Inverted Residential Rates
History, Theory, and Practice

Colorado Public Utilities Commission

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Jim Lazar, RAP Senior Advisor

50 State Street, Suite 3
Montpelier, Vermont USA 05602
Tel: 802.223.8199
Fax: 802.223.8172

1063 Capitol Way S. #202
Olympia, WA 98501
Tel: 360.786.1822

110 B Water St.
Hallowell, Maine USA 04347
Tel: 207.623.8393
Fax: 207.623.8369

Website: *http://www.raponline.org*

Inverted Residential Rates

- History of Inverted Rates in the West
- Cost Basis of Electric Inverted Rates
- Cost Basis of Gas Inverted Rates
- Expected Benefits of Inverted Rates
- Key Design Elements
- Dealing with Utility Revenue Stability
- Dealing with Customer Bill Stability

History of Inverted Rates in the Western U.S.

- Puget, Avista: ~1975, based on load factor
- WUTC: "Baseline Rates" ordered in 1980
- Seattle: 1982, as part of PURPA
- Oregon, Idaho: Early 1980's
- Arizona: Mid-1980's, Summer Only
- California: Implemented in 1980's; During 2000-2001 Crisis, moved to 5-blocks.
- BPA, 2008 (effective in 2012)
- Gas: Only California utilities have inverted rates.

Example Inverted Rates

(Larger Set on a Handout)

- **Pacific Power**, Washington

- Customer Charge: $6.00
- First 600 kWh: $.04914
- Over 600 kWh: $.07751

Schedule 16, Oct. 9, 2008

- **Arizona Public Service Company**, Arizona

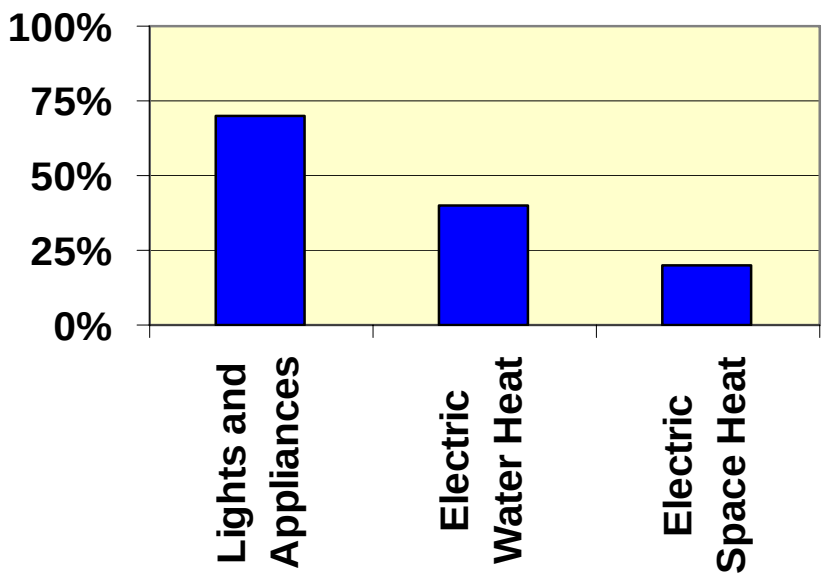
- Customer Charge: $7.59
- Summer
  - First 400 kWh $.08570
  - Next 400 kWh $.12175
  - Over 800 kWh $.14427
- Winter
  - All kWh $.08327

Schedule E-12, July 1, 2007

Cost Basis of Electric Inverted Rates

Load Factor Based

- Different end-uses have different load factors:



Resource Cost Based

- Different resources have different fully-allocated costs

Older Baseload:	$.04
Newer Baseload:	$.08
Peakers:	$.12

Demand-Related Costs Per kWh Increase for Low Load-Factor End-Uses

- Assume Total Transmission and Distribution Demand-Related Costs of $87.60 / kilowatt-year

100% Load Factor (Refrigerator)	=	$.01/kWh
40% Load Factor (Water Heater)	=	$.025/kWh
20% Load Factor (Air Conditioner)	=	$.05/kWh
10% Load Factor (Extreme Year AC)	=	$.10/kWh

