A Customer Balanced DSM Cost Perspective and Methodology

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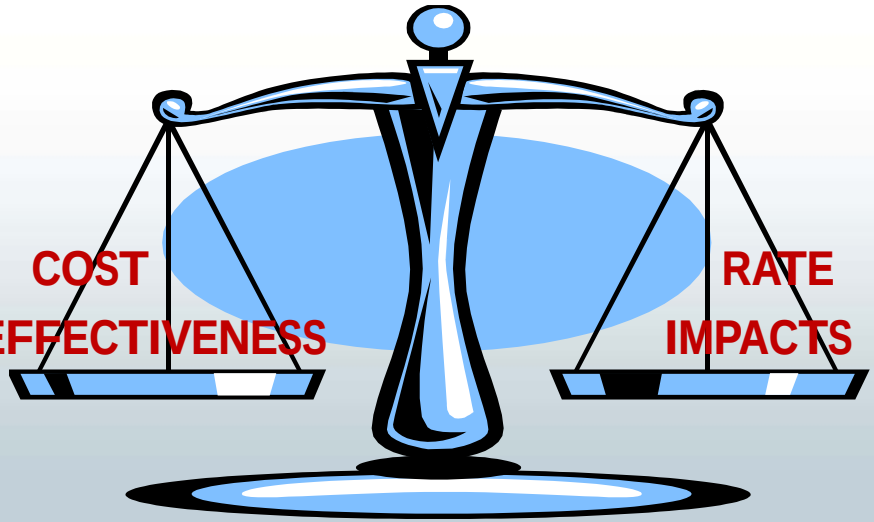


Where we were 25 years ago

The California Collaborative (1990)[1,2] reached partial consensus on the appropriate economic tests to use in assessing DSM programs:

- *Principle #4: Defining Cost Effectiveness for Demand-Side Resources … DSM program cost effectiveness is defined by the Total Resource Cost (TRC) test. However, results of the TRC test alone do not determine the optimal level of DSM and associated program funding levels.*

- *Principle #5: Two policy views … Each policy position recognizes that the determination of cost effectiveness for demand-side resource options is established by the TRC test. In both views, rate impacts are recognized as a relevant component of the decision process for setting funding levels.*

1California Collaborative 1990, *Report* of *the Statewide Collaborative Process, An Energy Efficiency Blueprint* ***for*** *California,* available from the California Public Utilities Commission and Pacific Gas and Electric Company, San Francisco, CA, January.

2 per Eric Hirst of the Oak Ridge National Laboratory for the DOE in November 1991 titled: "The Effects of Utility DSM Program on Electric Costs and Prices"

Eric Hirst, Research Engineer
Oak Ridge National Lab (1991)

"In general DSM program reduce electricity costs and raise electricity prices. Utilities and PUCs must make tradeoffs between the TRC and the RIM tests….."[2]

"…… I recommend that utilities and PUCs adopt a flexible approach to the assessment of DSM programs. Rather than adhering strictly to any single measure of cost effectiveness, the parties should modify program design and timing so that DSM programs provide major reductions in electric-energy-savings costs (the TRC test) with only minor increases in electricity prices (the RIM test)"[2]

2 Eric Hirst of the Oak Ridge National Laboratory for the DOE in November 1991 titled: "The Effects of Utility DSM Program on Electric Costs and Prices"

So, where are we now?

- 2009: IURC DSM Generic Order testimony excerpts:
  - The Utility Group: "the selection criteria for DSM first involved evaluation of each measure and program using broader cost effectiveness tests including the UC test, the TRC test, the Participant test, and the RIM test".
  - OUCC: "recommended that programs be selected and designed to encourage participation by consumers, and that budgets be set to ensure DSM programs be successful, while being mindful of the impact to ratepayers".
- 2014: The DSM debate continues

Indiana Proposed IRP Requirements

170 IAC 4-7-8 Resource integration

Demonstrate that supply-side and demand-side resource alternatives have been evaluated on a consistent and comparable basis.

