
Estimating Demand Response Potential for Resource Planning

Stuart Schare
Summit Blue Consulting

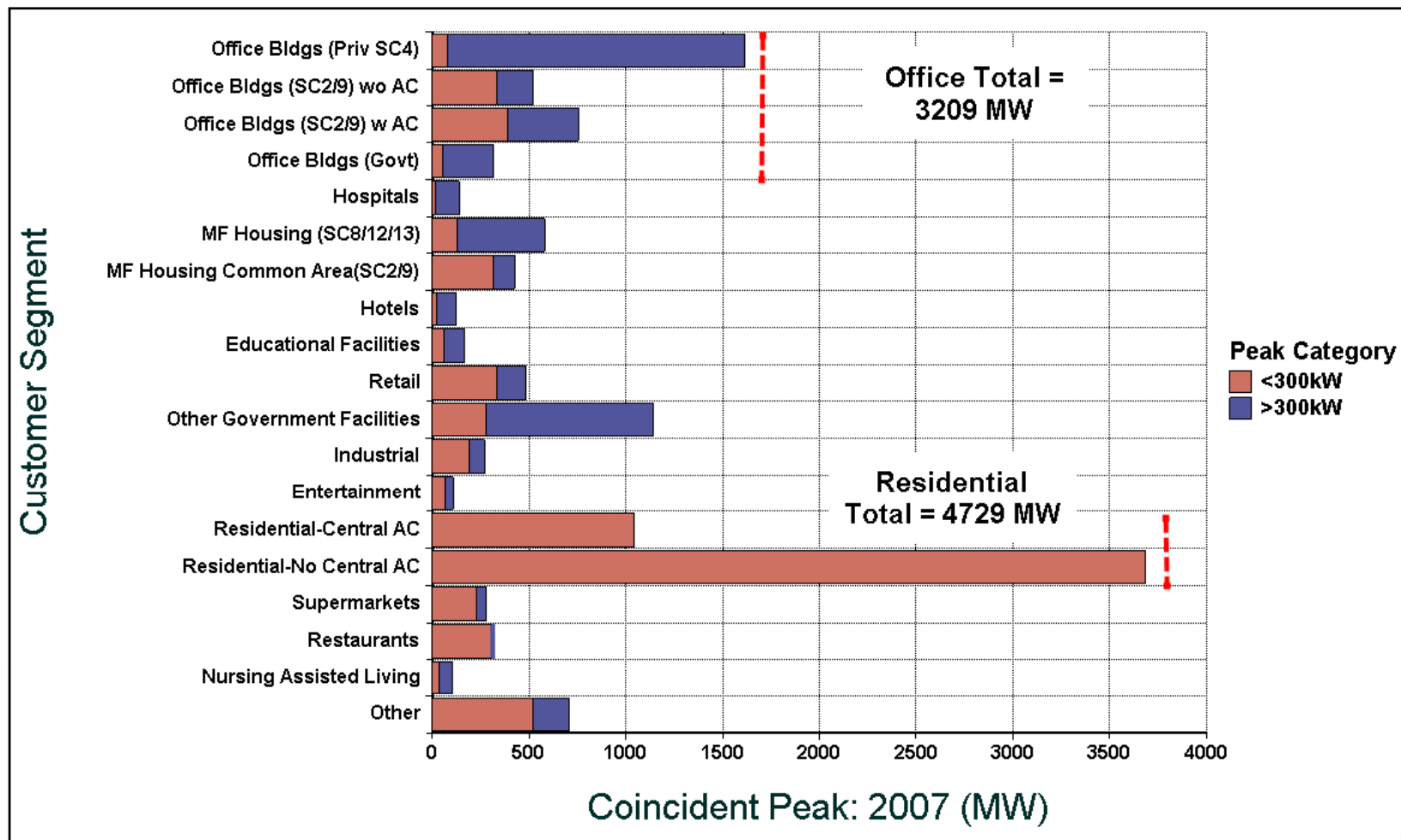
January 2009

Estimating DR Potential

- The simple method
 - Residential:
 - [10%-30% participation] x [# households w/ CAC] x [1 kW]
 - C&I
 - [20% load participation] x [20% of coincident peak (load shed)]
 - plus load shed of extremely large participants
- The rigorous method
 - Model individual customer segments
 - Use existing program impacts (local and national)
 - Uncertainty analysis
- Con Edison “Callable Load” potential study (2008)

