Revenue Neutral Energy Efficiency Feebates

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Today's Ground Rules

- Discuss the REEF w/o judging the merits of SFV rate design or decoupling.
- Not the opinion of Commissioners, PUC Staff or NRRI.
- Framework presented today may not be applicable to every situation.
- Paper on REEF previously circulated and available at NRRI website.
- Expanded discussion of REEF.

REEF as an Enhancement to SFV

- For contextual purposes, REEF discussed in association with SFV.
- Possible to consider REEF in other rate design environments. Beyond scope of prepared remarks.

What is a REEF?

- REEF = **R**evenue-neutral **E**nergy **E**fficiency **F**eebate
- Not aware of usage by gas or electric utilities

What is a REEF? "Revenue-neutral"

- Revenue neutral is from the utility's perspective
- Revenue neutrality is really about income neutrality
- The revenue paid by individual customers is subject to change through fees and rebates
- No change occurs to SFV charge where income is recovered

What is a REEF?
"Energy Efficiency"

- "Energy Efficiency" is a place holder for any targeted change in consumption patterns, for example:
  - Curtailing peak demand
  - Encouraging conservation
  - Reducing carbon emissions
- Design of feebate depends on "energy efficiency" goal(s)

What is a REEF?
"Feebate"

- Feebate charges some customers a **fee** while granting others a re**bate**
- Used and proposed to encourage improved automobile MPG
- Fees are fully distributed as rebates, hence revenue neutrality
- Design of feebate depends on "energy efficiency" goal(s)

Setting The Fee

- Depends on goal. More than one fee if more than one goal
- Look at avoidable or long-term marginal cost
- Can a revenue neutral feebate provide a price signal to avoid costs yet to be incurred
  - New capacity for reliability
  - Resources to reduce price spikes – de facto DSR
  - Reduced carbon emissions
- Fee can allow price signals in excess of embedded costs
- Examples indicate that fee needs to be significant to have impact

How a REEF may Improve SFV

- More of a conservation incentive
- More protection of smaller users
- More protection of existing conservation investments
- Looks at avoidable costs versus embedded costs

REEF – Breaking Away from Embedded Cost Rate Design

- Rate designs usually afford utilities opportunity to recover embedded costs
- Including concepts in traditional revenue tariffs such as avoidable costs or long-term marginal costs often disrupts embedded cost- based revenue recovery paradigm
- REEF is revenue neutral so fees and rebates designed as price signals do not disrupt the revenue requirement balance
- REEF allows price signals that are set outside the embedded-cost paradigm

REEF is flexible

- Targets can be set to meet specific goals
- Today's examples focus on general usage (conservation)
- Some other potential REEF targets
  - On peak usage (high wholesale cost of electricity)
  - Off peak usage (carbon from coal plants on margin)
  - Demand (reliability and avoidable capacity)
- Multiple goals possible as long as they do not conflict
  - E.g., off peak usage target and demand target each with their own REEF

REEF Design and Underlying Tariff

- REEF design could depend upon underlying variable charges
  - Real-time pricing
  - Time-of-Day
  - Seasonal
  - Demand charges
  - Increasing block rates
- Today, assuming SFV and comparing to Std Tariff with single block and full decoupling

Need for Technology

- Feebates can be more accurately calculated when AMR technology is installed
  - Avoids problems of estimated bills
  - Same applies for decoupling adjustment
- Feebate design (as is the case with rate design in general) can be constrained by metering technology and customer information systems
  - Demand meters, time-of-day meters, AMI
  - End uses, SIC, square footage

Homogeneous Customer Classes

- Fees and rebates should be kept within a customer class
- Classes should be relatively homogeneous (e.g., electric water heating customers vs. all-electric or commercial versus public schools)
- Feebates as discussed here may not be applicable to all classes of customers
- Options such as normalization should be considered before dismissing possibility (e.g. square feet for commercial retail customers)
- Lack of applicability to some classes is not a reason to dismiss REEF to other classes

REEF adjustment period

- **Monthly adjustment keeps incentives current.**
- **Annual adjustments have problems**
  - Changes in customer base
  - Potential large fee at year-end
  - Lack of current bill to reinforce behavior
- **Use of billing period**
  - Everyone in cycle has same weather and number of days, weekdays
  - Requires large enough customer class (utility can change billing cycles to consolidate a customer class)
- **Second best may be all customers billed within a period**
  - Keep aggregation period short (e.g. 3 days) and retain most of benefits of a single period while increasing the customers in the calculation pool.
  - Longer the period, greater the issues of unlike circumstances

