

Currents of Change in the Design of Tariffs for Distribution Networks

Energy Transformed: Pathways and Connections
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Five currents are swirling around network tariffs, making change all but inevitable

Current 1. The emergence of distributed generation, which has created inequities among residential customers

Current 2. The realization that the cost-causation principle also applies to residential customers

Current 3. The rollout of smart meters which makes it relatively easy to offer demand charges

Current 4. The need to improve load factor and clip peaks

Current 5. The recognition that a few US and European utilities have been offering demand charges for years

Distributed generation has exposed the failings of existing tariff design

While network costs are largely fixed, the bulk of the revenues are variable under traditional volumetric tariffs

As growth slows down due to the deployment of distributed generation and “organic” conservation, networks face revenue risks

Ultimately, tariffs are raised for all customers, creating inequities as customers with low kW demand subsidize customers with high kW demand

With no demand charges, customers have no incentive to lower their kW demand, creating inefficiencies in the deployment of scarce capital

How some utilities are dealing with the issue

Mandating demand charges for distributed generation customers

- In Arizona, Arizona Public Service (APS) and Salt River Project (SRP) are moving down this path
- Solar City has filed a law suit against SRP

Give distributed generation customers a choice between (a) paying a higher fixed charge or (b) paying standard fixed charge along with a demand charge

- In Kansas, Westar Energy is moving down this path

Optimal tariff design

Tariffs should promote economic efficiency and equity but changes in tariff regimes should be implemented gradually

For networks, this translates into a two-part rate, where the first part is a monthly service charge and the second part is a demand charge

Such rates have been offered to commercial and industrial customers for the better part of the last century, inspired by the writings of Hopkinson and Wright

Illinois is considering a law which would mandate demand charges for all residential customers

Demand charges in the US

19 U.S. utilities in 14 states offer them on an opt-in basis

- Included in this category are large utilities such as Duke Energy, Georgia Power and Xcel Energy
- California is missing in action

With two exceptions, APS and Black Hills Cooperative, where participation rates are in the 8-10% range, the offerings have elicited weak customer enrollment

- The tariffs are often poorly designed, poorly marketed, and offered without advice about load control technologies

The situation will change with the deployment of smart meters, which is nearing 40% of all U.S. households, and the realization that the distribution grid is nearing a point of inflection

Demand charges in the US (continued)

The demand charge is set to cover demand-driven distribution and generation capacity costs, and in some cases transmission capacity costs

However, the utilities have exercised judgment when establishing the tariffs to avoid setting the demand charge above a price that might be unacceptable to customers

In cases where the utility is providing electric service as well as distribution service, the demand charge is paired with a fixed charge and a volumetric charge, which may be time-varying

Demand charges in the US (concluded)

Demand charges provide an incentive for customers to improve their load factor

- More work needs to be done on how to define demand

Demand charges do not increase bills for small customers the way an increase in the fixed charge would because the customers have an incentive to reduce their peak load

- This concern for small users is a major reason consumer advocates oppose an increase in the fixed charge.

To the extent that distributed generation (DG) output is coincident with the owner's maximum demand, the demand charge compensates the DG owner for the capacity value of their generator, which flat volumetric rates do not necessarily provide

Demand charges in Spain

All customers must select a level of demand prior to being connected to the grid

- They can base this level on the size of their house, and on whether or not they have electric heating
- An engineering firm will provide a report to the network in order for service to be activated
- Customers may change their mind as often as they want and either increase or reduce the contracted peak demand
- Once they have selected a level of demand, they have to adhere to it
- If they exceed it, they will have a blackout and will have to reset the system

Demand charges in Spain (concluded)

The tariff includes a demand charge and an energy charge (based on a pass through of wholesale market prices).

The weight of the demand charge in the total bill for the average customer has changed with time:

- 10 years ago, when demand was growing fast, the energy charge component was more important than the demand charge component. The target was to incentivize energy savings and efficiency.
- When demand started falling after 2008, regulated revenues started falling very quickly, while costs remained stable or still increasing. The government reacted by increasing the share of the demand charge to stabilize revenues

Demand charges in Italy

The Italian distribution network tariff is three-part. The demand charge is levied on the “size” of the connection to the network.

The customer can choose the size of the connection, which then acts as a limit on the power (kW) that can be demanded at any point in time.

This approach predates the arrival of smart meters. All households in Italy now have smart meters, and one of the functionalities of the smart meter is that it can limit the maximum power delivered to the house.

That maximum can be adjusted remotely on customer request

Changing tariffs is never easy

In 1938, the British economist Bolton commented that changes in tariffs were guaranteed to be an “unfailing” source of argumentation.

