



## Making rooftop solar in developing countries fair for utilities and customers

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*Rooftop solar is booming in both developed and developing countries. Rooftop solar reduces greenhouse gas and other emissions from conventional power generation. However utilities are concerned that their reduced revenues exceed their cost savings and often they are not compensated for this loss.*

### Rooftop solar is good for the environment but adds to the challenges faced by utilities

Utilities in developing countries may face challenges of: increasing connections, typically to customers with low consumption and low ability to pay; providing additional network capacity to meet increasing peak demand; and collecting sufficient revenue to meet all expenses. Rooftop solar can support the first of these challenges while threatening the other two.

In this Viewpoint, we discuss options for electricity utilities in developing countries to mitigate the potential financial downsides of increased rooftop solar without compromising the benefits.

### Tariff and cost structures are not easily aligned

Electricity utilities typically earn revenues through a combination of fixed (per connection or per kW of

contracted demand) and variable (per unit of energy consumed and per kW of actual demand) charges. These revenues are required to cover fixed costs (eg, for installed network capacity) and variable costs (eg, the cost of fuel in a power station). Fixed costs of supply do not change as energy consumption (and variable costs) reduce.

Fixed costs typically account for a much larger share of total costs than the share of revenue from fixed charges. The *structure of the charges* that customers pay typically does not fully reflect the *structure of the costs*, particularly in countries without supply competition.

### Utilities can lose money with increased solar penetration

Customers who self-supply from their own solar panels can reduce energy consumption from the grid and reduce the associated variable charges<sup>1</sup>. However, retaining a main grid connection, with the benefit of having power available whenever required, still places fixed costs on the network (for the network assets), which must be recovered, regardless of energy consumption.

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<sup>1</sup> We do not discuss the sale of power back to the grid from customer solar panels here, although this changes little of the argument.

When fixed charge revenues are lower than fixed costs, the utility will make financial losses on supply to customers who install solar panels. In some cases it may be able to pass this loss on to consumers without solar panels, but often not.

### **Solutions vary in their economic efficiency and ability to implement**

Where there is no supply competition and the utility requires customers without solar panels to cross-subsidise those with solar panels, the framework is financially sustainable for the utilities (though not necessarily the best approach). We note below three alternative approaches utilities in developing countries can take to address this challenge.

#### **Increase fixed charges and reduce energy charges for all customers.**

This will move the structure of customer bills closer to the structure of costs faced by utilities, such that tariffs are 'cost-reflective'. For large consumers, this may have little impact on total monthly bills, but for the lowest consumption consumers (and possibly poorest customers), bills would likely increase. Such an outcome may be viewed as undesirable for policymakers and regulators, and therefore may be difficult to implement.

**Increase fixed charges for all but the poorest customers.** The impact on affordability noted above may be

avoided by applying the change to all customers except those in defined 'lifeline' categories (low income, low consumption), with the shortfall covered as a cross-subsidy or a levy on network charges from other customers.

**Increase fixed or variable charges only for those customers installing solar panels through a new tariff category.** This approach will decrease the risk of losses from solar customers. As it will have no impact on other customers, it should be easiest to implement. However, it may require careful explanation to avoid the appearance of discouraging solar installations.

#### **There is no simple, politically acceptable, solution**

The first alternative of shifting all customers to cost reflective tariffs may have a negative impact on the poorest customers, and therefore be deemed politically untenable. The second alternative, a lifeline tariff, overcomes this problem, but often the subsidy is poorly targeted (eg, it benefits those with second homes). The third alternative of imposing extra charges for customers with solar panels is also often difficult to explain to customers wishing to install solar panels. In some cases it may also require that the total output from the solar panels is metered in order to apply charges. Unfortunately, there are no easy solutions.

Economic Consulting Associates was established in 1997 to provide economic and regulatory consulting services to industry and government. Our senior staff have many years' experience of carrying out economic, market and policy analyses in the electricity, natural gas and water sectors.

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