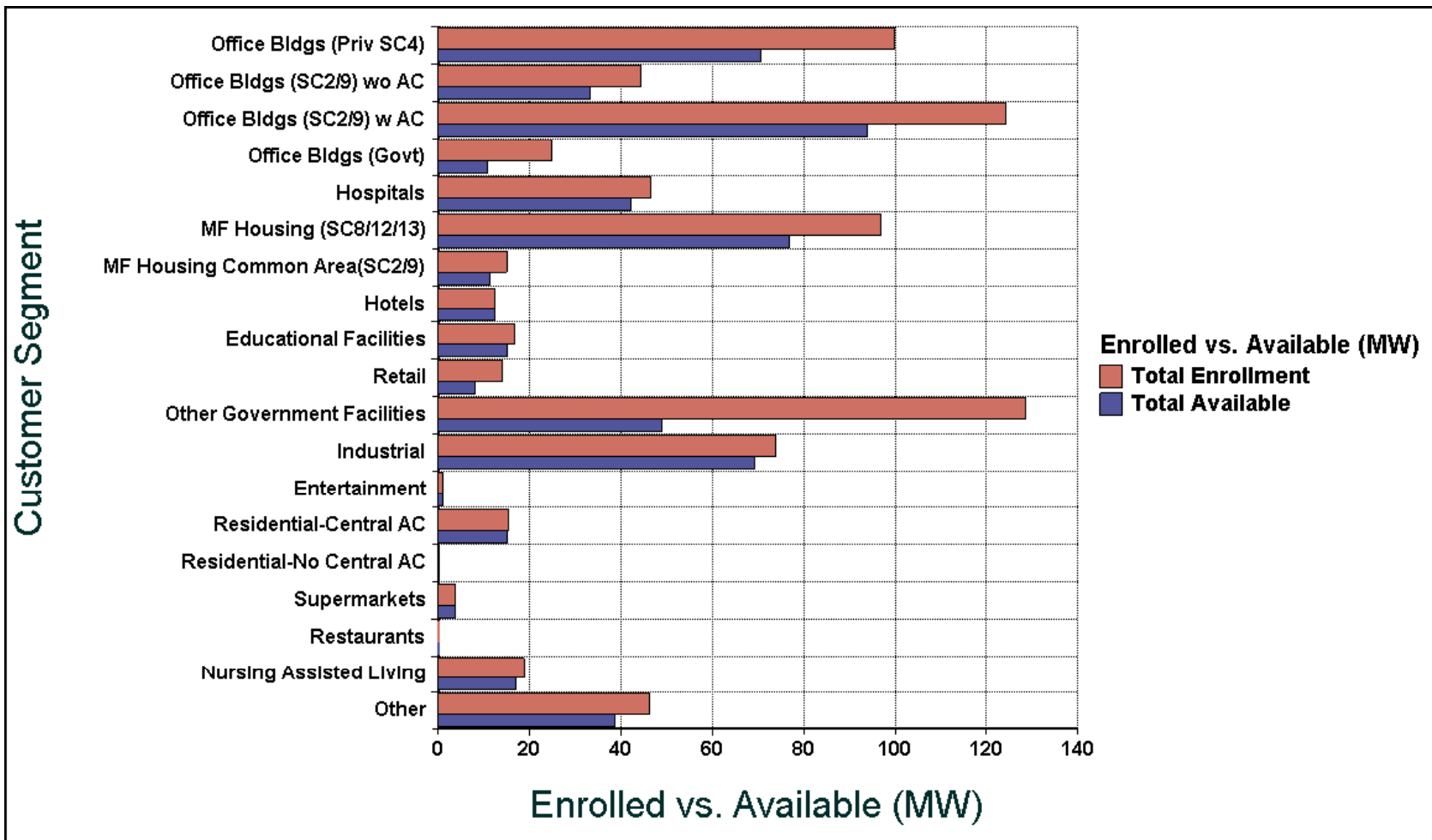
Market Characterization

Customers were segmented to account for differences in participation rates & load shed potential by segment & size category. Demand data & NAICS classification (millions of records) were analyzed.



Market Characterization

For comparison with potential, currently “available” demand response resources must be estimated (considering enrollment overlap and opt-out rates for voluntary and mandatory programs).