Billing

- Potential calculation process
  - Fee established in tariff (e.g., cents/kWh above target usage)
  - Target usage for period calculated per tariff (e.g., system average or 20% above system average)
  - Charge the fee as appropriate
  - Determine revenues generated in period by charging the fee on excess usage to determine total rebate (not necessary if using mean)
  - Determine usage that is eligible for the rebate (e.g., below system average or usage 20% below system average)
  - Credit customers with rebate based total upon eligible usage (same as fee if using mean)
- Put goal oriented message on the bill

Reconciliation

- Zero sum game.
- Feebate calculations done when all factors are known.
- No reconciliation required for REEF.
- Decoupling adjustments require tracking, auditing and reconciliation

Example - Assumptions

- Five customers
- Usage target of 1000 kWh (mean)
- Standard Tariff
  - Fixed Monthly Charge: $15
  - Variable Charge: $0.075/kWh
- SFV Tariff
  - Fixed Monthly Charge: $50
  - Variable Charge: $0.04
- REEF Fee
  - $0.05/excess kWh
- Excess usage=efficient usage as target is mean usage
- All cases assume no change in ROE or operating costs

Example – Start

Customer Usage	#1 650 kWh	#2 900 kWh	#3 1000 kWh	#4 1200 kWh	#5 1250 kWh
SVF Tariff	$50.00 $26.00 $76.00	$50.00 $36.00 $86.00	$50.00 $40.00 $90.00	$50.00 $48.00 $98.00	$50.00 $50.00 $100.00
REEF Fee or Rebate	-$17.50	-$5.00	$0.00	$10.00	$12.50
SVF with REEF	**$58.50**	**$81.00**	**$90.00**	**$108.00**	**$112.50**
Standard Tariff	$15.00 $48.75 **$63.75**	$15.00 $67.50 **$82.50**	$15.00 $75.00 **$90.00**	$15.00 $90.00 **$105.00**	$15.00 $93.75 **$108.75**

Start Results

- Represents starting point
- Total revenues same in both cases
- Feebate a straight calculation
  - (actual usage-mean usage) x feebate
- Total bill is lower for efficient users and higher for excessive users with REEF than Standard Tariff
  - Assumption dependent

Example - Step 2

Average Consumption Down 100 kWh

Customer Usage	#1 600 kWh	#2 750 kWh	#3 900 kWh	#4 1000 kWh	#5 1250 kWh
SVF Tariff	$74.00	$80.00	$86.00	$90.00	$100.00
REEF Fee or Rebate	-$15.00	-$7.50	$0.00	$5.00	$17.50
SVF with REEF	**$59.00**	**$72.50**	**$86.00**	**$95.00**	**$117.50**
Standard Tariff	$60.00	$71.25	$82.50	$90.00	$108.75
Decoupling Adj.	$2.33	$2.92	$3.50	$3.89	$4.86
Std Tariff+ Decoupling	**$62.33**	**$74.17**	**$86.00**	**$93.89**	**$113.61**

Step 2 Results

- Each customer conserves a different amount.
- Decoupling adjustment calculated by taking total loss sales (500 kWh) X $0.035/kWh in income and dividing by total sales (4500 kWh).
- SVF with REEF still lower and higher at ends than Std Tariff.
- Customers who went from old mean of 1000 kWh to new mean of 900 kWh saved $4 ($90-86) in each case.
- Customers that saved more (absolute change) than change in mean saved more under REEF.
- Customers who did nothing had $5 increase under REEF and $4.86 for Std with decoupling.
- Results are assumption dependent.

Example - Step 3

Average Consumption Rises 25 kWh from Step 2

Customer Usage	#1 600 kWh	#2 900 kWh	#3 925 kWh	#4 1025 kWh	#5 1175 kWh
SVF Tariff	$74.00	$86.00	$87.00	$91.00	$97.00
REEF Fee or Rebate	-$16.25	-$1.25	$0.00	$5.00	$12.50
SVF with REEF	**$57.75**	**$84.75**	**$87.00**	**$96.50**	**$109.50**
Standard Tariff	$60.00	$82.50	$84.37	$91.87	$103.13
Decoupling Adj.	$1.70	$2.55	$2.63	$2.91	$3.33
Std Tariff+ Decoupling	**$61.70**	**$85.05**	**$87.00**	**$94.78**	**$106.46**

Step 3 Results

- Bill for mean usage still equal under each tariff
- Decoupling adjustment down because usage is up.
- REEF case 600kWh bill went down w/o change in usage because mean increased.