Supply and Demand Resources are Different (Supply vs Demand, below)

How we Plan

- Measure Life: Long vs Short
- Measure Size: Big vs Small
- Measure Lead Time: Long vs Short
- Resource Timing: When Needed vs Ongoing

How we Analyze

- Customer Investment: No vs Yes (generally)
- Customer Segmentation: No vs Yes (generally)
- Customer Fairness Issues: No vs Yes (generally)
- Objective Function(s): One (PVRR) vs Multiple

"Consistent and Comparable" Single Metric/Model Focused

Least Cost (PVRR)[1] metric applied to Supply Generation

- Results in the most cost effective supply-side resource.
- All customers participate (share benefit of least cost plan).
- Minimizes customer electric rates vs other supply options.
- Cost effectively minimizes customer electric bills.

Least Cost (PVRR) metric applied to DSM (aka Utility Cost test)

- Does not necessarily result in the most cost effective resource.
- Does not necessarily mean all customers participate (i.e. share the benefit of least cost plan).
- Does not necessarily minimize customer electric rates.
- Does not necessarily *cost effectively* minimize customer electric bills.

[1] PVRR = Present Value of Revenue Requirements

"Consistent and Comparable" Customer Objective Focused

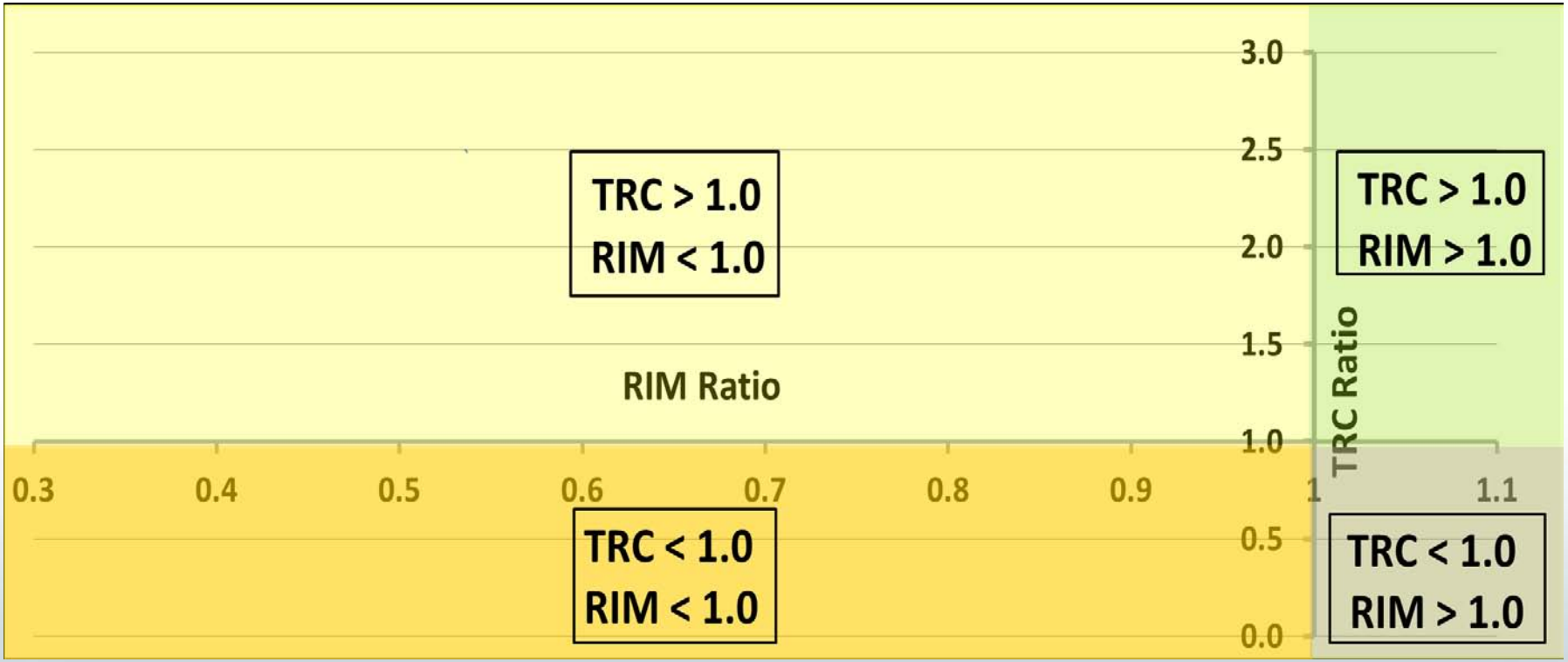
COST EFFECTIVE and LOW RATES

- COST EFFECTIVE RESOURCES (The TRC test for DSM)
  - Overall Customer Cost Effectiveness measure.
  - Does not consider rate impacts.
  - Does not consider equity (who benefits, who loses).
- LOW CUSTOMER RATES (The RIM test for DSM)
  - Overall Customer Rate Impact measure.
  - Fairness or Equity test. Non-Participant test. No Losers test.
  - Does not consider overall cost effectiveness.
- COST EFFECTIVE AND LOW RATES (PVRR for Supply)

Application of the DSM B/C tests

- Typically a "Pass" / "Fail" criteria.
  DSM Test "passes" if Benefits/Costs (B/C) > 1.0
- RIM B/C ratio is rarely above 1.0 for EE DSM. So it "Fails"
  Result: TRC Test Used. RIM Test Often Ignored.
- Ignoring a key resource planning objective (rate impacts) is not the answer.
- Finding a way to *balance* cost effectiveness and rate impacts "is"
- That will be the focus of this presentation

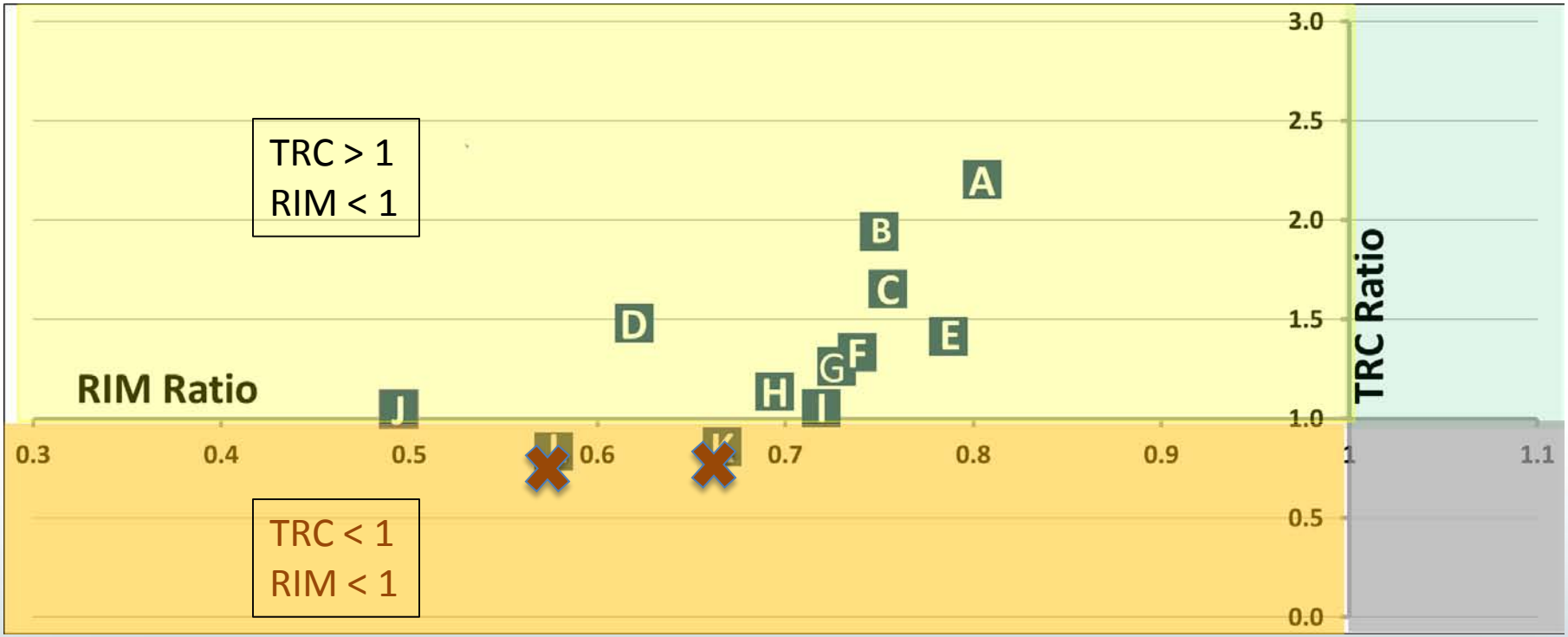
Mapping the Four TRC/RIM "Pass-Fail" Quadrants



