Rate Designs to Promote Energy Efficiency

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Along with designing and implementing effective programs targeting manufacturers, retailers, and consumers, regulators can employ **rate design options** to promote energy-efficiency goals. Such options do not necessarily require any expenditure. Rather, they rely on consumers responding to price signals when determining when to consume electricity and how much to consume. By extension, rates will in part dictate how much regulators pursue energy-efficiency measures. This presentation will discuss the following:

I. Conventional Rates
II. Straight Fixed Variable Rates
III. Inclining Block Rates
IV. Time-of-Use, Seasonal, and Real-Time Rates

I. Conventional Rates

Historically, rates have been flat, not varying by the time or quantity of consumption. Additionally, many utilities collect large amounts of variable costs in the fixed charges. As a result, reductions in consumption from aggressive energy-efficiency programs could lower revenues more than they reduce costs, substantially diminishing earnings. This relationship often leads to proposals for decoupling mechanisms to accompany ambitious energy-efficiency programs.

Some utilities also feature declining block rates, corresponding to the declining marginal costs of serving customers when substantial fixed costs are in the variable component of rates. Such rates *decrease* energy-efficiency incentives compared to conventional rates.

II. Straight Fixed Variable Rates

Aside from decoupling and incentive mechanisms, regulators can mitigate the financial consequences of energy efficiency programs by employing **straight fixed variable rates**. These rates allocate all fixed costs to the fixed or demand portions of rates, leaving only variable costs in the volumetric portion. As a result, when consumption falls, so do costs, leaving the utility indifferent from an earnings perspective. Regulators should understand several consequences of these rates:

1. They dampen price signals, encouraging higher consumption.
    a. To the extent that electric consumption is price-elastic, SFV rates lead to higher consumption.

b. SFV rates lengthen payback periods and lower the value for consumers of investments and energy efficiency and distributed generation (*e.g.*, solar panels). See the numeric example below.

Payback period calculation under conventional and SFV rates

	Standard Tariff	**Straight-Fixed Variable Tariff**
	Fixed charge $25.00	Fixed charge $55.00
	$0.09/kWh	$0.06/kWh
1,000 kWh	Fixed charge $25.00	Fixed charge $55.00
	Volumetric charge $90.00	Volumetric charge $60.00
	Total $115.00	Total $115.00
800 kWh (superior appliance)	Fixed charge $25.00	Fixed charge $55.00
	Volumetric charge $72.00	Volumetric charge $48.00
	Total $97.00	Total $103.00
Savings	$18.00/month ($216/year)	$12.00/month ($144/year)
Simple Payback Period for $500 appliance	2.3 years	3.5 years

2. SFV rates shift costs from large consumers of electricity to smaller ones.

III. Inclining Block Rates

Some utilities employ inclining block rates, in which customers pay higher volumetric charges when they reach certain monthly consumption thresholds. Typical characteristics include:

1. Two or three rate tiers
2. Rates only apply to residential customers
3. Mandatory

Inclining block rates encourage most customers to consume less electricity and improve the payback period for energy-efficiency investments. They could also shift costs towards higher-consuming customers. To implement these rates, regulators should make the following decisions:

1. How many rate tiers should there be?
2. How much should rates vary between tiers?

    a. Rates should encourage *most* customers to reduce consumption.
    b. Highest blocks could use long-run marginal costs to reflect their contribution to need for more generation or transmission.
    c. Rate differentials need to be large enough so that customers respond (more than 20%).

3. How much do billing determinates need to adjust to account for lower consumption resulting from rates?
4. Should the rates consider household characteristics? In California, customers with certain health problems can have inclining block rates waived. Regulators could consider looking at household size to prevent undue subsidization of small households by large ones.

IV. Seasonal, Time-of-Use, and Real-Time Rates

These rates designs largely intend to shift load but can also lead to some conservation effect (*e.g.*, buying an improved AC in response to TOU or seasonal rates does not necessarily mean that customers will consume more in off-peak periods). In most cases, time-of-use and seasonal rates are optional. Most seasonal rates contain one peak season (summer or winter) and an off-peak season. Time-of-day and real-time rates can require infrastructure additions.

Regulatory decisions:

1. How many time-of-day periods should rates contain? Most contain two, though shoulder (mid-peak) rates are possible.
2. What should the variations between rates in different seasons or times of day be?
3. To whom should these rates apply?
4. Should rates be opt-in, opt-out, or mandatory?