Energy Policy 85 (2015) 115–125

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Regulatory and ratemaking approaches to mitigate financial impacts of net-metered PV on utilities and ratepayers

Andrew Satchwell*, Andrew Mills, Galen Barbose

Lawrence Berkeley National Laboratory, 1 Cyclotron Road, Mailstop 90R4000, Berkeley, CA 94720 USA

HIGHLIGHTS

- Customer-sited PV presents negatively impacts utilities and ratepayers.
- Regulatory and ratemaking approaches exist to mitigate profitability and rate impacts.
- Mitigation approaches entail tradeoffs among stakeholders.

ARTICLE INFO

Article history:
Received 19 December 2014
Received in revised form
12 May 2015
Accepted 25 May 2015

Keywords:
Customer-sited PV
Utility regulation
Decoupling
Shareholder incentives
Rate design

ABSTRACT

The financial interests of U.S. utilities are poorly aligned with customer-sited solar photovoltaics (PV) under traditional regulation. Customer-sited PV, especially under a net-metering arrangement, may result in revenue erosion and lost earnings opportunities for utility shareholders as well as increases in average retail rates for utility ratepayers. Regulators are considering alternative regulatory and ratemaking approaches to mitigate these financial impacts. We performed a scoping analysis using a financial model to quantify the efficacy of mitigation approaches in reducing financial impacts of customer-sited PV on utility shareholders and ratepayers. We find that impacts can be mitigated through various incremental changes to utility regulatory and business models, though the efficacy varies considerably depending on design and particular utility circumstances. Based on this analysis, we discuss tradeoffs policymakers should consider, which ultimately might need to be resolved within broader policy contexts.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Regulators and policymakers are increasingly concerned about the negative financial impacts of customer-sited solar photovoltaics (PV) on utilities and ratepayers as PV deployments rapidly accelerate. Utilities point to impacts on profitability, as declining retail sales reduce collected revenues and future earnings opportunities. At the same time, average retail rates may increase because the utility must spread its fixed costs over a smaller sales base.

Debates about net metering are taking place against the backdrop of a larger set of discussions about existing utility business and regulatory models. One dimension of those broader discussions has focused on the poor alignment between the traditional utility business model – whereby utility profits are closely tied to sales volume and capital investments – and recent advances in technology and public policy that are driving the growth of demand-side resources, which tend to reduce sales and opportunities for capital investments (Kind, 2013; Fox-Penner, 2010). Arguably the greatest progress on those issues has occurred with respect to utility ratepayer-funded energy-efficiency (EE) programs, where the unintended consequences of the "utility throughput incentive" to increase sales and add capital investments to the utility's ratebase long have been recognized and a variety of regulatory tools have been developed and deployed to better align utility financial interests with EE goals (Wiel, 1989; Moskovitz et al., 1992; Harrington et al., 1994; Stoft et al., 1995; Eto et al., 1997; Kushler et al., 2006; NAPEE, 2007). Among the goals of the present study is to leverage this base of experience and illustrate how some of the same regulatory and ratemaking strategies could also be applied in the context of distributed PV.

Abbreviations: EE, energy efficiency; GRC, general rate case; ITC, investment tax credit; LRAM, lost revenue adjustment mechanism; NE, Northeast; NEM, net energy metering; NPV, net present value; PPA, power-purchase agreement; PV, solar photovoltaic; REC, renewable energy credit; ROE, return on equity; RPC, revenue per customer; RPS, Renewables Portfolio Standard; SW, Southwest

* Corresponding author. Fax: +1 510 4866996.
E-mail addresses: ASatchwell@lbl.gov (A. Satchwell), ADMills@lbl.gov (A. Mills), GLBarbose@lbl.gov (G. Barbose).

http://dx.doi.org/10.1016/j.enpol.2015.05.019
0301-4215/© 2015 Elsevier Ltd. All rights reserved.

A number of the EE studies and several others (Bird et al., 2013; Blackburn et al., 2014; Linvill et al., 2013; Kihm and Kramer, 2014; Shirley and Taylor, 2009) identify regulatory and ratemaking options for mitigating adverse rate impacts from distributed PV, while many others also discuss possible broader changes to utility business and regulatory models that are compatible with, or that could facilitate the growth of, distributed PV (EPRI, 2014; Hanelt, 2013; Harvey and Aggarwal, 2013; Lehr 2013; Moskovitz, 2000; Newcomb et al., 2013; Nimmons and Taylor, 2008; Richter, 2013a, 2013b; Rickerson et al., 2014; RMI, 2012, 2013; Wiedman and Beach, 2013). The studies provide a qualitative discussion of incremental and more fundamental changes to utility business and regulatory models, but they do not attempt to model and quantify the efficacy of those changes to better align shareholder and ratepayer interests with distributed PV.

Using a pro-forma financial model, we quantify the impact of a number of possible mitigation approaches that might reduce any negative impacts to shareholders and/or ratepayers from growing amounts of customer-sited PV under a net-metering arrangement.[2,3] These mitigation measures include alternative rate designs, utility revenue decoupling, utility ownership of distributed PV, and various other strategies. Our analysis results are based on characterizations of two prototypical utilities in the U.S.: a vertically integrated utility in the Southwest ("SW Utility") and a wires-only utility and default service supplier in the Northeast ("NE Utility"). Both utilities collect revenues through a fixed customer charge ($/customer), volumetric demand charges ($/kW), and volumetric energy charges ($/kWh). As described in more detail later, the rate of growth of customers and sales is higher for the SW Utility than for the NE Utility, though the fixed costs of the NE Utility grow at a higher rate. Since the SW Utility is vertically integrated, a much larger share of its costs are related to capital investments (45% of costs) compared with the NE Utility (16%).