Typical EE DSM B/C Test Results

Program	TRC Ratio	RIM Ratio
A	2.20	0.80
B	1.94	0.75
C	1.65	0.75
D	1.48	0.62
E	1.41	0.79
F	1.33	0.74
G	1.26	0.73
H	1.14	0.69
I	1.05	0.72
J	1.05	0.49
K	0.86	0.67
L	0.83	0.58

Plotting the TRC and RIM B/C Ratio Coordinates



Calculate "Net" TRC Benefits
PV ($000)

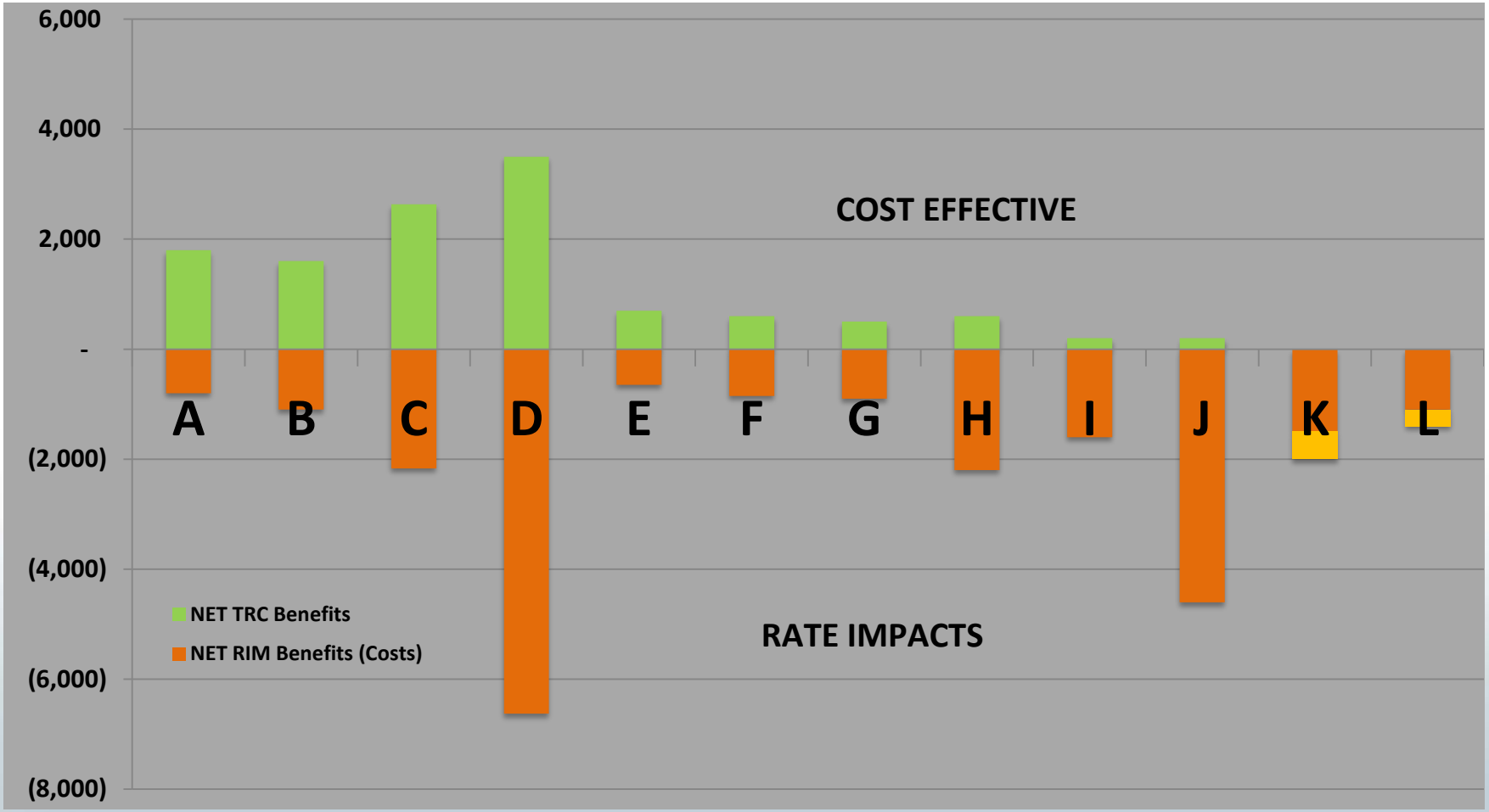
Program	TRC Ratio	TRC Benefits	TRC Costs	NET TRC Benefits
A	2.20	3,300	1,500	**1,800**
B	1.94	3,300	1,700	**1,600**
C	1.65	6,667	4,033	**2,633**
D	1.48	10,800	7,300	**3,500**
E	1.41	2,400	1,700	**700**
F	1.33	2,400	1,800	**600**
G	1.26	2,400	1,900	**500**
H	1.14	5,000	4,400	**600**
I	1.05	4,100	3,900	**200**
J	1.05	4,500	4,300	**200**
K	0.86	3,000	3,500	**(500)**
L	0.83	1,500	1,800	**(300)**

