**Review of Frank Wolak and Ian Hardman, "The Future of Electricity Retailing and How We Get There".**

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The well-known energy economist and consultant, Stanford Professor Frank Wolak, and doctoral student Ian Hardman, argue that, during the process of (US) electricity market restructuring, relatively little attention was given to retail market design compared to wholesale market design. This made sense given the initial relatively simple technical conditions, with mechanical manually-read meters, with the internet in its early stages, and with wireless and control devices in their infancy. But technology has since evolved – including with intermittent renewables, interval (smart) meters, and low-cost communications to control appliances – and global environmental concerns are now leading to aggressive plans for electrification. The authors argue that, despite such developments, retail markets have changed little in most places, and this failure to adapt retail market design limits the benefits from the earlier restructuring.

The authors distinguish between reactive and forward-looking approaches to adapting retail design, with the preferred approach depending on the initial conditions in any region and on the region's policy goals. They survey the technical drivers of changes in retail markets and regulatory barriers that might inhibit the realisation of benefits. They describe the current state of retail markets and the deployment of these new technologies, look at possible futures, with reference also to recent events in California and Texas, and conclude with some suggested directions for future research.

The two-fold aim of the book is to encourage regions to take a critical look at their electricity retail sector to determine whether it is holding back the realisation of significant economic and environmental benefits, and also to provide a framework for adapting to the technical and environmental policy changes. What's not to like? These are commendable and timely aims.

Taking the chapters in turn, Chapter 1 explains the proposed "two paths to the future of electricity retailing". The reactive approach addresses only major technological changes and may not realise all the potentially available economic benefits, but may be the most appropriate for some regions because of their existing infrastructure, regulatory institutions and renewable resource base. The forward-looking approach may be more costly and risky, but may be appropriate for other regions because of the ambition of their climate goals, the richness of their renewable resource base, and the current state of their physical and institutional infrastructure.

There is also discretion to mix and match. So each region will choose from the menu, and some regions, depending on their tastes and incomes, may choose burger with fries and ice cream, others a gourmet five-course dinner beginning with oysters Rockefeller (provided oysters are farmed in the region). The choice also depends on "the appetite of the regulator" for requiring final customers to manage hourly wholesale price volatility" (p 3).

But who exactly makes these regional decisions? Is there to be any estimate of costs and benefits in making them? Will the proposed approach not lead to increasing divergence between regions, and does this matter? These questions are not posed.

Chapter 2 explores the drivers of change in the retail sector. Innovations in monitoring and communications technology, including the move from mechanical to interval metering, have made it possible for consumers and retailers to benefit from investment in load-shifting and distributed storage. However, present approaches have created incentives for inefficient deployment of distributed solar. Declining costs of sensors (load control, programmable thermostats, "smart home" devices) enable monitoring and changing energy consumption remotely, reducing the effort required to respond to price signals. Falling solar capacity installation costs have made distributed solar a competitor to grid-scale electricity, and "the remaining potential for distributed solar installations is enormous" (p 14). Low-cost two-way communications technology is reducing the cost of real-time feedback. Policies to electrify the transport and heating sectors are having a significant impact. Suppliers are now offering different time-related rates for EV charging, separately metered from household supply. All this may be familiar to experts, but it seems a useful survey of technical developments.

To pick a few themes from Chapters 3 to 5, the book notes the great disparity in the introduction of retail competition, and the current states of retail markets, around the world, and even within larger countries such as the US. Yet it shows no interest in asking the reasons for this, and why some regions moved further or faster than others. Similarly, although there is reference to different subsequent price paths in the US, as between different types of retail market, there is no attempt to analyse the effects or to assess which has been more successful (although there is research elsewhere on these issues).

The book suggests that some barriers to change are a result of not putting in place necessary conditions such as interval metering, and cites some different regional approaches to that issue. The UK, Victoria in Australia, New Zealand and ERCOT in Texas all attempted a voluntary approach, but only New Zealand succeeded. The obvious questions are why and how, but again those questions are not posed.

There is some reference to cost-benefit analyses of smart metering installation programmes. For example, in Victoria the net present value (NPV) was initially estimated as plus A$775m and later in 2011 as minus $A309m. In the EU, estimates of cost ranged from €38 to €546 per meter, while estimates of benefits ranged from €19 to €493. Why such great differences, and can any such estimates be taken seriously?

