Rethinking Rate Design

Berkeley Lab's Discussion with Five Experts

By Lisa Wood, Ross Hemphill, John Howat, Ralph Cavanagh and Severin Borenstein





In a changing power system, how should utilities recover their costs? The evolution of the power system, driven by technological innovation, shifting loads, changing policies and new customer expectations is raising some fundamental questions about utility regulation.

Many utility investments, such as poles and wires, are fixed costs, at least over the short term. Most of their revenues, however, vary based on how much energy customers use, that is, kilowatt-hours. If customers buy less energy, whether due to less energy-intensive industries, greater efficiency, or self-generation, utility revenues decline. And growth in U.S. electricity use has gradually slowed each decade since the 1950s.

This trend has spurred new thinking about ways to charge customers for electricity services. Most utilities charge residential customers a fixed monthly fee, plus an amount based on energy consumption. Increasing the fixed charge is one way to ensure utilities have more stable revenues to cover fixed costs, and fixed charges have increased over time.

Raising fixed charges is also a response to concerns about revenue loss from higher levels of distributed energy resources, particularly customer-owned solar power systems. In 2015, utilities in about half the states proposed significant increases in fixed charges for all customers, or in some cases just for customers with onsite distributed generation.

To shed light on the issue, a new report in an ongoing series from Berkeley Lab called Future Electric Utility Regulation addresses various ways to recover fixed utility costs. Using a point-counterpoint format, experts from utility, consumer, environmental and economic perspectives discuss different types of ratemaking strategies and rate designs.

The authors of the report recently sat down to discuss their perspectives. The following are highlights of the discussion.

Lisa Wood

Many would agree that we are witnessing a major transition in the power sector. We see three key trends in the utility industry.

First, there is a transition to clean. Carbon emissions are down twenty percent below 2005 levels, and coal has fallen from fifty to about thirty-four percent of generation. We're seeing a lot of renewables come into the grid and a transition from coal to gas.

Second, things are getting more digital and distributed. Half of homes have smart meters now (about sixty-five million), and that number is rising. Companies are investing more than twenty billion dollars per year in the distribution grid, out of one hundred billion in total investment.

We have two-way power and information flows and exponential growth in distributed energy resources. This is probably the most fundamental and important reason why we're having this discussion today about pricing and distributed resources.

The system is becoming more complex and much more of a hybrid grid, where we have a mix of central power generating sources and distributed energy resources.

Lastly, we are seeing the individualization of customer services. Homeowners are going solar and buying energy management services. Large corporations with sustainability goals are buying renewable power, not just credits.

So utilities like Duke, Dominion and NV Energy are developing one-off customized tariffs to meet that demand. And there are new energy service business offerings. Edison Energy and Current, GE's new businesses, are offering energy as a service to large consumers, where they manage what energy is bought and what is produced on site.

This raises some key questions for regulators. How should regulators respond to these changes? What should the right rate designs be that encourage innovation, but maintain a reliable, affordable and flexible power system?

Lisa Wood is vice president of The Edison Foundation and executive director of the Institute for Electric Innovation. **Ross Hemphill** is a consultant with thirty-five years of experience in the power sector, including with Commonwealth Edison. **John Howat** is with the National Consumer Law Center. **Ralph Cavanagh** is a veteran attorney with the Natural Resources Defense Council. **Severin Borenstein** is an economist and professor at the Haas Business School at the University of California, Berkeley.

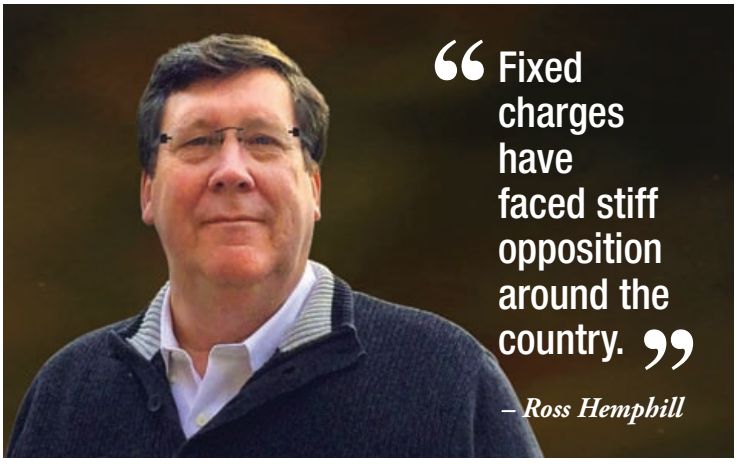
Electric utility companies are providing both grid services and energy services. Yet there's a tremendous amount of tension around charging for grid services directly, and this is the whole cost-shift issue underlying net energy metering.

