Revamping electricity tariff design to drive efficient investment in, and the optimal use of distributed energy resources

Promoting efficient investment in and utilisation of distributed energy resources (DERs), such as Solar PV and battery systems, offers numerous benefits for electricity system operators, distributors, and consumers alike. Achieving this, however, relies on tariff structures that provide clear and effective price signals.

Retail electricity tariffs in South Africa, like in many other countries, were not originally designed to promote efficient investment and integration of DERS. In the case of residential customers, most countries, including South Africa, still make use of volumetric tariff designs – such as inclining block Tariffs (IBT). Under volumetric tariffs, utilities recover most of their fixed costs via a charge based on the volume of electricity consumed typically measured in kilowatt-hours (kWh).

This design was popular because it was relatively easy to understand and linked a consumer's bill directly to the amount of electricity they use. It is problematic however because the implicit assumption is that each kWh consumed imposes the same cost on a utility regardless of, the time, location or total volume of electricity consumed. In reality, both energy and capacity costs are much higher in peak times than off-peak and in locations where a large proportion of costs of supplying a household with power are fixed – are incurred regardless of how much power the household consumes.

In addition, under volumetric tariffs, customers who install distributed generation can avoid their fair share of fixed costs. When a customer self-generates, the volume of grid-supplied power they consume (and as such their electricity bill) decreases significantly but the costs to the utility (of supplying the customer) remain largely unchanged – because they are mostly fixed.

The current retail tariff design for both residential customers and large power users in municipalities across South Africa also provides little incentive for self-generating customers to export power to the grid. Very few of the ~178 municipal electricity distributors currently compensate owners of DERS for the power they export to the grid. Only 8 out of the 22 largest municipal electricity distributors (by volume of electricity sales) and Eskom Distribution have designed and implemented tariffs that enable customers who own DERs to receive compensation (in the form of a credit on their utility bill) for some of the power they export.

In this paper we will discuss why retail electricity tariffs in South Africa need to be revamped and how they can be redesigned to drive efficient investment in, and the optimal use of, distributed energy resources.