In Victoria, the Government later censured the smart metering programme, attributing the A$309m net cost to lack of adoption of dynamic (real-time) pricing. Whereas the 2011 report assumed 4% enrolment in flexible tariff programmes by 2014, only 0.27% of customers had enrolled by 2015. But why was enrolment so much less than projected, and why was the projection itself so low? Again, these questions are not posed.

Chapter 6 provides many useful examples of the benefits of interval/smart meters. These include immediate readings, remote reading, two-way communication for maintenance and

control, advanced tariff systems, security and data protection. US distributors have thereby saved millions of dollars in operations and switching costs, and enabled quicker restoration of service after outages and better identification of failing distribution equipment. Retailers now offer battery storage systems with Electric Vehicles (EVs). Device-level data rather than household-level or building-level data aids customer participation in wholesale markets.

A regulatory barrier to change is argued to be the setting of inefficient prices for regulated Transmission and Distribution (T&D) services, and/or the use of average cost pricing instead of marginal cost pricing at the retail level. Thus, in California grid-based power is priced at an average of 22c/kWh versus residential rooftop solar at 15c/kWh, hence the rapid increase in rooftop solar power, and in grid costs, even though grid scale solar is cheaper than residential rooftop. The authors argue for charging T&D at marginal cost, recovering the balance in the monthly charge. To address the resulting burden on low-income customers, Wolak elsewhere proposes to relate the monthly charge to the expected value of the square of the household's hourly consumption. But low-income customers are seemingly still worse off. There is no indication of the strongly-held and very different views on this issue presently coming to a head in California and no doubt elsewhere.

Chapter 7 asks: if dynamic pricing is efficient, why don't customers like it? Answer given: because a default tariff equal to the average cost of wholesale energy will ensure that no one switches to dynamic pricing. This is explained with a "simple economic model" and diagram (whose use of customer indifference curves as between mean and standard deviation of hourly price took me back over fifty years, but alas without bringing any comprehension).

The chapter seeks to explain "why there is so little adoption of dynamic pricing plans in all regulated retail markets and competitive retail markets with a regulated default price option, which includes virtually all retail markets globally. First, there is significant bias towards setting the fixed default price too low to allow effective competition. Second, it is extremely difficult for regulators to determine pricing plans that involve customers managing some hourly price risk that will be chosen by consumers and still allow the retailer to recover the cost of serving all of its customers" (p 107).

On the first point, Lacey (2019) and others have plausibly argued that US default tariffs are indeed too low, because they do not include customer costs (call center, billing, accounting, risk management, regulatory, computers/IT, rent, office equipment, furniture, etc.), *not* (as the book argues) because default tariffs do not include an adequate risk premium (which is embodied in the bids to provide the default service). On the second point, the proposed regulatory responsibility seems novel but unclear.

Importantly, the use of dynamic pricing is roughly as negligible in unregulated retail markets, where there is no default tariff, as in the allegedly mis-regulated markets. A more plausible explanation is surely that most customers do not yet see sufficient financial benefit in it – at least, without some additional technology such as EV, rooftop solar and/or battery storage.

The book then explains "An approach that has worked to stimulate retail competition and active management of short-term price risk" (p 109), viz the 'price to beat' (PTB) established

in Texas. But the PTB has been somewhat tweaked here to fit the present narrative. Thus, it is suggested that the relatively high level in Texas was set "in order for vigorous retail competition to occur and customers to shift to retail prices that require them to manage some short-term price risk" (p 109). But the legislation (Senate Bill 7 1999) made no reference to customers managing some short-term price risk. Further, a central aim of the PTB, not mentioned here, was to prevent incumbent retailers holding on to their customers: accordingly, these retailers had to set their price equal to the PTB for three years, or until they had lost 40% of their residential customer load. Finally, the suggestion that "when the widespread deployment of interval meters in ERCOT was completed, *the price to beat* was no longer needed" (p 109) completely reverses the actual order of events. The PTB was in effect from 2002 to January 1 2007 latest, hence was removed before the smart meter installation program from 2008 to 2012 even began.

