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# Beyond net metering: A model for pricing services provided by and to distributed generation owners



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#### **1. Introduction**

At industry conferences, in academic papers, and in policy circles much has been made of the challenges facing electric utilities and their regulated business model. The decreasing cost of energy storage, a growing penetration of distributed generation (solar and other renewables), and the specter of full exodus from the grid has garnered the attention of utilities and other stakeholders. (The most ominous possibility, the so-called "utility death spiral,"<sup>1</sup> became a popular Google search term in March 2014.) But with these challenges also lies opportunity. Advances in both technology and the regulatory framework governing customer production and consumption of electricity can better align price incentives with efficient investment decisions, while still protecting consumers and utility investments, and, where there is commitment to do so, promoting renewable energy.

This article is organized as follows. The remainder of Section 1 introduces net metering in the context of the traditional utility business model and presents a framework for evaluating the efficiency and equity of net metering. Section 2 presents the approach that we advocate: decoupling of distributed generation compensation from retail electricity consumption tariffs, and providing market-based compensation, where possible, and an appropriate level of non-market compensation, where not.

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authors propose a new method of metering, compensating and charging customers who own DG resources. The authors encourage separate and granular gross DG output measurement and compensation (plus potentially charges), whether DG is exported to the grid or consumed locally, preferably reflecting locational and temporal value. They analyze the costs and benefits of net metering and their proposed alternative.

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Section 3 presents a discussion on important issues that may arise from the proposal in Section 2, such as ensuring adequate compensation to the utilities and sufficient price certainty to customers with DG. Section 4 compares our proposal to reforms of the net metering regime that have been implemented or proposed in the US and evaluates the *pros* and *cons* of these various approaches.

#### 1.1. The traditional utility business model

In the traditional electric utility model, captive customers<sup>2</sup> pay a combination of fixed charges and variable charges in exchange for safe, reliable electric service. Fixed charges tend to be specified on a per-customer basis. Variable charges tend to be per kWh "energy charges" for residential and small commercial customers or a combination of energy charges and per kW "capacity charges" for large commercial and industrial customers. The rates are generally determined by the utility's cost of service, with differentiated rates for each type of customer, known as a rate class, based on principles of cost causality, to the extent practicable. Utilities measure the cumulative energy consumption from the grid for most customers on a monthly basis, charging a single or block rate.

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<sup>&</sup>lt;sup>1</sup> The utility death spiral where utilities face ongoing customer departures and have to raise rates repeatedly for remaining customers until their rates become too high to be viable.

<sup>&</sup>lt;sup>2</sup> Customers are captive in the sense that they have no alternative but to take service from their local utility. While some US states have allowed customers to choose their generation supplier, customers in all states tend to be captive in that they must take distribution service from their local utility. For our purposes, we therefore do not draw distinctions between vertically integrated utilities and those that are "wires only."

#### 1.2. Net metering

Net metering is a charging policy that applies to customers with generation *behind* the meter, such as homes or small businesses with rooftop solar, small wind turbines, or other forms of self-generation.<sup>3</sup> Photovoltaic solar panels constitute the vast majority of installations. The default policy – in place for decades now – has been for the utility to read net metering customers' meters, which capture *net* consumption, as they would any other customer's meter even if those readings are lower due to on-site generation. When a customer actually generates more in a month than he or she consumes, this "negative consumption" amount can in most instances be carried over to the next billing cycle and netted against the amount consumed in a future cycle.

Historically, the penetration of distributed generation (DG) has been small and the aggregate effect of net metering policies on utilities insignificant. Any inefficiencies or inequities resulting from net metering were not large enough to justify reforming the rate structure for customers with small quantities of behind-themeter generation. But the rapid rise in DG over the past decade, especially distributed solar, which has grown at double digit rates in recent years, requires policymakers to address the efficiency and equity of net metering. As we detail in Section 4, several US states have already undertaken reforms to their net metering policies, while many others are considering them.

#### 1.3. Inefficiencies and inequities

The reasonableness of regulated rates must be tested against a common set of ratemaking objectives, which have evolved from the long history of public utility regulation in North America. Professor Bonbright, a renowned expert on public utility rates, outlined the principal objectives:

- (1) The related, "practical" attributes of simplicity, understandability, public acceptability, and feasibility of application.
- (2) Freedom from controversies as to proper interpretations.
- (3) Effectiveness in yielding total revenue requirements under the fair return standard.
- (4) Revenue stability from year to year.
- (5) Stability of the rates themselves, with minimum of unexpected changes seriously adverse to existing customers.
- (6) Fairness of the specific rates in the apportionment of total costs of service among the different consumers.
- (7) Avoidance of "undue discrimination" in rate relationships.
- (8) Efficiency of the rate classes and rate blocks in discouraging wasteful use of service while promoting all justified types and amount of use:
  - in the control of the total amounts of service supplied by the company;
- (9) in the control of the relative uses of alternative types of service (on-peak versus off peak).<sup>4</sup>

Regulators commonly use these objectives to guide evaluation of the reasonableness of proposed rates. As a practical matter, it is not possible to fulfill all of the objectives simultaneously, and regulators must accept trade-offs when objectives conflict. Few, if any, regulated rates are perfectly fair or perfectly efficient. Yet, in the design of rates, these objectives remain an appropriate goal, tempered only by pragmatism and the aim to fulfill the other goals.

