Arizona Public Service Energy Efficiency Baseline and Market Potential Study

June 6, 2008

Agenda

1. Brief Introduction to ICF

2. DSM Potential Study Methodology, Results, and Implications

ICF Overview

- Headquarters - Fairfax, Virginia
- 17 locations across the U.S.
- Founded in 1969
- Over 3,000 employees
- Symbol: ICFI (NASDAQ)
- $770 million annual revenue (2007)
- Supporting ENERGY STAR initiatives for over a decade

Energy efficiency services include:

- Market potential studies
- IRP
- Turnkey program design, planning, and implementation
- Market research
- Account management
- Marketing and outreach
- Training and education
- Data management
- Technical and financial analysis and support

ICF Experience with DSM Potential Studies

- DSM potential study for Dominion Virginia Power for the states of North Carolina and Virginia, and analysis of DSM potential in the metropolitan DC area regarding the ability of DSM to defer the need for a new transmission line, including development of a regional DSM potential study
- Testimony for Entergy Corporation regarding the ability of DSM to defer the need for a 600 MW coal plant, including development of a four-state DSM potential study
- Preparation of IRPs and regulatory filings, including DSM potential studies and DSM program designs for PEPCO in Delaware, Maryland, and D.C.
- Development of a DSM Potential Study and $250M Energy Efficiency and Demand Response Plan for Commonwealth Edison, including regulatory filings
- Development of DSM Potential and an Energy Efficiency and Demand Response Plan for the Ameren Illinois Utilities
- Assessment of Energy Efficiency potential in Wisconsin for National Economic Research Associates for use in statewide system planning and goal setting
- Development of a statewide DSM potential study for the Georgia Environmental Facilities Administration
- **Approximately 40 additional studies of DSM potential for clients across the United States and internationally**
- **In addition, we currently implement energy efficiency programs for approximately 30 utilities across the country and for the EPA's ENERGY STAR program**

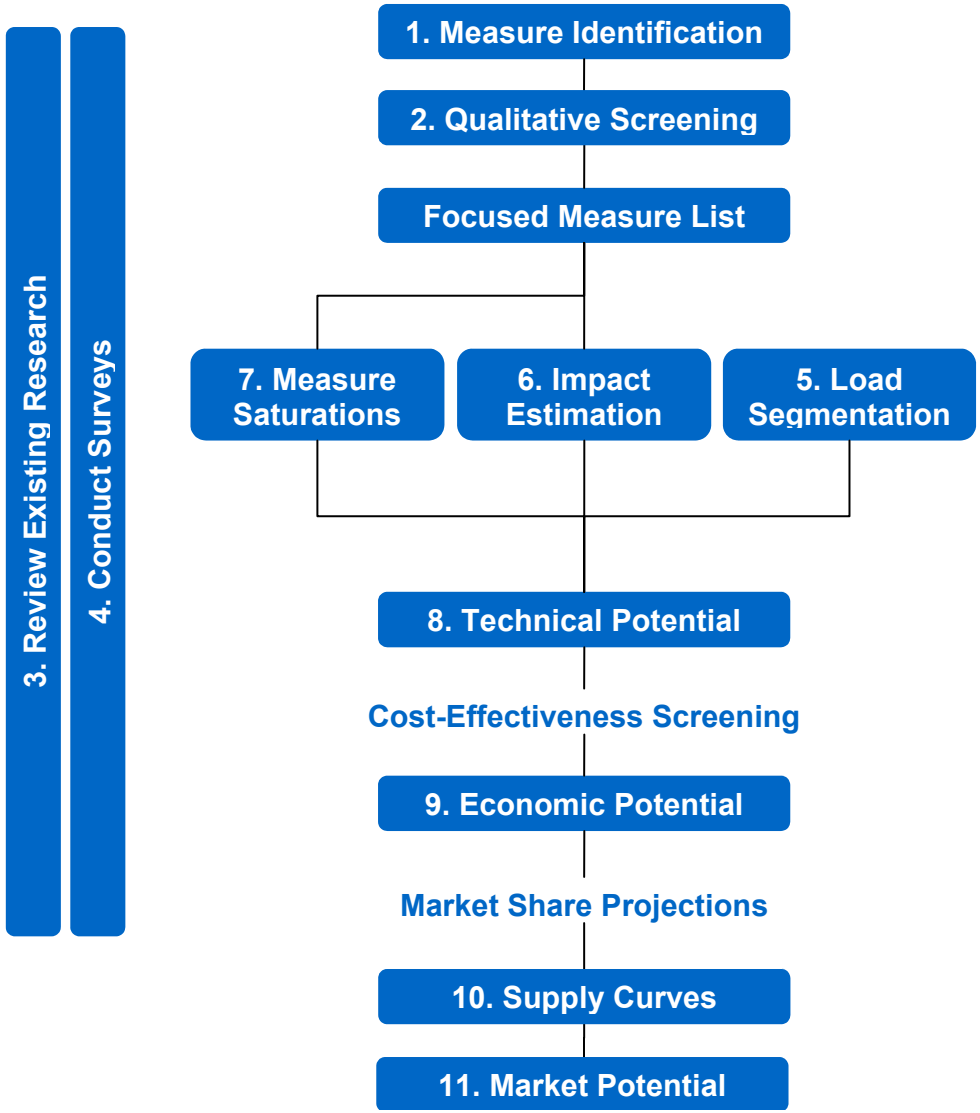
Potential Study

1. Objectives of the study
2. Process and scope of work
3. Key findings

Objectives

- Primary Objectives
  - Support the implementation of current programs
  - Document the current status of energy efficiency products and practices within the APS service territory
  - Quantify the potential impact of additional energy efficient technologies
- Key components of the study include:
  - Original market research with APS customers and trade allies
  - Detailed modeling of the energy impacts of a wide range of efficient technologies
  - Comparison of the costs and benefits of these technologies with APS' supply-side alternatives
  - Evaluation of the likely market acceptance of these technologies under a range of promotional scenarios

Methodology



Qualitative Screening Illustration

Weighting		25%	35%	20%	20%	100%
Technology Name	Sector	kWh Reduction per Installation	Market Size	Technology Maturity	Cost and Complexity of Delivery	Combined Score
HVAC Diagnostics, Testing and Repair	Residential	3	5	5	2	3.9
Reducing minimum outside air requirements	Non-Residential	4	3	5	4	3.85
Evaporative Coolers	Residential	4	3	5	4	3.85
Optimize chilled water and condenser water setting	Non-Residential	4	4	4	3	3.8
Continuous commissioning	Non-Residential	4	4	4	3	3.8

