However, regulators may be faced with multiple options with regard to both AMI deployment and dynamic pricing. For example, is a utility's proposed AMI plan the optimal one? Which dynamic-pricing method is best, and should it be the default rate design or just another customer option? What expenditures and investments would have to be incurred if the decision to deploy AMI is deferred?

Perhaps most difficult of all, how should regulators take into account unquantified and intangible benefits associated with AMI? Should they count local benefits only, or consider the effects of demand response in reducing market prices that spill over into neighboring states? Answering these complex questions will take time, so regulatory decisions won't be made overnight.

In time, widespread deployment of AMI and dynamic pricing in the United States might become increasingly attractive, as costs decline and customer benefits become more apparent. The soaring costs of new investment in generation and transmission make demand-side solutions look ever-more appealing. The compelling need to address global climate change increases the urgency of exploring the potential of demand-side options like dynamic pricing.

The pace of AMI deployment may depend on our success in revealing benefits that are not easily quantifiable, such as the hedge premium we pay for the privilege of having flat rates. The new administration's promise of federal grants to support smart-grid projects might provide further impetus. Inexorably, technological and economic forces will bring major changes to the electricity sector, as the smart grid takes shape and the full net benefits of AMI and dynamic pricing are revealed to utilities and consumers.

Endnotes

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http://docs.cpuc.ca.gov/Published/proceedings/R0604010.htm.

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16. Federal Energy Regulatory Commission, *Assessment of Demand Response & Advanced Metering: Staff Report*, December 2008, p. 15.

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