How well does net metering align with the eight objectives? Net metering, being a simple, consistent, and transparent scheme, meets objectives (2) and (5) well. It also satisfies most elements of objective (1), albeit without full acceptability by the public.<sup>5</sup>

Net metering may very well fail when it comes to meeting the other objectives, however. We address them by posing three key questions: (1) Is a net metering policy fair to customers with and without distributed generation? (2) Is net metering fair to utilities? (3) Does net metering provide economically efficient signals for DG investment? Our views on each follow.

- (1) Is a net metering policy fair to customers with and without distributed generation? (Objectives (6) and (7)) No. Studies in several jurisdictions show evidence that net metering schemes result in the subsidization of DG customers by non-DG customers.<sup>6</sup> This finding holds even when using the strict economist's definition of subsidy, meaning that the applicable rate is less than marginal cost or greater than stand-alone cost.<sup>7</sup>
- (2) Is net metering fair to utilities? (Objectives (3) and (4)) No. With the rapid and somewhat unpredictable growth in DG, there is additional risk to utilities that they will fall short of their revenue requirements. Longer term, net metering left unchanged could accelerate the challenges to the utility business model—particularly with respect to utilities' load balancing requirement.
- (3) **Does net metering provide economically efficient signals for DG investment?** (Objective (8), in a sense)<sup>8</sup> *No.* It is admittedly odd to discuss generation investment signals in the context of Objective 8, which addresses service provided by the utility to the customer. But this highlights the issues addressed by this article: distributed generation (and distributed resources generally) challenge the previous one-way relationship between utility and customer.

Net metering in effect compensates a customer for DG at the retail rate where – at least for smaller customers – the retail rate may be constant within a month or even within a year or more. The potential shortcomings of net metering already mentioned stem from the underlying implicit assumption that the retail rate provides fair and efficient compensation for DG. But paying the retail rate for DG ignores the following critical economic considerations:

<sup>&</sup>lt;sup>3</sup> It will be helpful to be precise about the meaning of "net metering." In most articles and regulatory/policy discussions, "net metering" is actually quite a narrow term, addressing what happens when a customer's total generation exceeds its consumption in a billing cycle. Under "net metering" in the narrow definition, the net quantity provided to the grid carries over to the subsequent billing cycle as a credit against net energy consumed (or similarly the customer receives a cash credit on their bill at the retail rate). So, when a jurisdiction contemplates moving away from net metering, often this only means that they are contemplating changing what happens to this "net excess energy." For our purposes, however, we refer to net metering as the netting of any behind-the-meter production against a customer's usage—i.e., any scheme where DG allows a customer to offset retail consumption still is a net-metering scheme.

<sup>&</sup>lt;sup>4</sup> James C. Bonbright, *Principles of Public Utility Rates* (New York: Columbia Univ. Press, 1961), p. 291.

 $<sup>^{5}</sup>$  In administrative law proceedings addressing net metering, some intervening parties have favored the net-metering *status quo*, while others have urged regulators to change it.

<sup>&</sup>lt;sup>6</sup> For example, see E3, *Nevada Net Energy Metering Impacts Evaluation 2016 Update*, August 2016. http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS\_2015\_THRU\_-PRESENT/2016-8/14179.pdf, p7. Note also that some have proposed the opposite: i.e., that retail rates undercompensate distributed generation (at least distributed solar): see, for example, Rocky Mountain Institute, 2013, *A Review of Solar PV Benefit* & Cost Studies, 2nd Edition, page 22, which shows several studies where retail tariffs are below the value of distributed PV, as well as studies that show the reverse.

<sup>&</sup>lt;sup>7</sup> See, for example, Faulhaber, Gerald R. (1975), Cross-Subsidization: Pricing in Public Enterprises, *American Economic Review*, 65(5):966–977.

<sup>&</sup>lt;sup>8</sup> In other words, we are asking: (a) does net metering lead to an efficient amount of DG investment (not too much, not too little), and (b) is the DG investment appropriately distributed—e.g., targeting the areas with the best DG potential?

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