As distributed energy resources continue to grow, the power grid is increasingly important as the integrator and enabler of these resources. It is absolutely critical for electricity customers to understand that they are buying both grid services and energy services and to price these distinct services appropriately. We need to adopt transparency in pricing and do it sooner rather than later.

Ross Hemphill

In our perspective in the report, we recommend formula ratemaking and appropriate cost-based approaches, such as fixed charges and demand charges.

Illinois has been doing formula ratemaking since legislation in 2011. Formula ratemaking is a lot like a budgeting process, where you simply compare what happened with what was expected. The formula sets revenue annually through a streamlined regulatory process.



It's just a simple math calculation using known and transparent inputs. In Illinois, the return on equity is determined by the average yields of thirty-year U.S. Treasury bond rates plus five hundred-eighty basis points.

More frequent and predictable rate cases provide the utility with more stability regarding cost recovery and result in larger customer benefits with regular needed investments in the utility's infrastructure.

The results in Illinois are really good. Electricity price increases are below inflation, storm recovery is faster, and customer satisfaction has improved.

We also recommend fixed charges that reflect the actual fixed costs that utilities face. But these charges have faced stiff opposition around the country.

Another cost-based approach is demand charges, replacing a per kilowatt-hour charge with a per kilowatt charge. They encourage customers to have a high load factor and provide incentives for energy efficiency and demand response. The challenge is that they are difficult to communicate to customers. It will take a lot of education to move forward.

Revenue decoupling is one approach that has worked well in the past for fixed cost recovery when energy efficiency was the primary driver for declining electricity usage. It remains helpful in the transition away from a commodity-based view of the utility business model.

But decoupling omits an important element of the ultimate solution to recovery of fixed costs when considering the significant growth in distributed energy resources. It does not address the need for all users of the grid to pay their share of the costs of using the grid.

The minimum bill approach that some recommend has benefits for efficiency. It could help ensure fair treatment of distributed energy resources and non-distributed energy resources customers if set at a sufficient amount per customer.

The formula ratemaking approach that we recommend is an effective way to recover the fixed costs associated with modernizing the grid, to incorporate the virtues of revenue decoupling, and to accomplish much of what is needed today in terms of rate reform.

John Howat

As the saying goes, the more things change, the more they stay the same. Energy is still a basic necessity of life. During this utility transition my hope is that issues of equity and consumer protection remain front and center.

Low-income households pay a higher share of their income for energy, and they often can't afford to invest in the things that can save energy. Access to energy efficiency, management and generation technologies is certainly not an equal opportunity proposition. Bear that in mind before we adopt rate designs and structures for people who don't have access to some of that technology.

We really need to think big in terms of coming up with ways to increase access to those technologies and the benefits of those technologies.

It's vital to preserve the economic and operational viability of the utility distribution system that retains the obligation to serve all customers. Some utility-of-the-future discussions neglect that point.

We've seen fixed charges as the predominant utility response to the changes that are in play. Since 2014, utilities in thirty-four states have proposed increased fixed charges.

Fixed charges create an intra-class cost shift, from high-volume to low-volume customers. On average, low-income households, the elderly, and households of color use less energy

than their counterparts in their rate class. Bigger fixed charges reduce incentives for energy efficiency and customer control over their bills.

For example, Madison Gas and Electric in Wisconsin proposed going from a fixed charge of ten dollars forty-four cents a month to nineteen dollars a month, and a reduction in the volumetric charge. That would result in a 5.5 percent increase in costs for low-use customers, while costs for high-use customers would drop 2.7 percent.