- Approximately 215 measures screened. Measures identified based on ICF national experience, APS input based on local market knowledge, especially measures resulting from collaborative meetings, other national and regional studies of DSM potential, and vendor suggestions.
- Sensitivity analysis conducted. Specific attempt to be inclusive
- Approximately 100 measures passed to detailed evaluation

Surveys

- Telephone surveys with 600 residential customers
- On-site data collection and engineering testing of 24 existing residential homes
- Telephone surveys with 30 new home builders
- Site inspections of 25 retailers of energy-efficient product retailers, and 23 in-depth telephone surveys with such retailers
- Telephone and internet surveys with 34 "Market Actors" (HVAC Contractors, Lighting Contractors, Commissioning/Retro-commissioning Contractors, Commercial Building Contractors, Architects, and Engineers.)
- Telephone surveys with 783 commercial and industrial customers

Illustrative Residential Survey Results

	Percentage of Market Purchasing Each Year[1]	Percentage of Purchasers that Purchase ENERGY STAR or energy efficient equipment	Market Actors
Homeowners			
Insulation	6%	NA	Insulation Contractor or Builder
Central AC	3-9%	47%	HVAC Contractor or Builder
Evaporative Cooler	2-3%	NA	HVAC Contractor or Builder
Windows	4-5%	42%	Home Improvement Stores, Specialty Contractors or Builder
Appliance Owners			
Refrigerators	7-13%	53%	Appliance or Home Improvement Stores
Clothes washer	6-13%	53%	Appliance or Home Improvement Stores
Dishwasher	5-8%	55%	Appliance or Home Improvement Stores or Builder
Standalone Freezer	2-5%	51%	Appliance or Home Improvement Stores
Window AC Owners			
Window AC	1-13%	46%	Appliance or Home Improvement Stores

Illustrative Homebuilder Survey Results

Measure	Approximate Percentage of Homes That Do Not Typically Install/Use/Perform[2]	Number of Builders That Do Not Currently Typically Install/Use/Perform (n's vary based on number of valid respondents)
Install windows with a SHGC less than 0.4	100%	30 (of 30)
Install High SEER Heat Pump	99%	25 (of 27)
Install High SEER central AC units	87%	29 (of 30)
Use blown insulation in the majority of walls where it could be used	74%	19 (of 27)
Perform whole house tests in at least half of homes built	71%	17 (of 27)
Test for duct leakage in at least half of homes built	62%	14 (of 28)
Perform advanced air sealing in at least half of homes built	42%	10 (of 26)
Install ENERGY STAR light fixtures	39%	13 (of 28)
Use cardboard baffles in the majority of attics where could be used	31%	5 (of 24)
Use blown insulation in the majority of attics where it could be used	20%	7 (of 28)
Install all ENERGY STAR appliances	20%	5 (of 30)
Install Low-E windows in the majority of homes	20%	3 (of 30)
Install programmable thermostats	11%	4 (of 30)
Install at least R13 wall insulation (in Metro Phoenix homes)[3]	0%	0 (of 24)
Install at least R30 attic insulation (in Metro Phoenix homes)[3]	0%	0 (of 24)

Illustrative Existing Homes Survey Results

	Low Value	High Value	Average (or most common)
House Floor Area	1,000	4500	2119
Number of Bedrooms	2	5	3.0
Estimated Year of Construction	1951	2005	1986
Foundation Construction Type	Crawl	Slab	Slab
Wall Construction Type	2x6 Wood	2x4 Wood	2x4 Wood
Roof Color	Dark	Medium	Medium

Illustrative Retailer Survey Results

Store Type	Number of Stores Visited	Products Sold	Approximate Cost Difference Between ES and Non-ES	ENERGY STAR Promotional Materials
Specialty Appliance	7	Clothes washers, refrigerators, freezers (but not ENERGY STAR freezers); dishwashers	Clothes washer: $350 Refrigerator: $300 Dishwasher: -$50	Decal in some stores for refrigerators and dishwashers; In-store rebate for refrigerators in some stores; Nothing beyond decals and logos for clothes washers
Mass Merchandiser	5	Clothes washers, refrigerators, etc.	Clothes washer: $450 Refrigerator: $100 Dishwasher: -$200	ENERGY STAR brochures and placards. Some material, decals and logos.
Home Improvement	4	Clothes washers, refrigerators, etc.	Clothes washer: $400 Refrigerator: $400 Dishwasher: $0 Freezers: $200	ENERGY STAR aisle violators and placards. Some co-branded store/manufacturer.

Illustrative New Homes Rater Data

Window U-Value

Window U-Value

Bin	Frequency	Percent
0.35	313	8.79%
0.40	106	2.98%
0.45	20	0.56%
0.50	105	2.95%
0.55	52	1.46%
0.60	1599	44.92%
0.65	56	1.57%
0.70	1104	31.01%
0.75	63	1.77%
0.80	140	3.93%
More	2	0.06%

Duct Leakage

Duct Leakage - CFM25/100SF

Bin	Frequency	Percent
2	17	0.48%
3	60	1.69%
4	160	4.49%
5	241	6.77%
6	974	27.36%
7	961	26.99%
8	579	16.26%
9	517	14.52%
10	7	0.20%
11	13	0.37%
More	31	0.87%

Window SHGC

Window SHGC

Bin	Frequency	Percent
0.35	231	6.49%
0.40	1823	51.21%
0.45	75	2.11%
0.50	95	2.67%
0.55	284	7.98%
0.60	63	1.77%
0.65	49	1.38%
0.70	938	26.35%
0.75	0	0.00%
0.80	2	0.06%
More	0	0.00%

Attic Insulation R-Value by House Location

All Houses Attic R-Value

Bin	Frequency	
19	24	0.72%
25	77	2.31%
30	2707	81.27%
35	142	4.26%
38	369	11.08%
44	9	0.27%
49	3	0.09%
More	0	0.00%