Modeling Demand Response Potential



Demand Response Simulator (DRSim) Model

Model Details

Key Input

Input based on analysis of Con Edison data

Non Coincident Peak: 2007	(MW)	Result	<small>mid</small>	Edit Table
Coincidence Factor	(fraction)	Result	<small>mid</small>	Edit Table
Emergency Gen. Capacity	(MW)	Calc	<small>mid</small>	Edit Table
Current Enrollment	(MW)	Result	<small>mid</small>	Edit Table

Other Input

Load shed parameters	(fraction)	Edit Table
Load shed parameter weights	(dmnl)	Edit Table
Baseline participation rates	(%)	Edit Table
Participation scenario factors	(dmnl)	Edit Table
Generation participation rates	(%)	Edit Table
Percent of generation eligible	(%)	Edit Table
Percent of capacity connected	(%)	Edit Table
Load growth (over 10 years)	(%/10-year)	Edit Table
Available within 10 minutes	(%)	Edit Table

Key Output

Coincident Peak - 2017 Projection

Coincident Peak: 2017 Proj.	(MW)	Result	<small>μ</small>
Total Coinc. Peak: 2017 Proj.	(MW) :	14.9K	<small>mid</small>

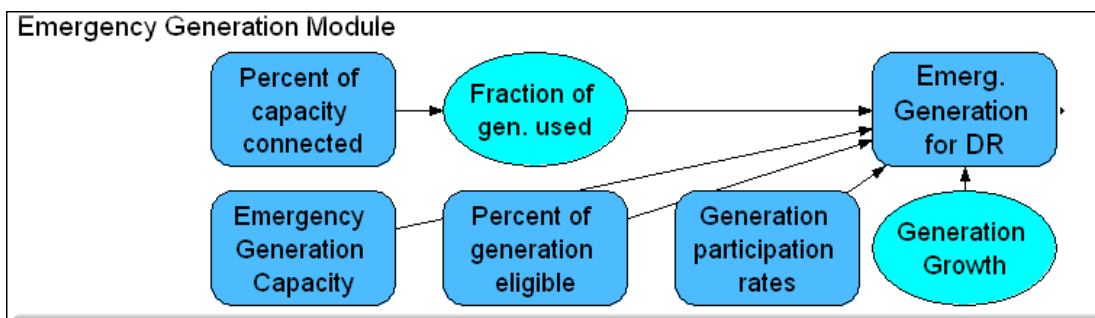
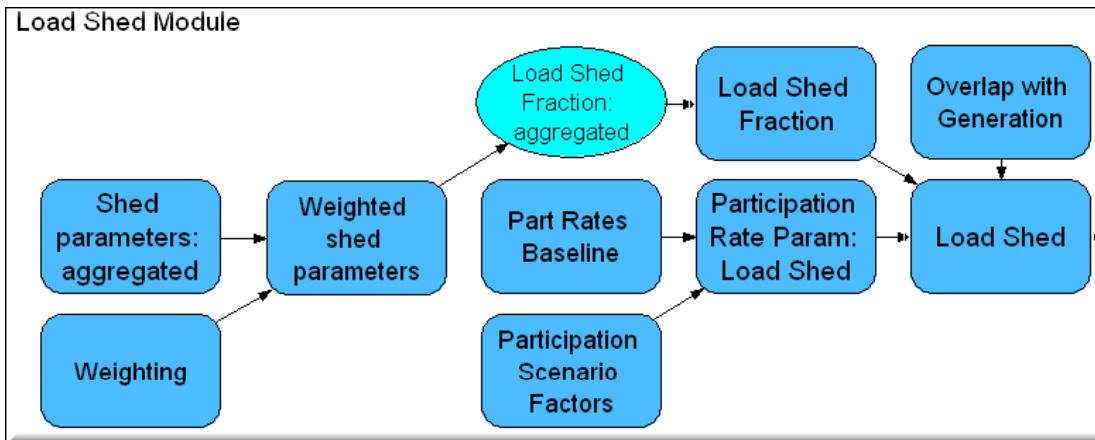
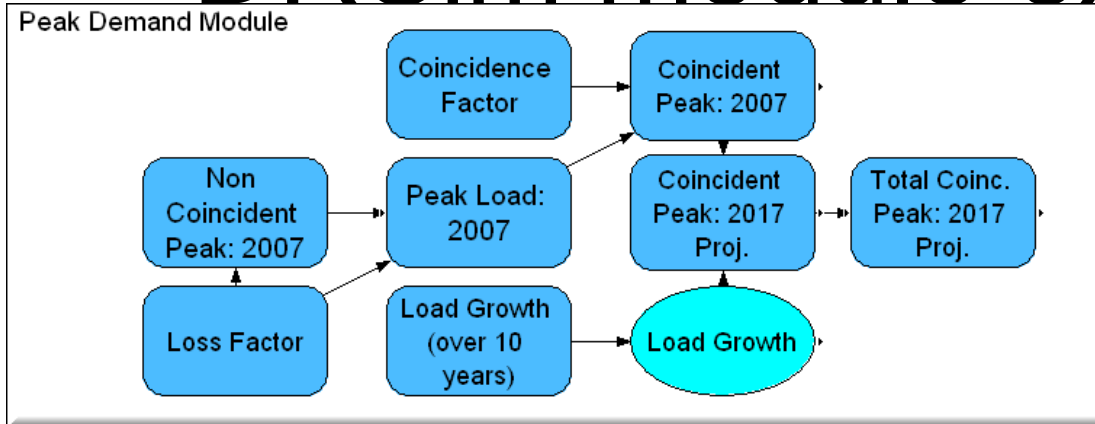
Callable Load Potential - 2017 Projection