He added, perceptively, that “there is general agreement that appropriate tariffs are essential to any rapid development of electricity supply. And there is complete disagreement as to what constitutes an appropriate tariff.”

How to make a smooth transition

Define the nature of the rollout

- Opt-in, opt-out, mandatory

Specify the type of metering

- Interval or smart

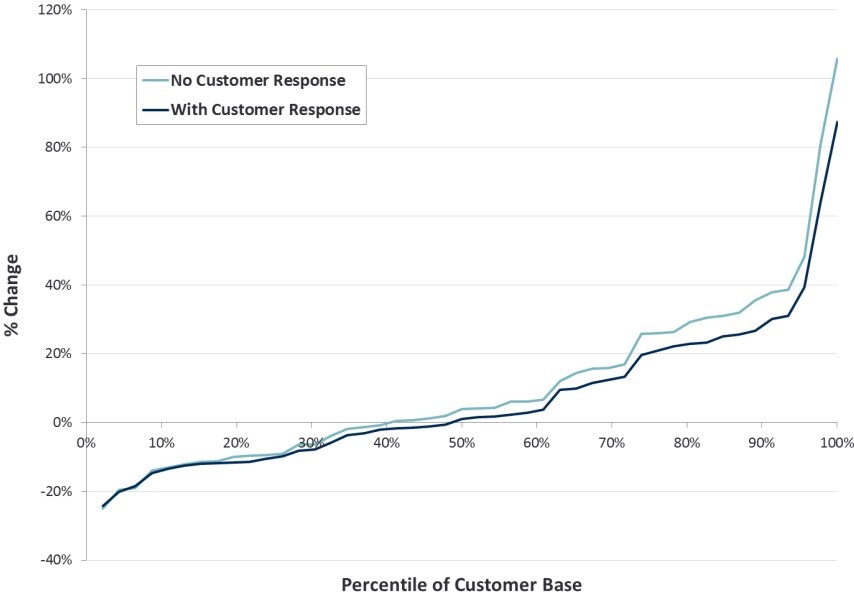
Mitigate the adverse impact on the bills of peaky customers

- Gradual rollout or bill protection or energy stamps
- Provision of enabling technologies to ameliorate bill impacts

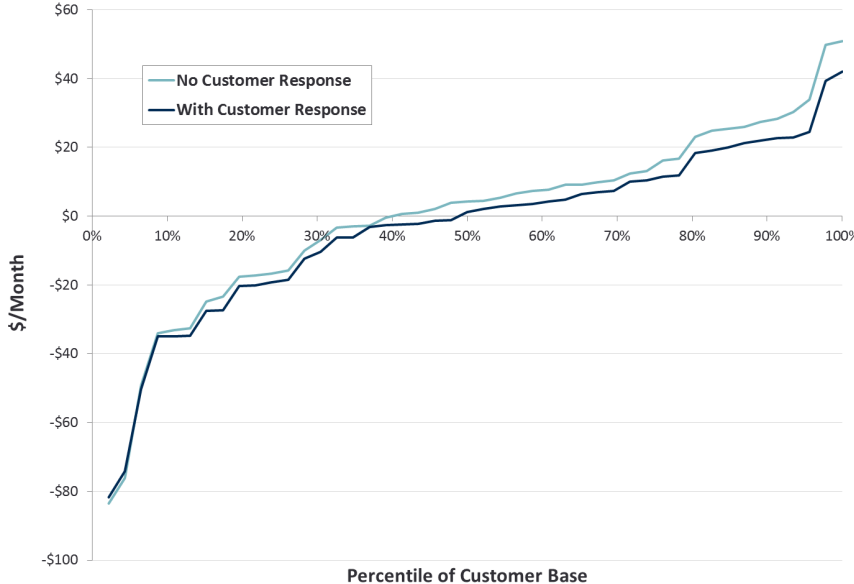
Educate customers on how to cope with demand charges and explain the rationale of these tariffs to policy makers and opinion leaders

There will be winners and losers even after allowing for demand response

Change (%)



Change (\$/month)



Dealing with vulnerable customers will be very important

Exempt them from needing to pay demand charges by retaining the existing two-part tariff for them, perhaps for a limited period of time

Provide them bill protection, again for a limited period of time

Give them “energy stamps” which would defray any increase in bills that would otherwise occur

Conclusions

The inclusion of demand charges in future network tariffs has become inexorable

The challenge for networks will not be how to design them or how to predict their impacts, because tools and data exist for doing both

The challenge will be to protect those who would lose under the rates so they don't take to the streets

- Reversing a centuries worth of inequities will take patience and tender loving care
- One option would be to temporarily reduce the gains to the instant winners and use the reductions to offset the losses of the instant losers

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