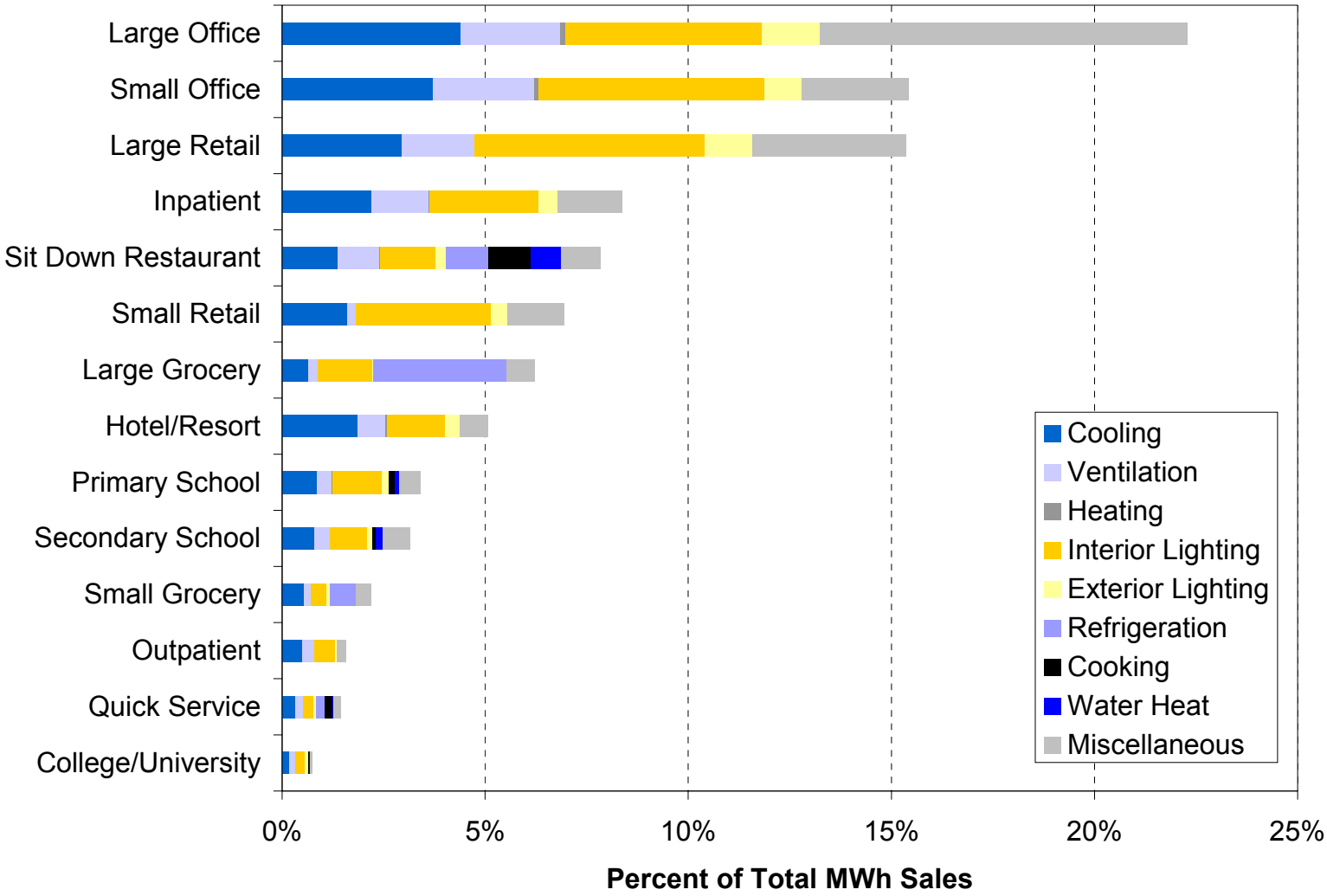
High Country Attic R-Value

Bin	Frequency	
19	0	0.00%
25	1	8.33%
30	3	25.00%
35	4	33.33%
38	4	33.33%
44	0	0.00%
49	0	0.00%
More	0	0.00%