Chapter 7 considers the possibility of a default tariff with the wholesale cost component set equal to the hourly wholesale price. It is argued that this need not lead to much monthly bill volatility because a customer would purchase in advance various load shapes at potentially different prices "analogous to how cell phone customers currently purchase minutes of service each month". Thus, "a household might purchase 1 kWh of wholesale energy delivered 24 h per day and 7 days per week at 4 cents/kWh, 1 kWh of energy delivered 6 days per week for the 16 highest demand hours of the day at 6 cents/kWh, and finally 0.5 kWh of energy delivered 5 days per week for the four peak hours of the day at 10 cents/kWh" (p 111). But, "different from a cell phone plan, if the customer's consumption during an hour is less than its scheduled consumption, then the customer could sell the difference in the wholesale market at the real-time price" (p 112).

My first reaction was, maybe only the Wolak and Hardman households would consider such a monthly purchasing plan? But we don't know. How do we find out? What kinds of regulatory arrangements can best facilitate experimenting with thousands of options in order to focus on, develop and adopt those relatively few that appeal to customers, are economically viable for retailers, and meet national or international goals? Surely a main case for unfettered retail competition is that it is more likely to find and implement such best options than a formal, time-consuming and costly litigated regulatory process involving a monopoly utility or a nominally "competitive" market that is in practice unduly restricted. But that argument is not made here.

Chapter 8, on lessons for market design from California and Texas, was presumably added to reflect on the implications of the rolling blackouts there in August 2020 and February 2021, respectively. The chapter makes three main arguments: first, for an improvement in California's long-term resource adequacy mechanism, and for Texas to adopt such a mechanism; second, for substantial regulatory oversight to ensure that retailers do not take excessively risky gambles, that electricity sold at fixed retail price is hedged with fixed price wholesale contracts, that retailers have sufficient hedges or collateral to continue to supply their customers if stressed system conditions occur, and possibly to meet other financial solvency conditions; and third to limit customers' exposure to the hourly electricity price to only that amount of consumption that they can actually reduce, since few if any customers

should be paying the wholesale price for all of their consumption in any hour, and customers that want to take on more risk might be required to sign a waiver confirming their financial resources and sophistication.

These are substantial last-minute changes, but does the Texas regulatory record, for example, justify the proposed move to significantly more retail regulation? The regulatory scarcity pricing mechanism set the blackout price at some 75 times the average price during the year, a level subsequently found unacceptably high and now reduced. The regulatory commission is alleged to have kept the scarcity price in operation, in response to political pressure, for several days longer than the rules prescribed. And in the event, the Texas legislature rejected the regulatory restrictions proposed here and simply prohibited the sale of real-time electricity products to residential customers. This would seem to rule out rather a lot of the policies urged in the book. Ahmad Faruqui has observed that the Texas power crisis "set the move towards dynamic pricing back by a decade".

The final chapter 9 briefly explores some directions for future research. Perhaps the most interesting is "methods for communicating dynamic pricing information to customers in a salient and actionable manner". Or, as the subheading puts it, "adapting customers". A "simple economic model" is used to characterise the customer's monthly bill as

$$Bill\ S(_t) = \int_0^{[\Sigma^K_{k=1} A_{kt}\, s_{kt} + \varepsilon_t]} p(x)dx.$$

Then "teaching the households how $Bill(S_t)$ is determined and the values of $\partial Bill(S^*_t)/\partial s^*_k$ for the major electricity-consuming appliances owned by the customers can create more sophisticated customers willing to manage wholesale price risk." (p 146) Well, good luck with that. I once tried to explain the concept of an RPI-X price cap to my civil servant Deputy Director General. "But that's just algebra", she said.

Wolak and Hardman have provided a powerful argument for increased attention to the retail electricity sector in light of the rapidly expanding range of technical options becoming available. But they have not really considered whether competitive retail markets or some other regulatory arrangements are likely to work best, for customers or for achieving local, national and international goals. My vote is for retail competition, but the apparent simplicity of a regulatory obligation is always tempting to governments.

**Reference**

Lacey, F (2019), "Default service pricing – The flaw and the fix: Current pricing practices allow utilities to maintain market dominance in deregulated markets", *The Electricity Journal*, 32 (3), 4-10.