Calculate "Net" RIM Benefits

PV ($000)

Program	RIM Ratio	RIM Benefits	RIM Costs	NET RIM Benefits
A	0.80	3,300	4,100	**(800)**
B	0.75	3,300	4,400	**(1,100)**
C	0.75	6,667	8,833	**(2,167)**
D	0.62	10,800	17,425	**(6,625)**
E	0.79	2,400	3,050	**(650)**
F	0.74	2,400	3,250	**(850)**
G	0.73	2,400	3,300	**(900)**
H	0.69	5,000	7,200	**(2,200)**
I	0.72	4,100	5,700	**(1,600)**
J	0.49	4,500	9,100	**(4,600)**
K	0.67	3,000	4,500	**(1,500)**
L	0.58	1,500	2,600	**(1,100)**

Compare TRC and RIM "Net" Benefits (PV, $000)



Calculate a "Customer Balance Test" (CBT) Ratio

Program	TRC (Benefit – Costs)	RIM (Costs – Benefits)	TRC NET BENETITS / RIM NET COSTS
	NET TRC Benefits	NET RIM Costs	CBT Ratio
A	$ 1,800	$ 800	**2.25**
B	$ 1,600	$ 1,100	**1.45**
C	$ 2,633	$ 2,167	**1.22**
D	$ 3,500	$ 6,625	**0.53**
E	$ 700	$ 650	**1.08**
F	$ 600	$ 850	**0.71**
G	$ 500	$ 900	**0.56**
H	$ 600	$ 2,200	**0.27**
I	$ 200	$ 1,600	**0.13**
J	$ 200	$ 4,600	**0.04**
K	$ (500)	$ 1,500	**(0.33)**
L	$ (300)	$ 1,100	**(0.27)**