Fixed costs should not be equated with fixed charges.

Consumer advocates are also concerned about decoupling, since we lose the ability to litigate a cost structure. Revenues don't necessarily track costs. And it mitigates utility risk, but doesn't have a benefit to consumers.

But there are some changes to decoupling that can stabilize utility revenues and break the throughput incentive in a way that is more palatable to consumer advocates.

With time-varying rates, there are iterations that matter a lot to consumers. Time-of-use rates that vary by time-of-day or season are more predictable than critical-peak or real-time pricing.

Advanced metering rollout has really slowed since the federal stimulus funds ran out. That is an impediment to time-varying rates. They shouldn't be mandatory initially. And some safety valves should be included when they are rolled out.

Regulatory review of utility cost structures has got to continue. You can't just turn it over to autopilot. Cost structures have to be trued up on a regular basis.

Ralph Cavanagh

It may seem like we have a lot of disagreement, but if you locked the five of us in a room and told us to come to an agreement, I predict we could do it.

I think we all agree that the system does need to change in light of the changes Lisa Wood laid out. Since 2000, the U.S. trend has been less electricity use per capita. What was once a comfortable commodity business, that era is over.

But it's always a mistake to look for a single policy approach as a panacea. I think a package of policies can work for a broad range of interests.

My part of the paper tries to answer three questions. First, how can we break from the commodity model without reducing rewards for things we want customers to do? Second, as Ross Hemphill powerfully said, how can regulators allocate the cost of the grid equitably?

And finally, how can rate designs best signal to customers the actual cost of the electricity services they use to encourage efficient choices? That's something I know my friend Severin Borenstein will be talking about.

Ross said the problem with decoupling is that it doesn't ensure that every customer makes a reasonable contribution to the grid they're using. I'm going to agree with him, but I'm going to point out that we can't expect each of these approaches to solve all problems. We need to think of them in combination.

Decoupling is fundamental since it breaks us out of the commodity model. It has been tested in half of the states. It opens a path for more experimentation and innovation in rate design, since it reduces the risk of under- or over-recovery. So it contributes to solving other issues.

The policy recommendations in my paper, I think of as a package.

The first is time-varying rates. For those of us who are enthusiasts for energy efficiency, a key question is whether a robust portfolio of cost-effective measures will save more on-peak than off-peak.

Recent research by the Northwest Power and Planning Council for its Seventh Regional Plan indicates that such a portfolio would reduce peak demand more than off-peak. Moreover, critical peak pricing can be integrated effectively with traditional inclining block rates, as the Regulatory Assistance Project has shown.

With the growth of wind and solar, we are going to need more flexibility in our loads and generation sources. We want to send people strong price signals to use power, such as charging their electric vehicles, in ways that enhance system reliability and reduce costs.

There is a lot of confusion about the difference between a fixed charge and a minimum bill. Someone explained to me that a minimum bill is like a two-drink minimum in a bar, while a fixed charge is like a cover charge.

Everyone in a rate class subject to a fixed charge pays it, regardless of consumption. The resulting revenues are used to

reduce charges per kilowatt-hour, which also reduces customers' reward for saving electricity.

A minimum bill, on the other hand, is relevant only to those using very modest quantities of electricity. Everyone else would simply pay a higher volumetric rate for every kilowatt-hour consumed, compared to customers paying a fixed charge.

Minimum bills are fair to consumers and easy to understand. They avoid many equity concerns that John Howat raised, and address Ross's concern that all users should support the grid.

The way to go, I think, is a package of time-varying rates, minimum bills, tiered rates and decoupling.

Then there are some less effective reforms.

Frequent rate cases have high regulatory costs, but more importantly they don't solve the problem of decoupling utilities' financial health from retail sales. Even with frequent cases, most of life is lived between rate cases.

Higher fixed charges, like the all you can eat plan that Reliant offers in Texas, will reduce energy efficiency incentives for all customers. It's well documented that market failures block least-cost solutions like efficiency, with today's rates. The last thing we need in my view is rate designs that encourage additional electricity waste.