Making a Residential Inverted Rate from Xcel Rate SG

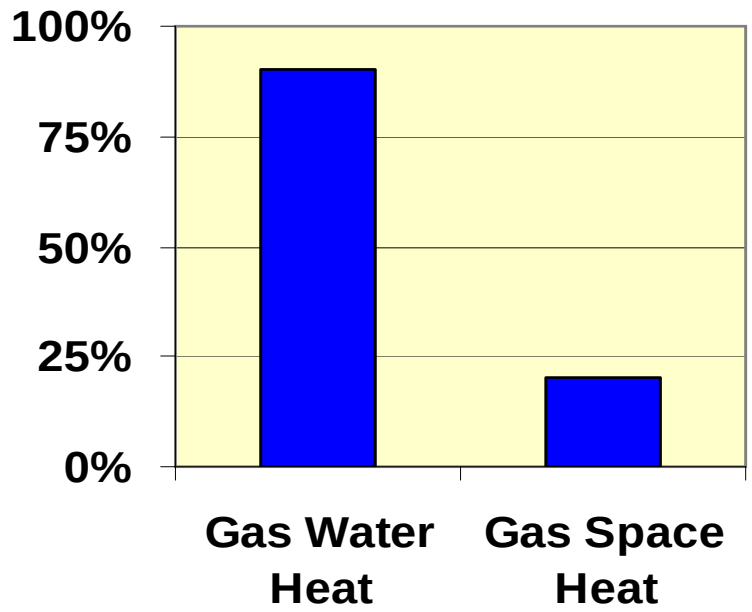
- Rate SG Applies to Commercial Customers
- Summer Rate:
- **Demand Charge: $9.58/kW**
- **ECA Rate: $.03849** Ignore all other elements and riders

Block	Load Factor	kWh / kW	Demand	Energy	Total
Rate SG	**50%**	**360**	**$ 9.58**	**$ 0.0385**	**$ 0.0651**
kWh / kW calculated based as load factor x 720 hours per month.					
Hypothetical Residential Rate Based on SG Rate					
0 - 400	**70%**	**504**	**$ 0.019**	**$ 0.0385**	**$ 0.0575**
401 - 800	**40%**	**288**	**$ 0.033**	**$ 0.0385**	**$ 0.0718**
800 +	**20%**	**144**	**$ 0.067**	**$ 0.0385**	**$ 0.1050**

Cost Basis of Gas Inverted Rates

Load Factor Based

- Water Heat, Cooking are high load factor **90%**
- Space heat is low load factor **20%**



Resource Cost Based

- Flowing pipeline gas is lowest cost, serves baseload needs.
- Storage gas is more expensive, serves normal year space heat needs
- LNG, Interruptible Service, and other peaking resources are most expensive, serve extreme year space heating.

Expected Benefits of Tiered Rates

- Align marginal rates with long-run marginal costs.
- Reflect marginal CO2 costs in marginal rates.
- Promote efficient fuel choice.
- Elasticity effect produces energy savings; very few customers see the headblock as their marginal rate, so very few have an incentive to “consume more.”
- Tailblock price improves cost-effectiveness of energy efficiency, encourages participation in DSM programs.

Inverted Rates as a Demand Response Measure

- Space conditioning is very peak-coincident.
- Inverted rates price incremental space conditioning at a higher rate than other uses.
- No new metering is required; the PSE pilot demonstrated that TOU metering and billing may not be cost-effective for residential consumers.
- New England Demand Response Initiative recognized inverted rates as a residential Demand Response measure.

Key Design Elements of Tiered Rates

- Keep the first block fairly small, so most consumers make their decisions based on upper block(s).
  - 400 kWh / month usually meets this test.
- In a three-block rate, target the third block to space conditioning usage: 800 – 1200 kWh+
- Limit the customer charge to metering and billing costs, to align marginal rates with marginal costs.
- Combine all rate riders and surcharges into an understandable rate design on the bill.
  - Customers need to know what they will save if they reduce usage.

Dealing With Revenue Stability for the Utility

- Inverted rates increase annual revenue volatility due to weather and other factors.
- Retained earnings are the “normal” tool. If the equity ratio is 45%+, probably OK.
- Weather normalization reserve account
- Weather normalization mechanism
- Decoupling Mechanisms

Dealing With Bill Volatility for the Consumer

- Inverted rates do cause larger variations in consumer bills due to weather.
- While most low-income households will benefit, a few will face significant increases.
- Budget billing is typical for utilities; single settlement month may need modification.
- Multi-month payoff periods for large variations in bills are an option

Summary

- **Inverted rates are applied to most residential electric consumers in the West.**
- **Inverted rates are cost-based for both electric and gas utilities.**
- **Energy savings can be predicted, but are split between curtailment and conservation.**
- **The increased revenue volatility and bill volatility issues must be addressed.**
- **Make sure consumers can understand the rate.**