Case 1

Consumption Down 100 kWh by Everyone

Customer Usage	#1 550 kWh	#2 800 kWh	#3 900 kWh	#4 1100 kWh	#5 1150 kWh
SVF Tariff	$72.00	$82.00	$86.00	$94.00	$96.00
REEF Fee or Rebate	-$17.50	-$5.50	$0.00	$10.00	$12.50
SVF with REEF	**$55.50**	**$76.50**	**$86.00**	**$104.00**	**$108.00**
Standard Tariff	$56.25	$75.00	$82.50	$97.50	$101.25
Decoupling Adj.	$2.14	$3.11	$3.50	$4.28	$4.47
Std Tariff+ Decoupling	**$58.39**	**$88.11**	**$86.00**	**$101.78**	**$105.72**

Results – Case 1

- Feebates for each customer unchanged from start as mean usage shifted.
- Decoupling adjustment unchanged as total usage unchanged between Case 1 and Base Case Step 2

More Cases
Change the Design

- Case 2: Fee equals difference between Standard Tariff Variable Charge and SFV Variable Charge ($0.35)
  - Customer bills equal at base usage in REEF or Std Tariff
- Case 3: No fixed charge in Standard Tariff and Std Tariff variable charge equals SFV variable charge plus fee
  - Customer bills equal at base usage in REEF or Std Tariff
- Case 4: Higher feebate ($0.06)
  - REEF>Standard variable-SFV variable
  - Exceeds embedded cost model

Summary Results
Bill Comparison after Change

Customer	#1	#2	#3	#4	#5
Usage	600 kWh	750 kWh	900 kWh	1000 kWh	1250 kWh
Decrease	50 kWh	150kWh	100 kWh	200 kWh	0 kWh
Base REEF	$59.00	$72.50	$86.00	$95.00	$117.50
Base Std	$62.33	$74.17	$86.00	$93.89	$113.61
#2 REEF	$63.50	$74.75	$86.00	$93.50	$112.25
#2 Std	$62.33	$74.17	$86.00	$93.89	$113.61
#3 REEF	$59.00	$72.50	$86.00	$95.00	$117.50
#3 Std	$57.33	$71.67	$86.00	$95.56	$119.44
#4 REEF	$56.00	$71.00	$86.00	$96.00	$121.00
#4 Std	$62.33	$74.17	$86.00	$93.89	$113.61

Bill Comparison Comments

- Mean always the same in these examples
- Cases 2 and 3 converge as start points were equal
- Usefulness of metric depends on goal
- Change in bill may be more useful as conservation incentive

Summary Results
Change in Bill Comparison

Customer Decrease Usage	#1 50 kWh	#2 150 kWh	#3 100 kWh	#4 200 kWh	#5 0 kWh
Base REEF	$0.50	-$8.50	-$4.00	-$13.00	$5.00
Base Std	-$1.42	-$8.33	-$4.00	-$11.11	$4.86
#2 REEF	-$0.25	-$7.75	-$4.00	-$11.50	$3.50
#2 Std	-$1.42	-$8.33	-$4.00	-$11.11	$4.86
#3 REEF	$0.50	-$8.50	-$4.00	-$13.00	$5.00
#3 Std	-$1.17	-$9.33	-$4.00	-$12.44	$6.94
#4 REEF	$-2.50	-$10.00	-$4.00	-$12.00	$8.50
#4 Std	-$1.42	-$8.33	-$4.00	-$11.11	$4.86

Bill Change Comments

- All changes total to -$20.00
- No difference at mean
- REEF does not provide as great of incentives for small amounts of conservation as Std Tariff until REEF is high (Case 4 -50 kWh)
- Both methods penalize non-movers (0 kWh)
- REEF consistently provides larger incentive to large changes (200 kWh)
- Large REEF may improve conservation incentive payback

Lots of Cases. Lots of Insights.

- Decoupling adjustment allocates lost income based upon current usage.
- REEF is allocated based upon difference from class target.
- REEF rewards conservation that is greater than system average in absolute amounts.
- REEF incentive dwindles as customers converge on mean.
- REEF and decoupling provide same result at mean when mean target used.
- REEF has more impact when feebate is high (e.g., SFV variable charge + feebate > std tariff variable charge).

