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Thoughts on Tariff Design for Emerging and Developing Markets

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About the Author

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Abstract

Throughout the world, emerging and developing markets are challenged to expand, modernize and sustain the utility infrastructures (e.g. electricity, natural gas and water) that will improve the economic vitality of their nations and the well being of their people. This paper considers the modalities of tariff design that support this critical effort.

Introduction

A sound tariff structure for the resale of utility "products" (i.e. the electricity, natural gas and water that is delivered to re-sellers and end-users by the utility infrastructure) is at the heart of making utility service self-sustaining. To be effective that structure cannot simply put a price tag on the regulated product, it must provide customers at every point of sale reliable market signals that empower those purchasers to make rational economic decisions about their use of utility products.

It must be noted, however, that this discussion cannot address prices that are discounted artificially, or subsidized by government. Prices that do not reflect of the full "cost of service" being provided transfer to the taxpayer costs that should be borne by consumers and, in doing so, diverts public resources from the achievement of other national or local objectives. This diversion may ultimately risk the nation's economic viability and negate the "good" that operation of the utility infrastructure would otherwise provide.

The Basic Tariff Formula

Although tariff setting has incorporated many modalities over the years, the basic formula remains:

$$p = d + c + g$$

Where:

p = price per unit purchased
d = demand charge per unit of a maximum quantity required over a specified time period
c = commodity charge per unit purchased
g = cost of the good (or service) per unit purchased

The demand charge is meant to include all of the fixed costs incurred by the service provider in creating, operating and maintaining the infrastructure to deliver the regulated product from the point of its purchase by the service provider to the next downstream point of sale. (This may be the retail end user or an intermediary that will re-sell the product to the end user or another intermediary purchaser.) In addition, the fixed cost component of the tariff includes interest on debt incurred by the service provider in connection with development of the infrastructure as well as the incentive of a reasonable return on his equity investment. The commodity charge is the sum of all variable costs incurred by the service provider in operating and maintaining the utility infrastructure.

Service Un-bundling and Cost Recovery

At one time it was commonplace for all components of utility service to be integrated – or "bundled" together – and sold to end users at a single, combined sales price. Service providers retained responsibility for obtaining and delivering utility products to end-users who had few choices about the utility service they were receiving. Whether sold at cost-reflective or subsidized tariffs, this system suggests that some higher authority – the utility, the government or even a political party – allocates essential services among a population that has little, if any, responsibility to pay for these services or participate in programs of conservation.

Currently, however, the more common practice is to *un*-bundle the utility service into its distinct components – e.g. production, transportation and distribution – and price each of those components separately. With un-bundling, separate providers are able to focus attention on each component by engaging in fair competition among other providers of similar services. Even more importantly, customers are able to make rational purchase decisions about each component.

For the un-bundled method to be successful, however, the basic tariff formula requires that the charge for each component be "fully loaded" to include all costs that are reasonably and prudently incurred by the service provider in delivering regulated goods to the purchaser:

First, the sum of all fixed charges (i.e. the "demand" component) is divided by the maximum volume that the utility infrastructure (e.g. pipelines, "wires") can deliver during a fixed period of time. The result is a demand charge per unit of maximum delivery, and the customer, in paying that demand charge for a specific number of units of firm service, effectively reserves that portion of the infrastructure's daily capacity to ensure that this volume will be transported to meet his needs on any given day throughout the year (or, as may be applicable, another contracted period).

Second, and similar in principle, the commodity component is the sum of variable charges that the service provider expects to deliver during a contract year. Dividing this amount by the total volume of product that the service provider expects to deliver during the contract year produces a cost per unit of delivery. The customer, in paying the commodity charge, is paying his equitable share of the operating and maintenance costs of the infrastructure that will provide the desired utility service.

It is important in setting these tariffs that the denominators by which the totals of fixed and variable costs are divided be reflective of actual capacities and throughputs. Typically these values are determined during a historic "test year" – e.g. a twelve-month period that immediately precedes the period over which the tariff will apply. To the degree that there is a variance between test year volumes and actual experience any costs associated with the differential will be

un-recovered through the tariff and must, of necessity, be charged against the utility's retained earnings. A common example is that of comparing projected sales of electricity during a test year in which the demand calculation is based upon normal weather conditions, with actual sales during a year that has experienced significantly different weather. Under the assumption that the market includes a large component of air conditioning demand, revenues will be higher than expected during warmer-than-normal years. Conversely, there will be a shortfall in revenues during colder-than-normal years.

To correct for any differences between actual and projected sales volumes, the regulator may allow a periodic tracking or "truing-up" mechanism to bring tariffs calculated on the basis of estimates in line with actual experience. This corrective mechanism is also useful in "de-coupling" the utility's revenue stream from sales volumes, an important element in the promotion of conservation. Without a truing-up mechanism, the utility that promotes conservation by its customers has the implicit disincentive of promoting usage levels that will not recover all of the utility's fixed costs.