Load Shed	(MW)	Calc	<small>μ</small>
Emerg. Generation for DR	(MW)	Calc	<small>μ</small>
<hr/>			
Callable Potential	(MW)	Calc	<small>μ</small>
<10 minute notification	(MW)	Calc	<small>μ</small>
Total Potential	(MW)	Calc	<small>⌋</small>
Potential as % of Peak	(%)	Calc	<small>⌋</small>

Gap Analysis - Enrolled vs. 2017 Projection

Achievable vs Available	(MW)	Calc	<small>μ</small>
"Gap"	(MW)	Calc	<small>μ</small>
Total Available vs. Achievable	(MW)	Calc	<small>μ</small>

DRSim module examples



Variables disaggregated by:

Customer segment
(18 customer segments)

Peak Category
(2 size categories -- <300 kW customers, >300 kW customers)

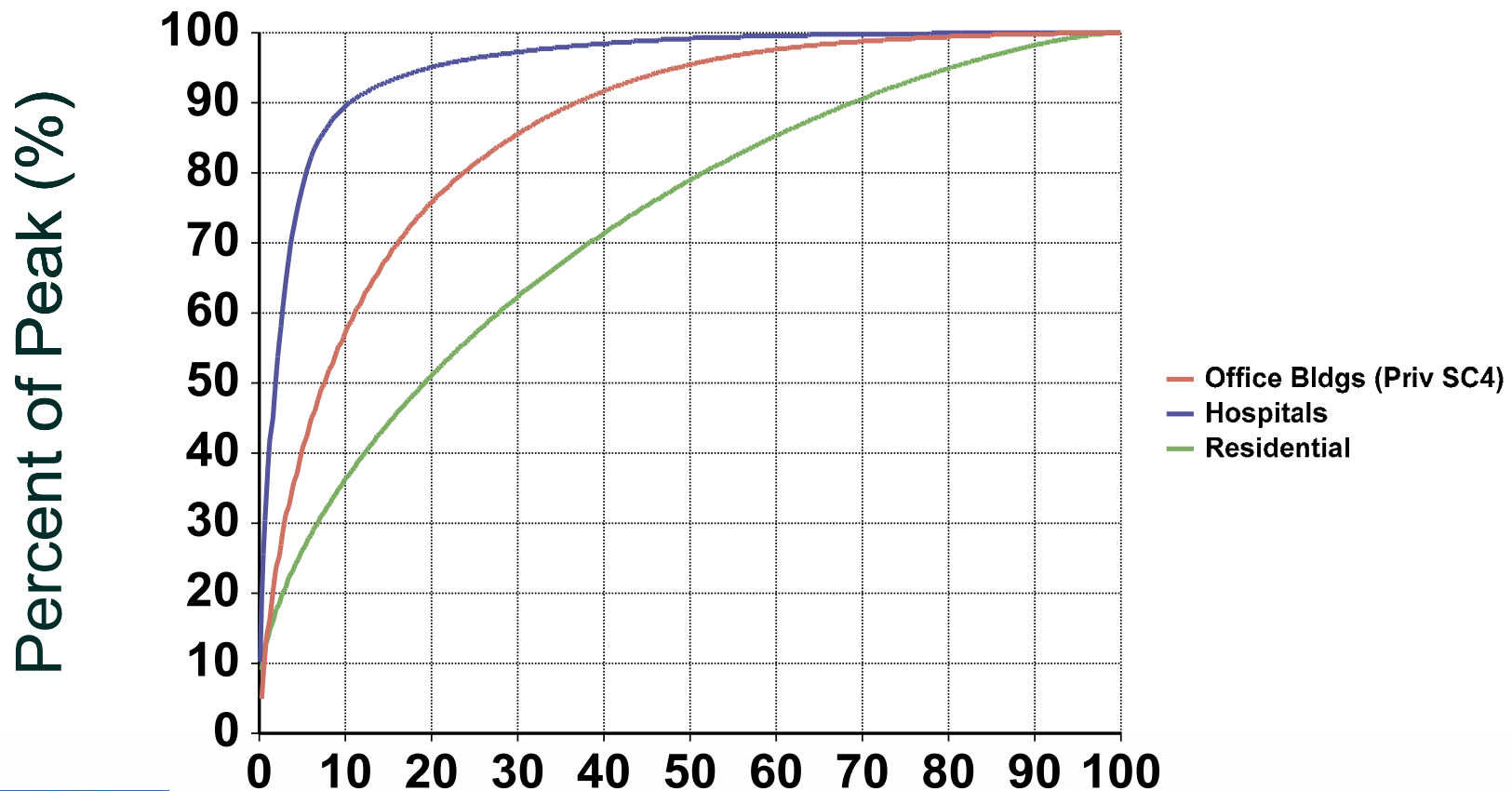
Shed Scenario
(3 scenarios -- High, Medium, Low)

Generation Scenario
(3 scenarios -- High, Medium, Low)

Potential Type
(2 types -- Market, Technical)

What is “participation?”

For modeling purposes, participation is defined as the % of peak load enrolled (as opposed to % of customers), since heterogeneity among segments can vary dramatically



Participation Assumptions

Baseline assumed participation rates varied by customer size & segment. Scenario analysis conducted to explore uncertainty in participation rates, which is significant.