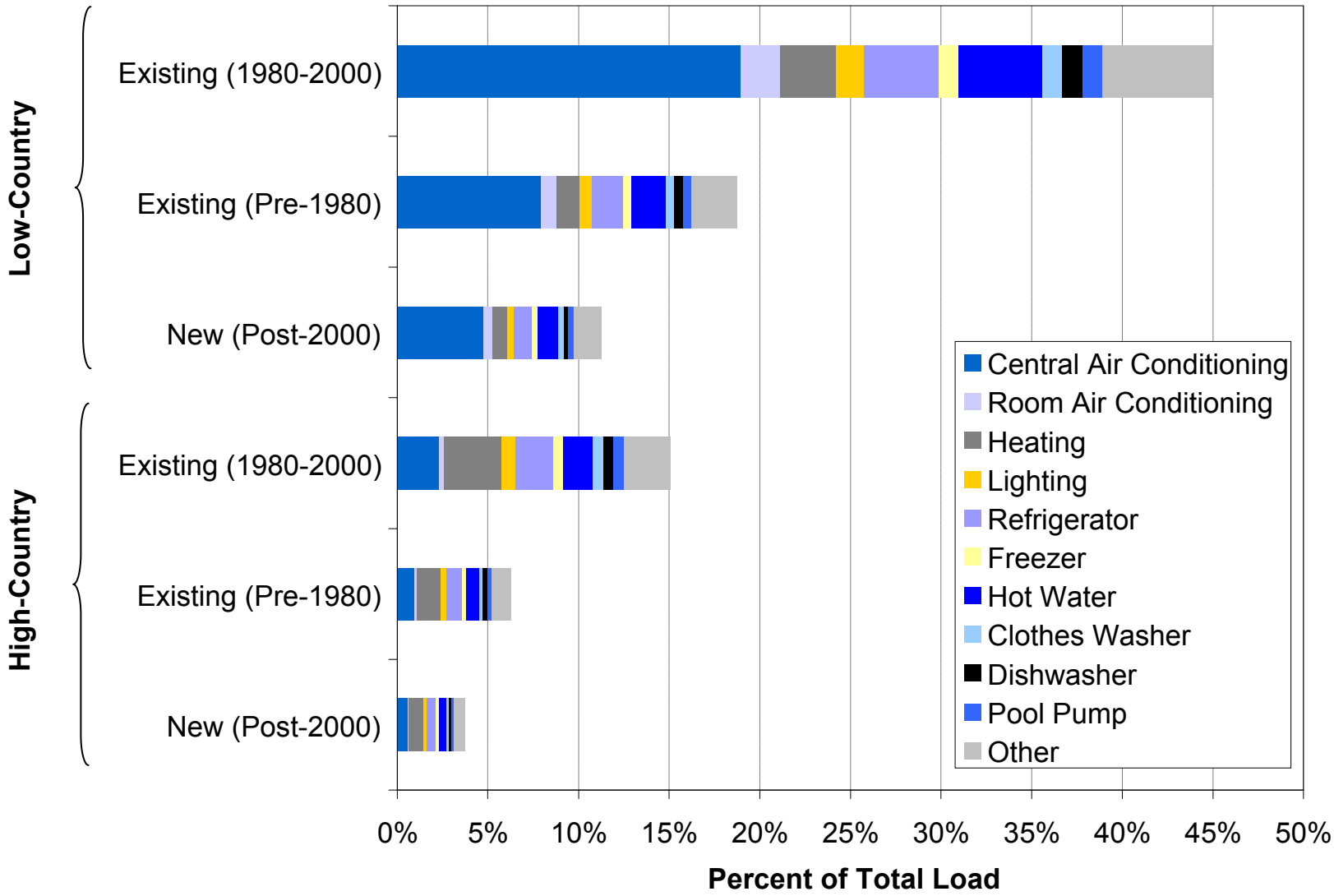
Low Country Attic R-Value

Bin	Frequency	
19	24	0.72%
25	76	2.29%
30	2699	81.44%
35	138	4.16%
38	365	11.01%
44	9	0.27%
49	3	0.09%
More	0	0.00%

Load Segmentation (non-residential energy)



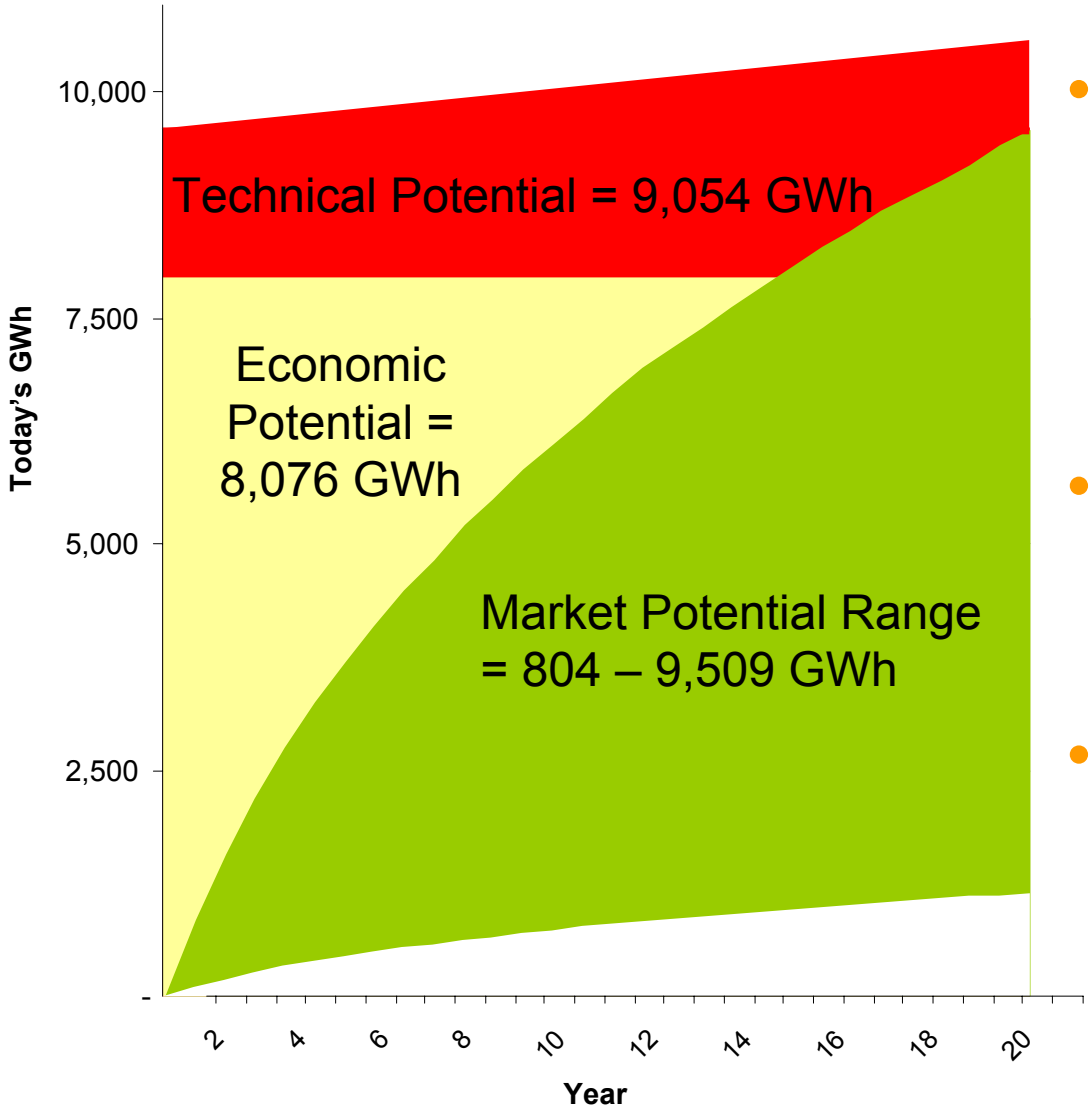
Load Segmentation (residential energy)



Measure Impact Estimation

- Weather sensitive measures used DOE2.1E
  - The residential simulations include weighted average results from approximately 560,000 sets of unique home configurations (i.e., combinations of weather zone, size, vintage, construction, equipment, etc.)
  - The commercial simulations include approximately 24,300 sets of unique building uses and configurations.
- Non weather-sensitive measures used a combination of engineering calculations, DEER, and M&V studies as appropriate

Technical & Economic Potential



- Technical Potential if everyone installed the efficient measure without regard to TRC cost-effectiveness. 9,054 GWh
- Economic Potential if everyone installed all measures passing the TRC test. 8,076 MW
- Market Potential: the subset of Potential that we can expect to adopt the measures under a variety of scenarios

Definition of Cost Effectiveness
The "Total Resource Cost Test"