Rank Programs by "Customer Balance Test" (CBT) B/C Ratio

Program	TRC Ratio	RIM Ratio	CBT Ratio (RANKED)
A	2.20	0.80	2.25
B	1.94	0.75	1.45
C	1.65	0.75	1.22
F	1.41	0.79	1.08
G	1.33	0.74	0.71
D	1.26	0.73	0.56
E	1.48	0.62	0.53
H	1.14	0.69	0.27
I	1.05	0.72	0.13
J	1.05	0.49	0.04
K	0.83	0.58	(0.27)
L	0.86	0.67	(0.33)

CBT Application 1: Derive a CBT Program B/C Pass-Fail Criteria

- Objective:

  The TRC "Net" Benefits (cost effectiveness)
  needs to be greater than
  The RIM "Net" Costs (rate impacts)

- In B/C Ratio terms:

$$\frac{\text{TRC Net Benefits}}{\text{RIM Net Costs}} > 1.0$$

CBT Application 1:
CBT Program B/C Pass-Fail Criteria

Program	TRC Ratio	RIM Ratio	CBT Ratio
A	2.20	0.80	2.25
B	1.94	0.75	1.45
C	1.65	0.75	1.22
F	1.41	0.79	1.08
G	1.33	0.74	0.71
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K	0.83	0.58	(0.27)
L	0.86	0.67	(0.33)

Calculate an equivalent B/C Pass-Fail CBT Criteria line

A	B	C	D	E	F	G	H
TRC RATIO	TRC Benefits	TRC Costs	TRC Net Benefits	RIM Net Costs	RIM Benefits	RIM Costs	RIM RATIO
1.00	100	100	-	-	100	100	1.00
1.20	100	83	17	17	100	117	0.86
1.50	100	67	33	33	100	133	0.75
2.00	100	50	50	50	100	150	0.67
3.00	100	33	67	67	100	167	0.60
			Set Equal				

Calculation:

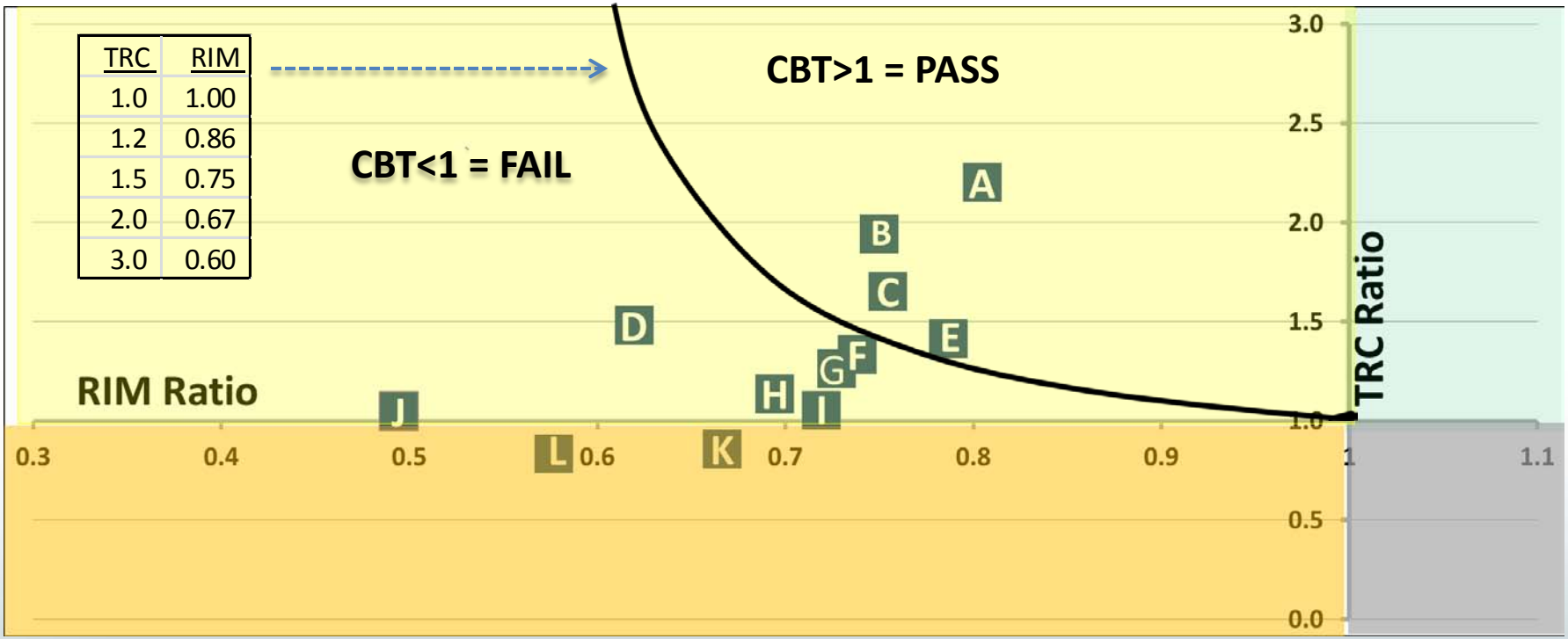
(1) Set RIM Net Costs equal to TRC Net Benefits to derive corresponding RIM threshold (Col D= Col E)