Table 4-3. Load Shed Participation Rate (% of kW demand) vs. Peak Demand

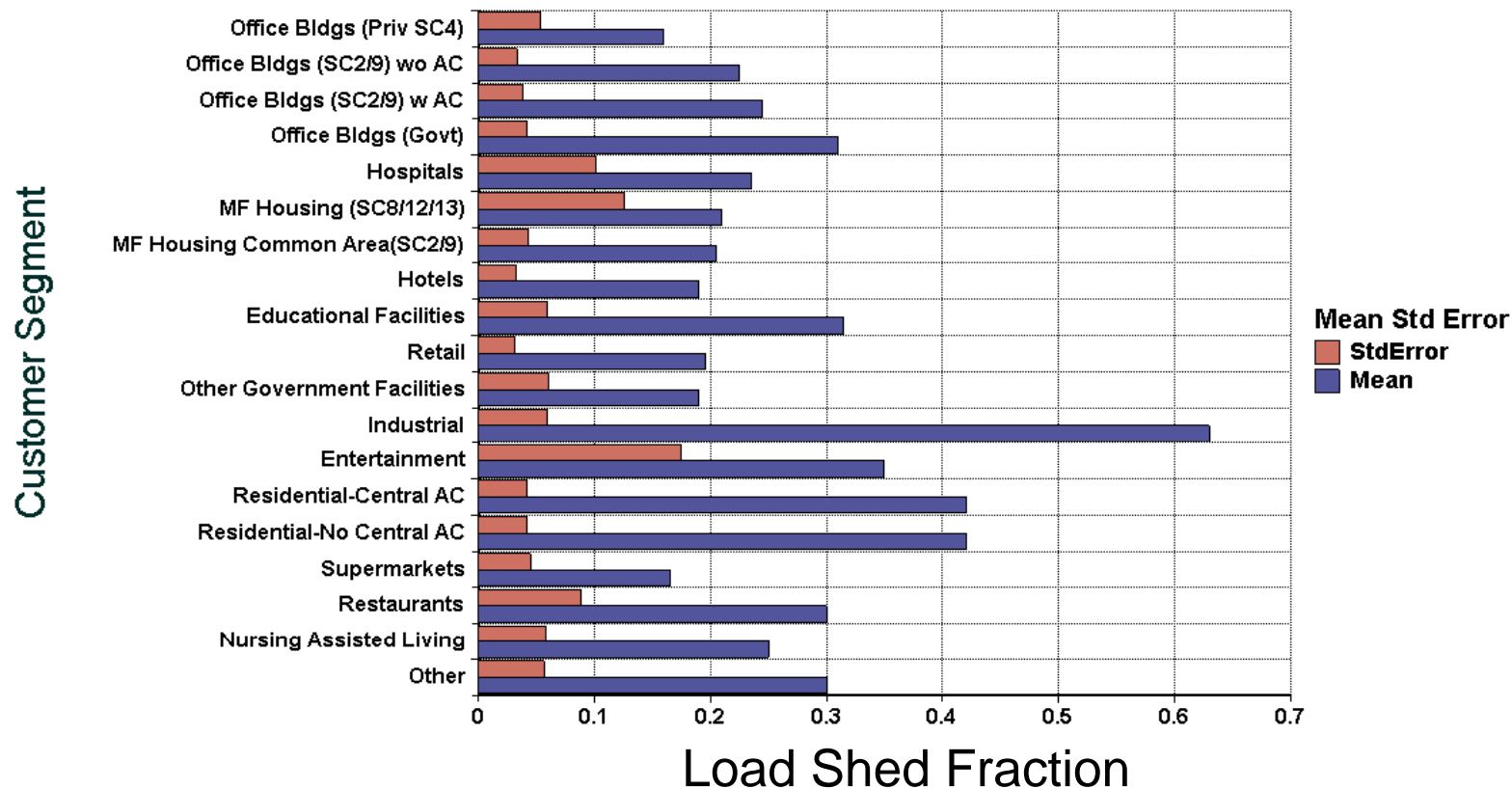
Peak Demand Category	Participation Rate (% of kW)
<20kW	10%
20-100kW	10%
100-200kW	15%
200-300kW	20%
300-500kW	30%
500-1000kW	40%
>1000kW	50%

Table 4-4. Load Shed Participation Rates (as a % of peak kW) – Baseline

Customer Segment	Peak Category	
	<300kW	>300kW
Office Bldgs (Priv SC4)	15%	47%
Office Bldgs (SC2/SC9) - w/HVAC	11%	45%
Office Bldgs (SC2/SC9) - w/o HVAC	12%	45%
Office Bldgs (Govt)	15%	48%
Hospitals	13%	48%
MF Housing - (SC8/12/13)	16%	41%
MF Housing Common Area (SC2/9)	11%	43%
Hotels	14%	45%
Educational Facilities	13%	43%
Retail	11%	42%
Other Government Facilities	15%	44%
Industrial	25%	50%
Entertainment	13%	41%
Residential - Central AC	20%	N/A
Residential - No Central AC	0%	N/A
Supermarkets	12%	33%
Restaurants	11%	39%
Nursing Assisted Living	15%	38%
Other	11%	44%