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Benefits

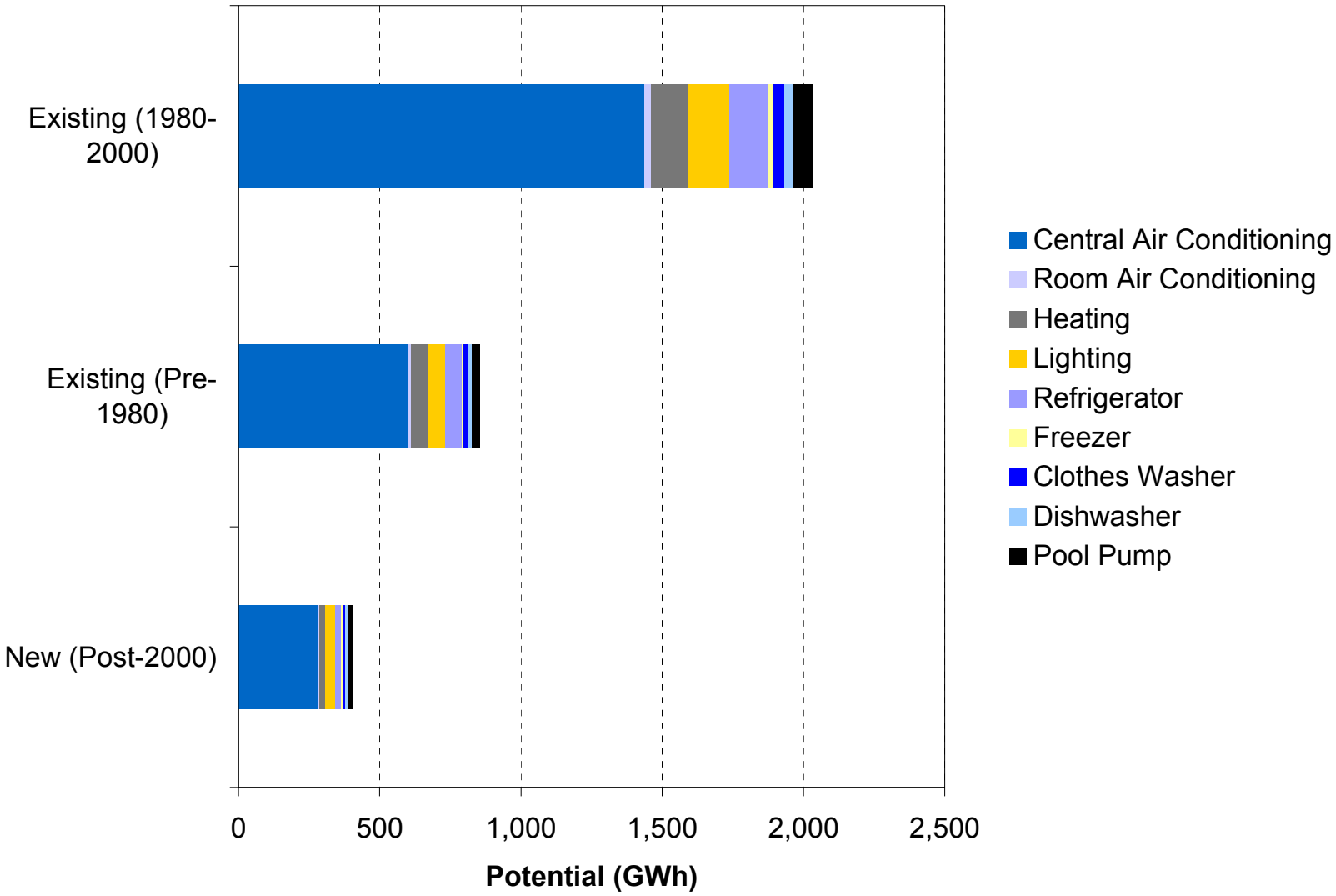
- Avoided Generating Capacity
- Avoided Transmission and Distribution Losses
- Avoided Reserve Margins
- Avoided Fuel
- Avoided Emissions
- Avoided O&M

Costs

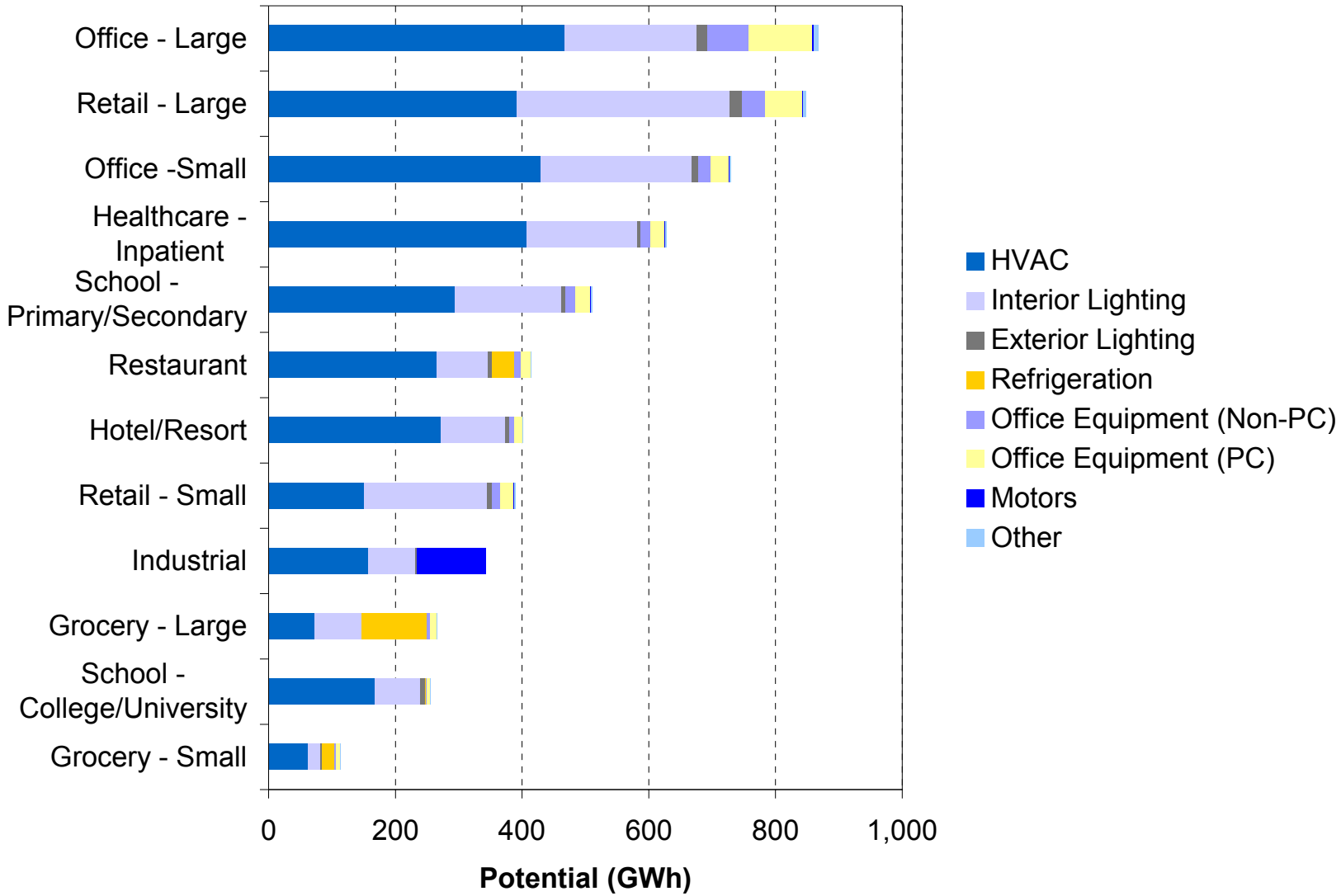
- The incremental cost of the "efficient" equipment or activity over and above the cost of the "standard"
- The cost of running the program (marketing, admin, training, evaluation, etc.)