Importantly, the paper builds on a companion article quantifying the impacts of customer-sited PV on the same prototypical utilities (see Satchwell et al., 2015). For each utility, we modeled the potential impacts of PV over a 20-year period, estimating changes to utility costs, revenues, average rates, and utility shareholder earnings and return-on-equity (ROE). The utility shareholder and ratepayer impacts of customer-sited PV were first assessed under a set of base-case assumptions related to each utility's regulatory and operating environment, in order to establish a reference point against which potential mitigation strategies could be measured. The base-case analyses were performed with total penetration of customer-sited PV rising over time to stipulated levels ranging from 2.5% to 10% of total retail sales (compared to current penetration levels of 0.2% for the U.S. as a whole and of roughly 2% for utilities with the highest penetrations, excluding Hawaii), all under a net-metering arrangement.[4] Each of these PV penetration cases was compared to a scenario with no customer-sited PV over the entire analysis period.

Results from the companion article identify two negative financial impacts for the modeled utilities and one negative impact for ratepayers. First, although customer-sited PV reduces total utility costs by roughly similar amounts for the two prototypical utilities,[5] the reduction in non-fuel revenues generally outpaces the reduction in non-fuel costs, which reduces the utility's ROE and results in the "revenue erosion effect." Second, some reductions in non-fuel utility costs represent deferred or avoided future utility capital investments in generation plants, transmission systems, and distribution systems. This diminishes future earnings opportunities, resulting in the "lost earnings opportunities effect." From the ratepayer perspective, reduced utility retail sales due to customer-sited PV increase average all-in retail rates (expressed as total annual collected revenue divided by total annual retail sales) as costs are spread over a smaller sales base. The mitigation approaches in this paper are targeted at the two impacts on utilities and the one impact on ratepayers identified in the foundational study.

2. Methods

We used a pro-forma financial model that calculates utility costs and revenues based on specified assumptions about the utility's physical, financial, operating, and regulatory characteristics.[6] This model has been used to analyze the financial impacts of EE programs on utility shareholders and ratepayers under alternative utility business models (Cappers and Goldman, 2009a, 2009b; Cappers et al., 2010; Satchwell et al., 2011) and to analyze the impacts of customer-sited PV (Satchwell et al., 2014; Satchwell et al., 2015).[7]

Aside from the traditional cost-of-service business model, alternative regulatory mechanisms can be implemented in the model. The model can represent sales-based or revenue-per-customer (RPC) decoupling mechanisms, lost-revenue-adjustment mechanisms, and shareholder-incentive mechanisms. It can also analyze alternative ratemaking approaches (e.g., a high fixed customer charge) by changing the way utility revenues are collected among different billing determinants.

Table 1 shows the mitigation cases examined in this analysis. Though by no means exhaustive, this set of measures includes many of the regulatory and ratemaking strategies implemented or discussed in connection with EE programs as well as analogs that might apply to PV. Most of these measures specifically target the shareholder impacts from customer-sited PV (associated with either revenue erosion or lost earnings opportunities), and these measures might exacerbate the ratepayer impacts from customer-sited PV, exemplifying one kind of tradeoff that can arise.

Our analysis of mitigation measures focuses on the 10% PV penetration scenario so that the effects of the measures are revealed clearly. Assuming lower PV penetration for this portion of the analysis produces qualitatively similar, but less discernible, results. The mitigation analysis involves changes from base-case conditions that occur only in conjunction with PV. Thus we gauge the effectiveness of each mitigation measure in terms of the extent to which it restores shareholder earnings, shareholder ROE, and/or

[2] The work in this article is based on a longer technical report (Satchwell et al., 2014), entitled *Financial Impacts of Net-Metered PV on Utilities and Ratepayers: A Scoping Study of Two Prototypical U.S. Utilities*, available at: emp.lbl.gov/publications.

[3] Net energy metering (NEM or simply "net metering") is a billing mechanism that allows customers to export electricity generated by their PV systems to the grid and apply that excess generation against electricity consumption at other times, in effect receiving credit for all PV generation at the prevailing retail electric rate. It is currently the predominant compensation mechanism for customer-sited PV in the U.S.

[4] Specifically, penetration of customer-sited PV rises from zero in year 1 to levels ranging from 2.5% to 10% of retail sales in year 10 and then remains constant as a percentage of retail sales for the latter 10 years of the 20-year analysis period. This approach was taken in order to capture end-effects that occur after PV additions take place.

[5] SW Utility costs decrease 1.3% and NE Utility costs decrease 1.5% under 2.5% PV penetration, and SW Utility costs decrease 4.0% and NE Utility costs decrease 4.5% under 10% PV penetration.

[6] Data to populate the model for this analysis were taken from publicly available utility filings, including integrated-resource plans, rate-case filings, and shareholder financial information (e.g., SEC 10-k).

[7] The model was adapted from a tool (the Benefits Calculator) initially constructed for the National Action Plan on Energy Efficiency (NAPEE) to analyze the financial impacts of EE programs on utility shareholders and ratepayers under alternative utility business models (NAPEE, 2007). We significantly updated and expanded the Benefits Calculator for the present study.

Download English Version:

https://daneshyari.com/en/article/7400498

Download Persian Version:

https://daneshyari.com/article/7400498

Daneshyari.com