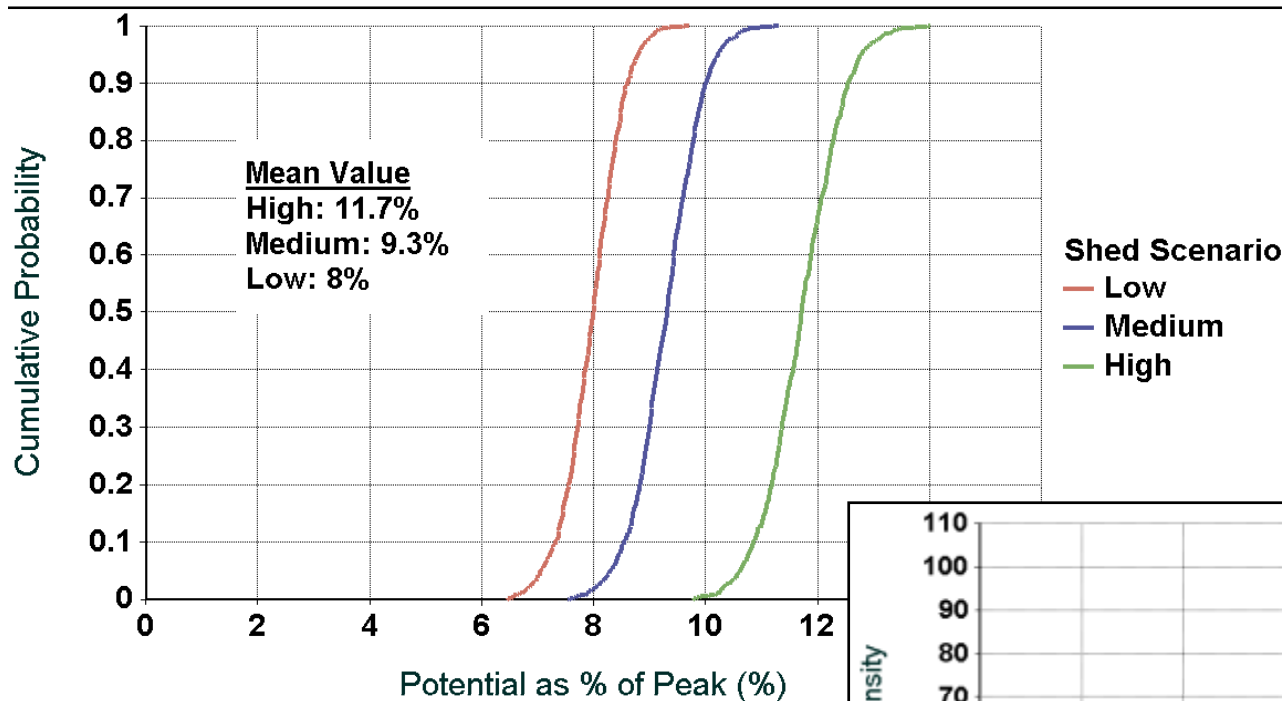
Modeling Demand Response Potential

*Load shed fractions were estimated combining **literature review** results & analysis of individual customer **curtailments** during **actual DR events** – cross-checked with **survey data**.*

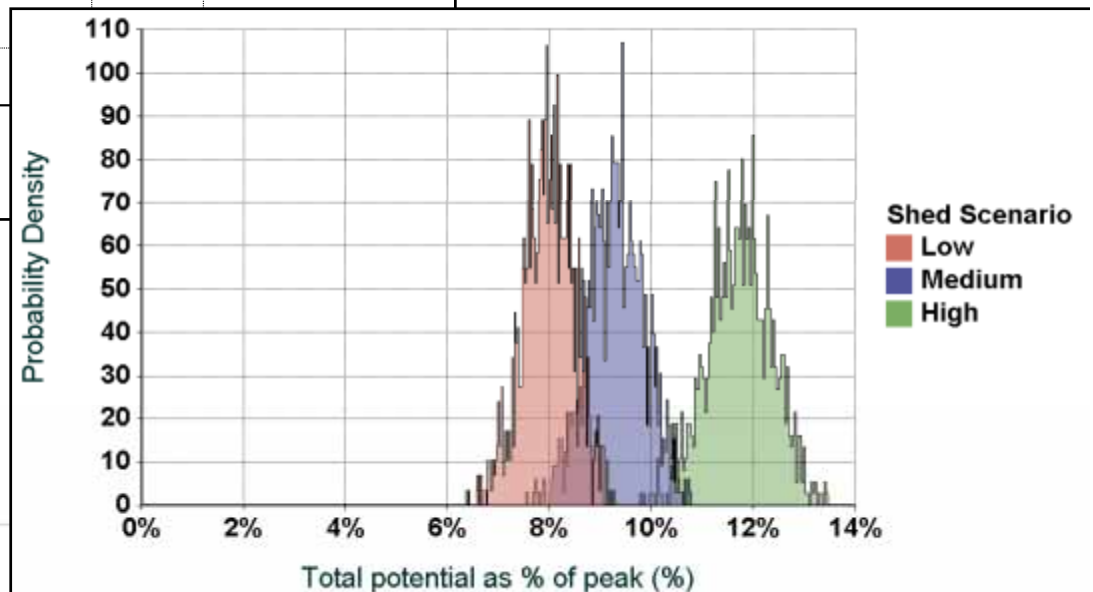


DR Potential Probabilities

“Shed Scenarios” reflect different assumptions regarding participation rates – the largest uncertainty in the estimation of potential.