Note: the incentive payments from the utility to the participant are not included since while they are a cost to the utility they are also a benefit to the participant, and hence are a "wash" from the perspective of the TRC test

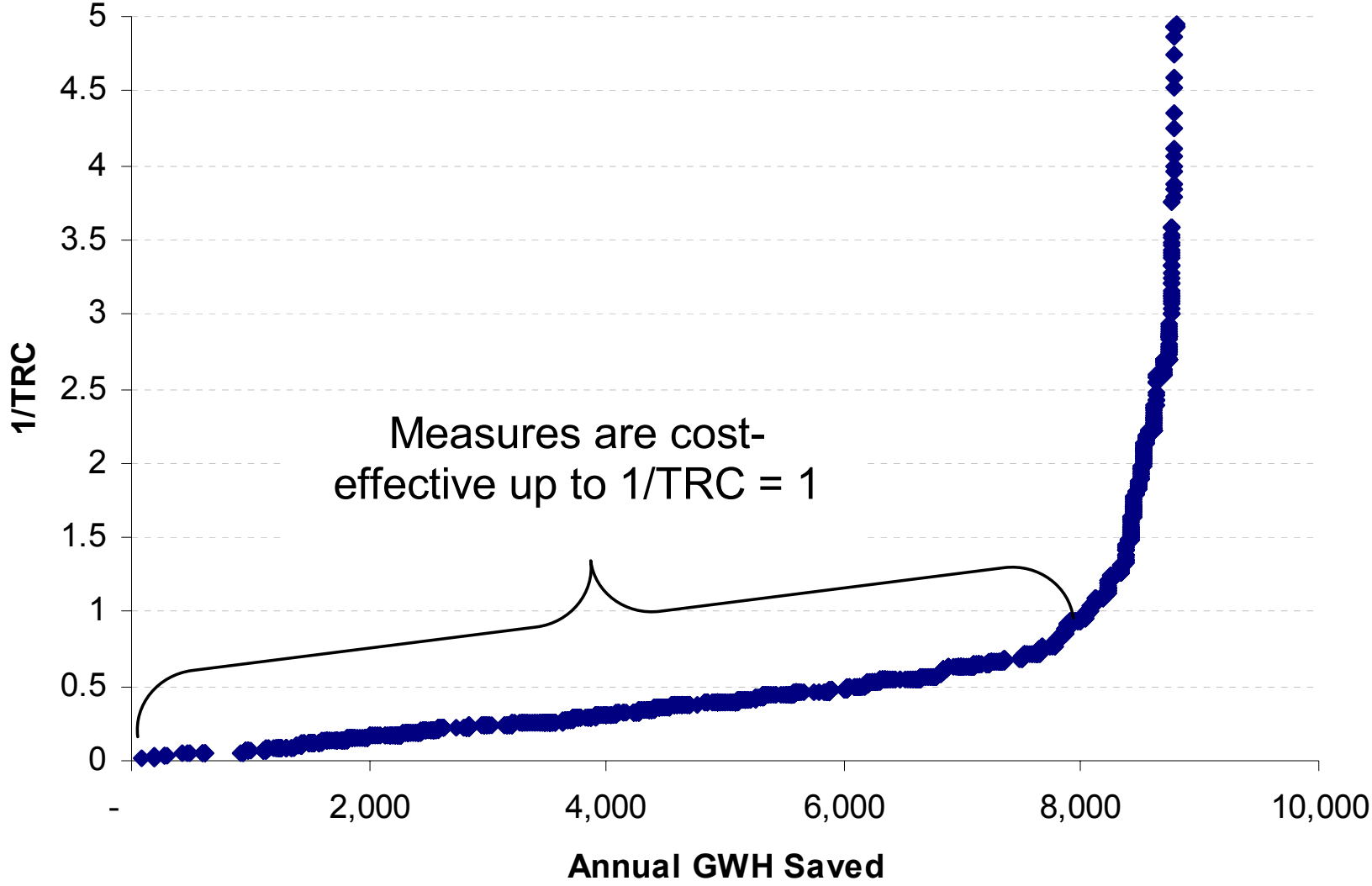
Residential Technical Potential by End Use