I would disagree that fifty percent of the utilities' costs are fixed, if you correctly consider what's fixed.

– Severin Borenstein

Lost revenue adjustment mechanisms sound benign. But there are all kinds of perverse incentives to adopt practices that look good only on paper. And these mechanisms create automatic rate increases. Decoupling, on the other hand, adjusts rates up or down.

There are many ways to combine approaches. There is tremendous good will among most of the parties involved. We don't have to rely on pitched battles to get long-term solutions.

Severin Borenstein

Why is there a cost recovery problem for utilities? Twenty years ago the task of rate design was to decide whose ox got gored, since most people had no choice. But now we're seeing more choices in terms of distributed energy resources, and even the ability to leave the system altogether.

Now there are issues of economic efficiency, as well as equity and treatment of low-income consumers. Tariff policy can no longer just focus on equity and low-income customers.

It is important to set a price equal to the full social marginal cost. Setting it lower or higher encourages inefficient behavior and creates an impediment to beneficial behaviors, such as using electric cars or installing more lighting for safety.

A minimum bill is like a two-drink minimum, while a fixed charge is like a cover charge.

– Ralph Cavanagh

External costs need to be included in that marginal cost. For example, greenhouse gases and local pollutants like sulfur dioxide.

And it needs to vary by time. It doesn't mean all customers have to be on time-varying rates, but people have to face up to the fact that they are imposing higher costs on the system at some times more than at others.

Time-varying rates make more sense than ever. In California we're now seeing the famous duck curve which is showing that net load is actually very low, and it's getting even lower on spring and fall mid-days.

So we're now seeing very low wholesale cost of electricity in the middle of the day. If you don't send pricing signals to consumers saying "now is a good time to charge your car or run your washer" or whatever, then we're going to end up curtailing some of the grid-scale, zero marginal cost resources.

Fixed charges are attractive on efficiency grounds, but the issue with them is equity. Big and small customers could pay the same fixed charge, unrelated to demand, which doesn't make sense to people.

There is also a repeated claim that fixed costs should be recovered with fixed charges, but that has no basis in economics. I would disagree that fifty percent of the utilities' costs are fixed, if you correctly consider what's fixed. But even if that were the case, that's not a reason that fixed charges should cover half of all costs.

I don't support tiered pricing, or inclining or declining block pricing. Inclining-block pricing is a very poorly targeted way to help low-income customers. It is not adjusted by the number of occupants in a household. It deviates grossly from social marginal costs.

And minimum bills are never a good option. They are identical to a fixed charge plus some free electricity. They grossly undermine price signals.

Cartoon drawn exclusively for *Public Utilities Fortnightly* by Tim Kirby

As Ralph said, it is like a two-drink minimum. Once you sit down those two drinks are free because you're going to get charged for them whether or not you consume, so you might as well drink them. This is rate design that encourages waste.

Likewise, demand charges don't have a place in solving this problem. The old definition of demand charges was simply the customer's monthly peak. The rationale was that a bigger customer required a higher level of service.

The new definition is the customer's peak during system peak periods. It's moving toward dynamic pricing, but is more confusing and less efficient than critical-peak or real-time pricing. It's hard for consumers to keep track of it, and still may not reflect actual system stress.

Frequent rate cases or decoupling have some advantages, but they are not addressing the fundamental problem of fixed costs.

In conclusion, there is no perfect answer to meeting the revenue shortfall problem. Demand charges and minimum bills don't meet the test of being cost-based, nor are they efficient or equitable.

Fixed charges should play a role, possibly based in part on service levels. The basis for volumetric prices should be social marginal costs, not vague goals. Charging high prices to some customers to get them to conserve should not be a valid argument. Conservation should only be encouraged to the extent it is efficient conservation. PUF

The report, *Recovery of Utility Fixed Costs: Utility, Consumer, Environmental and Economist Perspectives*, is part of the Future Electric Utility Regulation series. Produced by the Electricity Markets and Policy Group at Lawrence Berkeley National Laboratory, the series taps leading thinkers in the field to present different views on the future of electric utility regulation and business models and achieving a reliable, affordable and flexible power system.

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