(2) RIM Benefits are the same as TRC Benefits (avoided energy and capacity costs) (Col F= Col B)

(3) RIM costs are equal to RIM benefits less Net Costs (Col G = F + E)

(4) Calculate Corresponding RIM B/C Ratio (Col H)

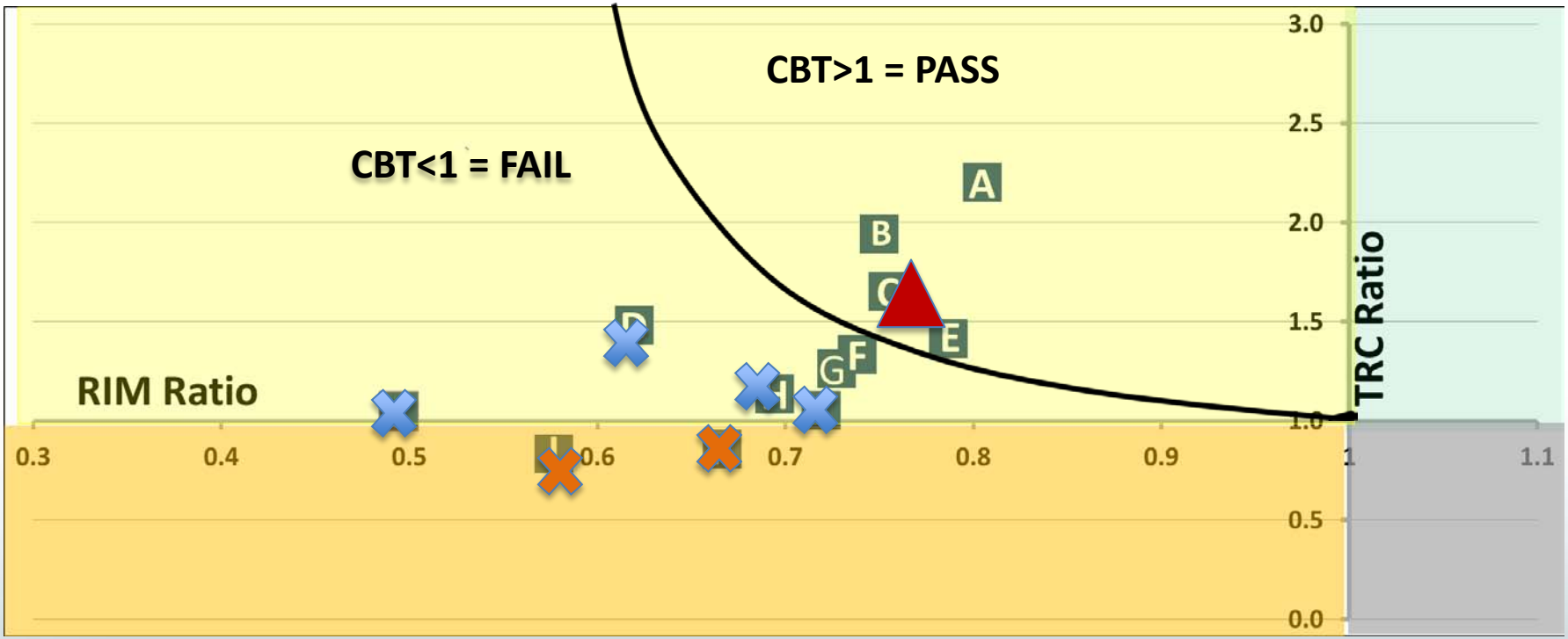
Plotting the DSM programs vs the CBT B/C Pass-Fail Criteria