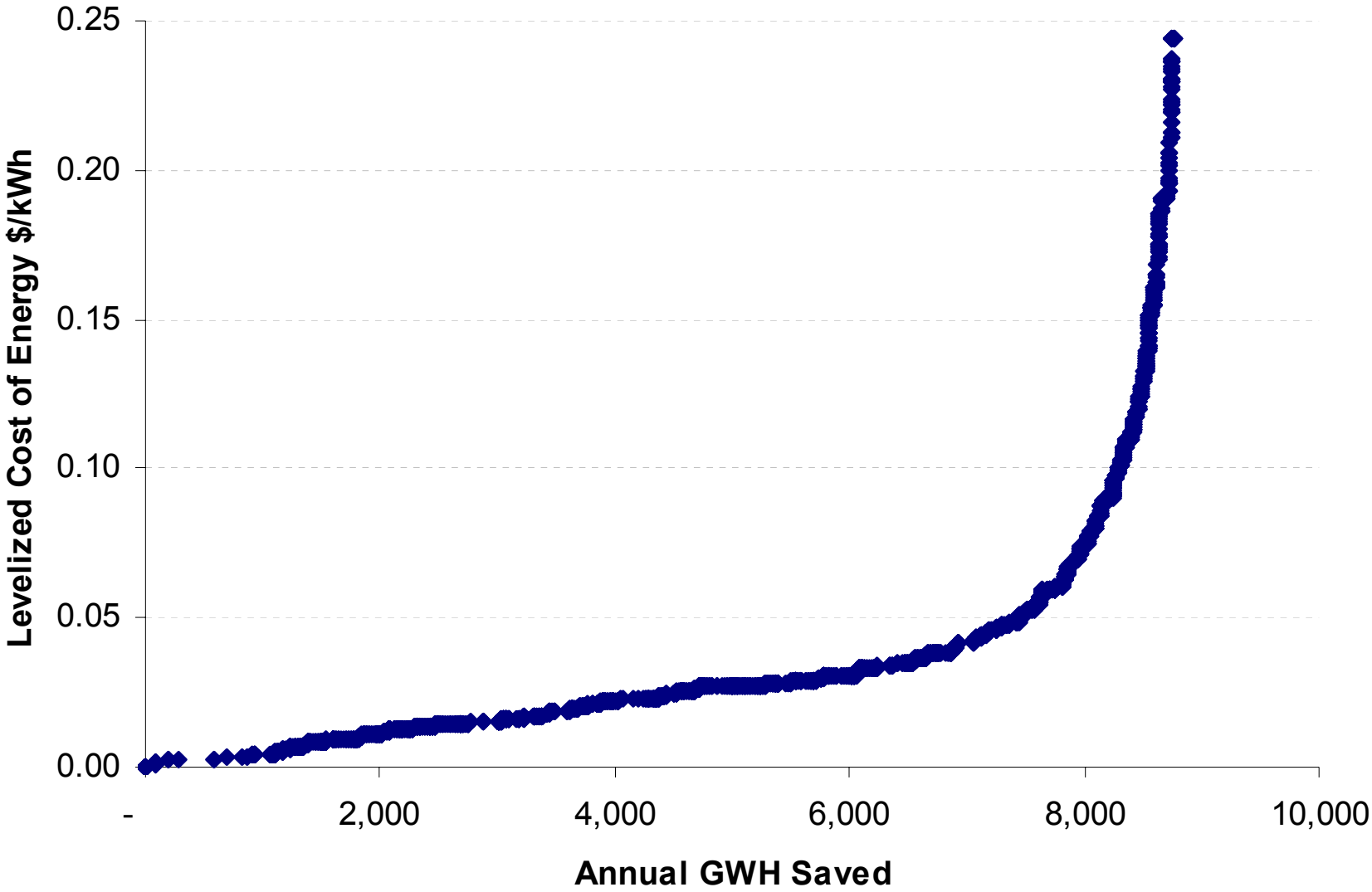
Non-Residential Technical Potential by End Use



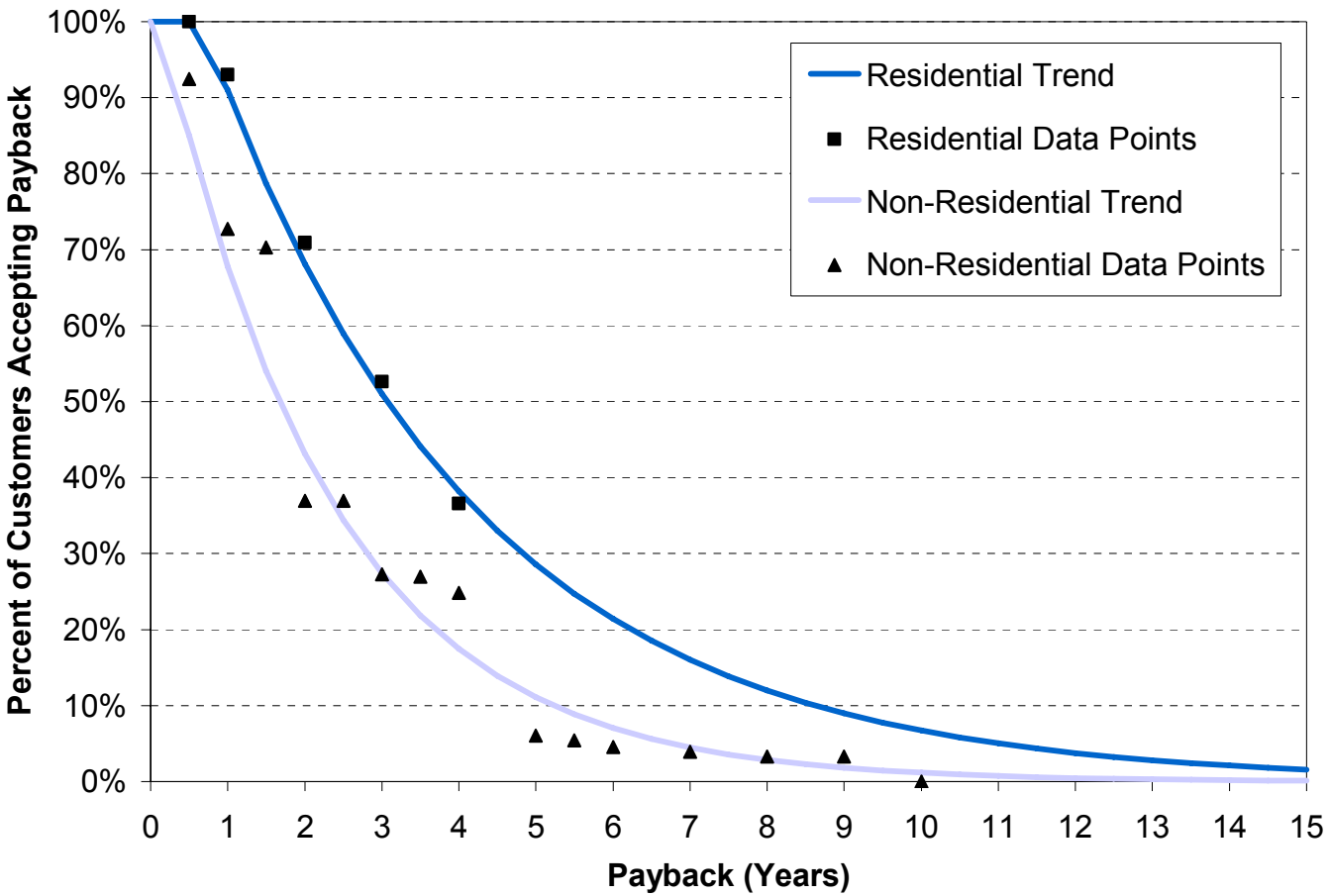
All Sectors DSM Supply Curve (v.TRC)