REEF vs. Decoupling Adjustment – What are your goals?

- Lowest bill for smallest users
- Reward efficient users in a class and penalize higher users
- Encourage absolute conservation
- Encourage relative conservation
- Decrease everyone's usage vs. individual customer's usage (shift the mean)
- Encourage any conservation including minimal efforts
- Encourage conservation not subsidized by utility

REEF – Conservation Incentive

- Fees and rebates can be relatively large as they only apply excess or efficient usage.
- Effectiveness of incentive tied to size and design.
- If everyone in class uses about the same amount, feebates less effective incentive.
- If everyone in class uses about same amount, decoupling takes away savings.
- If mean is not target, size of kWh rebate is subject to change as fees charged change.
- REEF and decoupling have a snooze and lose factor.

Commission Questions

- Impact on low-income customers
  - Protection to smaller users
  - Still need low-income conservation programs to overcome market barriers
- Consumer education is needed for any new rate design
  - Message on bill a good but not sufficient step
- Billing Modifications
  - Algorithm very simple
  - May need to reclassify customers into more homogeneous classes
  - May need to reorganize billing cycles
- Special Pricing
  - Fee always starts by looking at underlying design and desired goals

REEF – Assessment

- Administratively easy – no audits or reconciliation required.
- Flexible
  - Target goal
  - Usage targets automatically refresh based upon current usage
  - Easy to change fees and rebates as no effect on revenue requirement
  - Not constrained by embedded cost revenue requirements
- Is REEF a superior conservation incentive than a tariff with a decoupling adjustment clause? Depends on details.
- REEF may not be easily applied to classes without relatively large number of homogeneous customers
- Goals determines where applicable.

Recap

- REEF not the only solution
- Devil is in the details
- May not be applicable to all classes of customers, but this does not disqualify application to other classes
- Goals and avoidable costs may determine applicability
- Presentation focused on electric. Gas could have similar results depending on targets, avoidable costs and size of fee
- Important that options be discussed in forums like this one

Appendix – Other Case Details

Case 2

Fee equals Std Tariff Variable-SFV Variable

	600 kWh	750 kWh	900 kWh	1000 kWh	1250 kWh
SVF Tariff	$74.00	$80.00	$86.00	$90.00	$100.00
REEF Fee or Rebate	-$10.50	-$5.25	$0.00	$3.50	$12.25
SVF with REEF	**$63.50**	**$74.75**	**$86.00**	**$93.50**	**$112.25**
Standard Tariff	$60.00	$71.25	$82.50	$90.00	$108.75
Decoupling Adj.	$2.33	$2.92	$3.50	$3.89	$4.86
Std Tariff+ Decoupling	**$62.33**	**$74.17**	**$86.00**	**$93.89**	**$113.61**

Case 3

Variable Charge in Std Tariff = SFV+Fee & Zero Fixed Charge

	600 kWh	750 kWh	900 kWh	1000 kWh	1250 kWh
SVF Tariff	$74.00	$80.00	$86.00	$90.00	$100.00
REEF Fee or Rebate	-$15.00	-$7.50	$0.00	$5.00	$17.50
SVF with REEF	**$59.00**	**$72.50**	**$86.00**	**$95.00**	**$117.50**
Standard Tariff	$54.00	$67.50	$81.00	$90.00	$112.50
Decoupling Adj.	$3.33	$4.17	$5.00	$5.56	$6.94
Std Tariff+ Decoupling	**$57.33**	**$71.67**	**$86.00**	**$95.56**	**$119.44**

Case 4

Higher Feebate ($0.06)

	600 kWh	750 kWh	900 kWh	1000 kWh	1250 kWh
SVF Tariff	$74.00	$80.00	$86.00	$90.00	$100.00
REEF Fee or Rebate	-$18.00	-$9.00	$0.00	$6.00	$21.00
SVF with REEF	**$56.00**	**$71.00**	**$86.00**	**$96.00**	**$121.00**
Standard Tariff	$60.00	$71.25	$82.50	$90.00	$108.75
Decoupling Adj.	$2.33	$2.92	$3.50	$3.89	$4.86
Std Tariff+ Decoupling	**$62.33**	**$74.17**	**$86.00**	**$93.89**	**$113.61**