The Natural Monopoly and the Role of the Regulator

When there is a mature and well-established market for the utility product, a variety of market mechanisms, ranging from restrictive, long-term, take-or-pay contracts to short-term, spot market transactions have evolved to eliminate the need for regulating the pricing of individual transactions. Indeed, the intervention of the regulator in transactions that take place within the established commercial and technical frameworks would distort the functioning of the market. For example, historical attempts to control the price of natural gas at the wellhead (i.e. before the additional costs of treatment, transportation, distribution, etc.) have created disincentives to exploration and development and have resulted in supply shortages and rising prices to consumers.

Developing economies look toward the example of the mature markets that exist in North America and the European Union for models of cost recovery mechanisms and regulatory oversight. However, and more typically in the developing economies, the local economic environment may be able to support only one utility supplier. Since the investment that is required to develop a utility infrastructure is generally so great that it is unlikely – indeed, grossly inefficient – for competing service providers to exist side-by-side, few investors in those economies would conclude that the competitive risk of making such a speculative investment justifies the investment and, therefore, the development of the needed infrastructure. This is a "natural monopoly" and calls for an independent regulatory function to intervene as a proxy for competition.

In the absence of competition (and appropriate regulation), customers are "captive" and subject to paying the supplier's price regardless of the relationship between that price and the actual cost of service incurred in providing the supply. In order to protect the consumer's interest – as well as the interests of all stakeholders – the appropriate intervention is an economic regulator's authority to approve the setting of tariffs for regulated services. This authority requires a careful review of all components in the proposed tariff with the objectives of ensuring that (a) the supplier remains in business in order to provide the needed service, but (b) the customer pays a fair and reasonable price for that service.

The two-part tariff described above ensures sustainability of operations by fully recovering from customers all prudently incurred costs as well as the opportunity to earn a reasonable return on

equity. The reasonableness of this return is very much a focus of attention by the regulator that will consider rates of return for similar investment opportunities, the potential safety of the investment and the economic conditions under which customers will pay for utility services.

There is a persistent criticism that "cost of service" pricing fosters inefficiency and excessive spending on the part of the service provider, but inefficiencies need not be the inevitable result of this system. Importantly, the cost of service model does not guarantee the service provider's profit. Regulators have the duty to examine the utility's costs with the view of making sure that only prudently incurred costs are included within the approved tariff. The threat of disallowance – i.e. that these costs will, in effect, diminish the investor's return on equity – is a significant disincentive for service providers to spend more than they should in providing utility service. Conversely, however, efficiencies resulting in lower operating costs – and higher profits - may not be allowed to reward the owner unless and until the regulatory authority is persuaded to grant a higher return on equity. The philosophy of the cost of service approach to rate-making is that these efficiencies should result in lower costs to the customer rather than higher profits to the investor.

With the expansion of infrastructure providing connections with other potential suppliers, the supplier will need to develop a cost-effective portfolio of products in order to provide his customers with utility service at a price that is reasonable. Monitoring the effectiveness of these purchasing plans is an important role of the regulator. Importantly, under the concept of un-bundling, purchases from affiliates and/or purchases at premiums to market prices (e.g. under take-or-pay contracts that require purchases at prices that are above market clearing) are likely to be "re-priced" by regulators with the result that any excess purchase costs will reduce the investor's return on equity.

Another important element of the regulatory analysis in tariff design is the ratio of equity to assets on the utility's balance sheet; a reasonable return on equity being integral to the tariff's demand component. As the non-equity share of the enterprise approaches one, the investor may be inclined to abandon the facilities in the case of business failure. Conversely, as the equity share approaches one the investor has greater "ownership" of the enterprise and is more inclined to remain pro-active in working for its long-term success. This "constructive investment" is elemental in support of sustainability, which is, of course, to the benefit of the utility customer.
This leaves us with the actual cost of the product being delivered by the utility. Once the utility product is produced to a commonly accepted standard of quality, it is fungible. The product may be sold under different conditions - e.g. seasonally, interruptible, etc. – but any differential pricing required by the contract is accommodated within the demand and/or commodity components of the tariff. (For example, the demand calculation cited above provides for "firm" capacity; unused capacity can be re-sold on an "interruptible" basis on a discounted basis.) Neither the service provider, the quality of its service, nor the contractual terms by which that service is provided, adds to or detracts from the value of the product itself.

Conclusions and Summary

Utilities, regulators and governments have long had the joint responsibility of developing infrastructures to support national objectives and improve the lives and livelihoods of their countrymen. It remains for this responsibility to be shared with customers, whose day-to-day economic decisions underpin the allocation of national resources. The primary modality for involving these key stakeholders is the implementation of a tariff regime that, considering the

topics discussed above, fairly allocates the risks and rewards of utility investment that is essential for infrastructure development and sustainability.

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