CBT Application 2:
CBT Portfolio B/C Pass-Fail Criteria

Program	PROGRAM TRC Ratio	PROGRAM RIM Ratio	PROGRAM CBT Ratio	PORTFOLIO CBT Ratio
A	2.20	0.80	2.25	2.25
B	1.94	0.75	1.45	1.79
C	1.65	0.75	1.22	1.48
E	1.41	0.79	1.08	1.43
F	1.33	0.74	0.71	1.32
G	1.26	0.73	0.56	1.21
D	1.48	0.62	0.53	0.87
H	1.14	0.69	0.27	0.78
I	1.05	0.72	0.13	0.72
J	1.05	0.49	0.04	0.57
L	0.83	0.58	(0.27)	0.53
K	0.86	0.67	(0.33)	0.48

Plotting the DSM Portfolio TRC and RIM vs the CBT B/C Pass-Fail Criteria



CBT (6 Program) Portfolio Plan: CBT = 1.21, TRC = 1.62, RIM = 0.76

The 4 Eliminated (TRC >1) Programs: CBT = 0.30, TRC = 1.23, RIM = 0.62

CBT Application 3: Use Broader DSM Planning Objectives

1) Rank programs by CBT = cost effectiveness per rate impact.

2) Apply broad planning criteria regarding selection (i.e. where to draw the line), such as:
   - Floor – sustainable DSM program level
   - Cap – rate impact (%) per year
   - Other –

CBT Application 3: Example only
Rank + Apply Planning Objectives
(Floor = 6 programs, Cap = 8 programs)

Program	Program Costs Floor ($M/Yr) ($15M)	Rate Impact Cap (%/Yr) (2% per year)	CBT Ratio Ranked (example only)
A	2.50	0.05	2.25
B	5.00	0.15	1.45
C	7.50	0.30	1.22
F	10.00	0.50	1.08
G	12.50	0.75	0.71
D	**15.00**	1.10	FLOOR 0.56
E	17.50	1.50	0.53
H	20.00	**2.00**	CAP 0.27
I	22.50	2.75	0.13
J	25.00	0.49	0.04
K	27.50	0.58	(0.27)
L	30.00	0.67	(0.33)

Key Takeaways

- "Consistent and Comparable" should be Customer Objective Focused.
  - Cost Effectiveness (TRC) Matters. Rate Impact (RIM) Matters. For both Supply and Demand.
  - PVRR achieves customer objectives for Supply resources, but not for Demand resources.
  - "Pass-Fail" application of RIM test is flawed. But ignoring it not right either.
  - No exact answer. Trade-offs need to be recognized. Balance is the key.
- Customer Balance Test (CBT) provides a single balancing metric.
  - CBT provides balance between Cost Effectiveness and Rate Impacts.
  - CBT provides balance between Participants and Non-participants.
  - CBT Identifies "Cost Effectiveness value per Rate Impact buck"
  - CBT more clearly identifies marginal cost effective programs that have over-sized rate impacts.
- Three heuristic CBT Applications presented today:
  - Select Programs individually by CBT, such that Program CBT > 1.0
  - Rank and Select programs by Portfolio target, such that Portfolio CBT > 1.0
  - Rank DSM programs by CBT and apply broader planning criteria.

QUESTIONS / NEXT

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