All Sectors DSM Supply Curve (v.$/kWh)



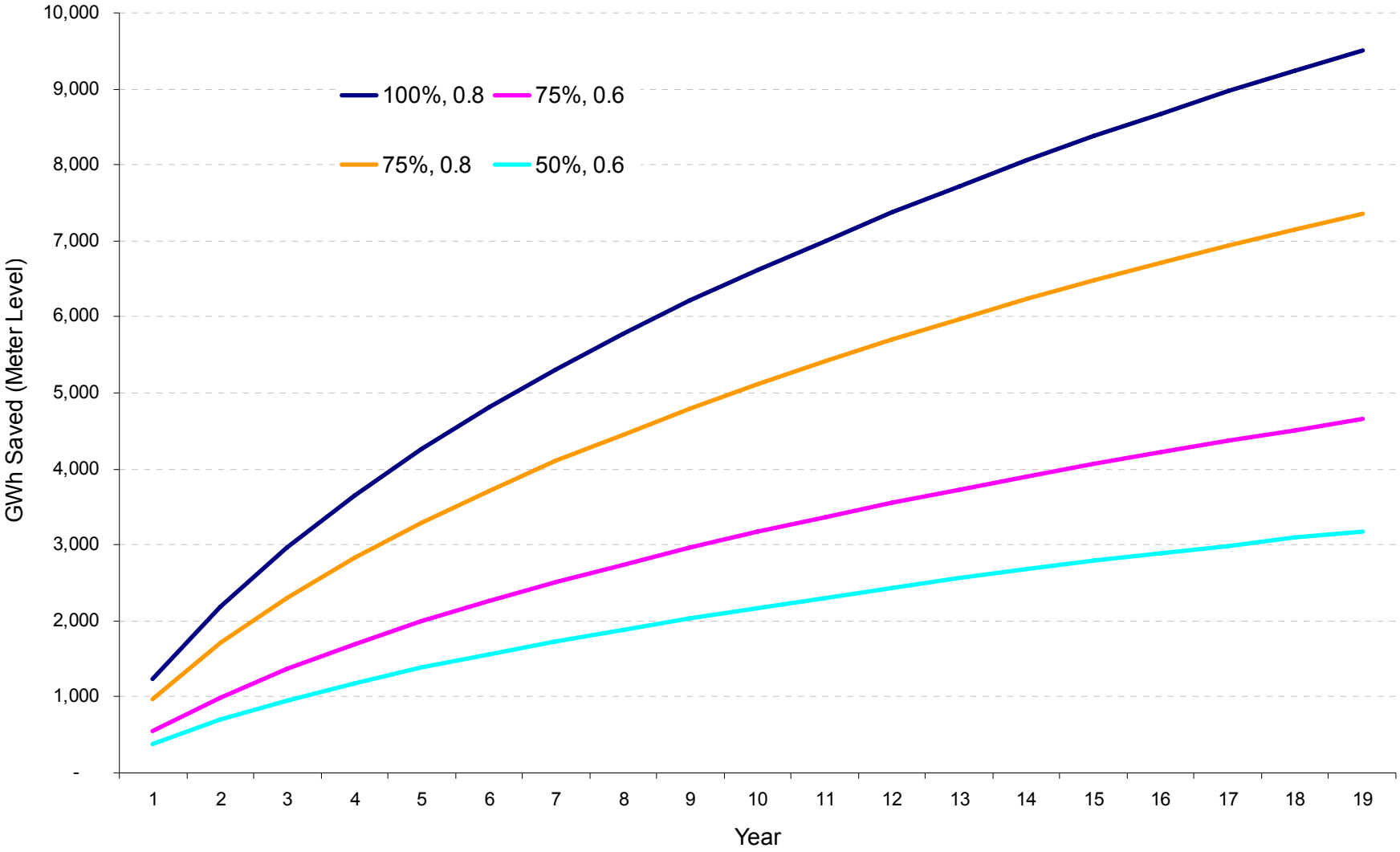
Market Potential and Payback Acceptance



Market Potential and Incentive Scenarios

Scenario	Program Acceptance Factor	Rebate Description
100% Incremental	0.8	Rebate equal to 100 % of measure incremental cost
75% Incremental	0.8	Rebate equal to 75 % of measure incremental cost
75% Incremental	0.6	Rebate equal to 75 % of measure incremental cost
50% Incremental	0.6	Rebate equal to 50 % of measure incremental cost

GWh Market Potential by Incentive Scenario



Potential for Diminishing Returns

- The larger the programs and expenditures, the more expensive DSM becomes:

Annual Expenditure	Cost of DSM
– Current	$11/Lifetime MWh
– $75M	$32/Lifeftime MWh
– $170M	$53/Lifetime MWh
– $420M	$72/Lifetime MWh

Implications

- There appears to be significant cost effective potential for additional DSM programs
- The size of these of programs will be a function of program type, program design, expenditure level and customer acceptance
- Expenditure levels need to be viewed in context with acceptable short term rate impacts, forecasts of future fuel and generating plant costs, equity between customers and customer classes, environmental policy, cost recovery, shareholder incentives, and other policy considerations
- Broader issues, such as the rate of "naturally occurring" DSM and federal, state, and local standards (e.g., appliance efficiency minimums, building codes, etc.) may also have significant impact on the expenditure and cost-effectiveness of utility DSM programs