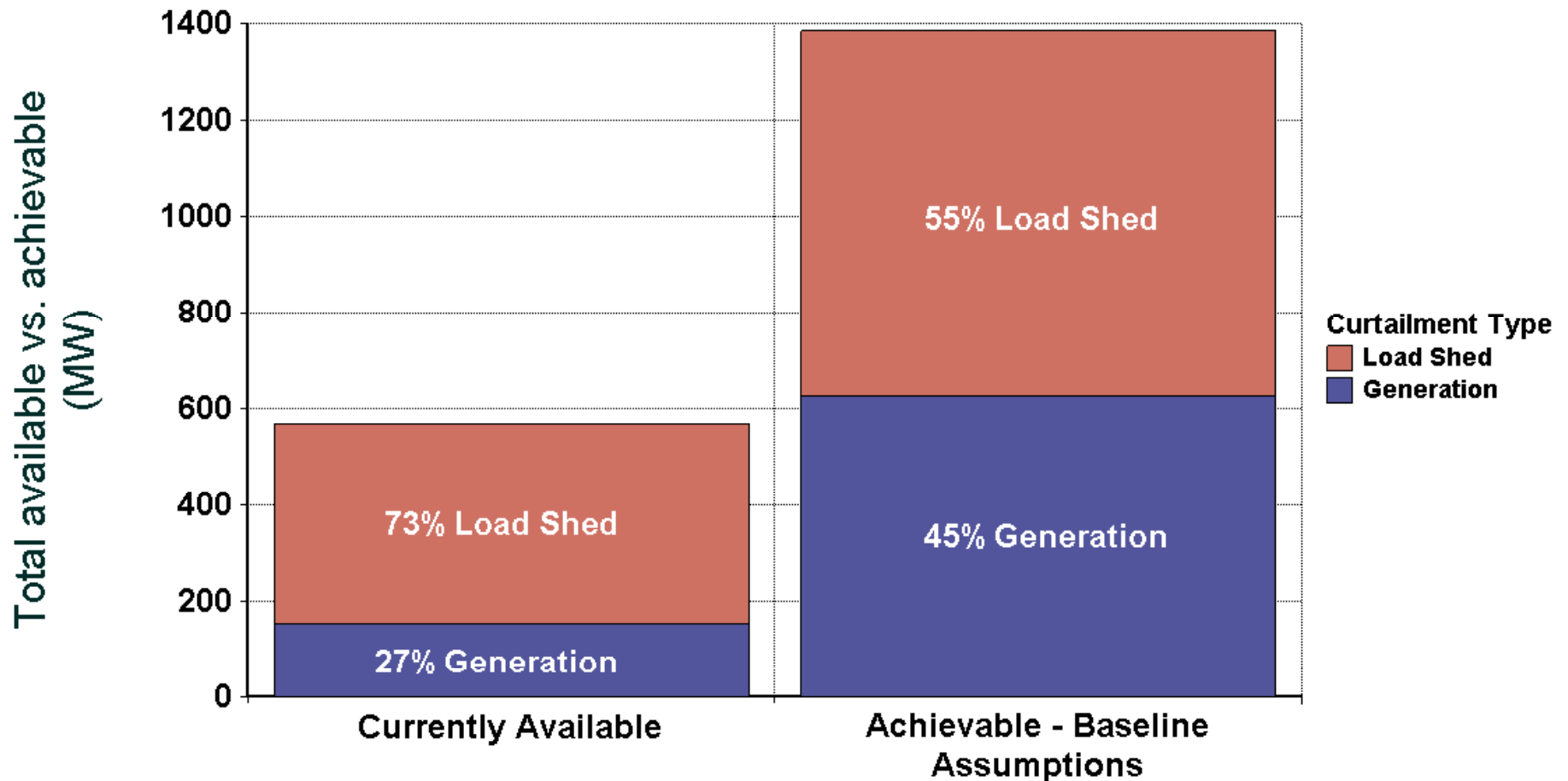


Monte Carlo Analysis:
1000 Runs



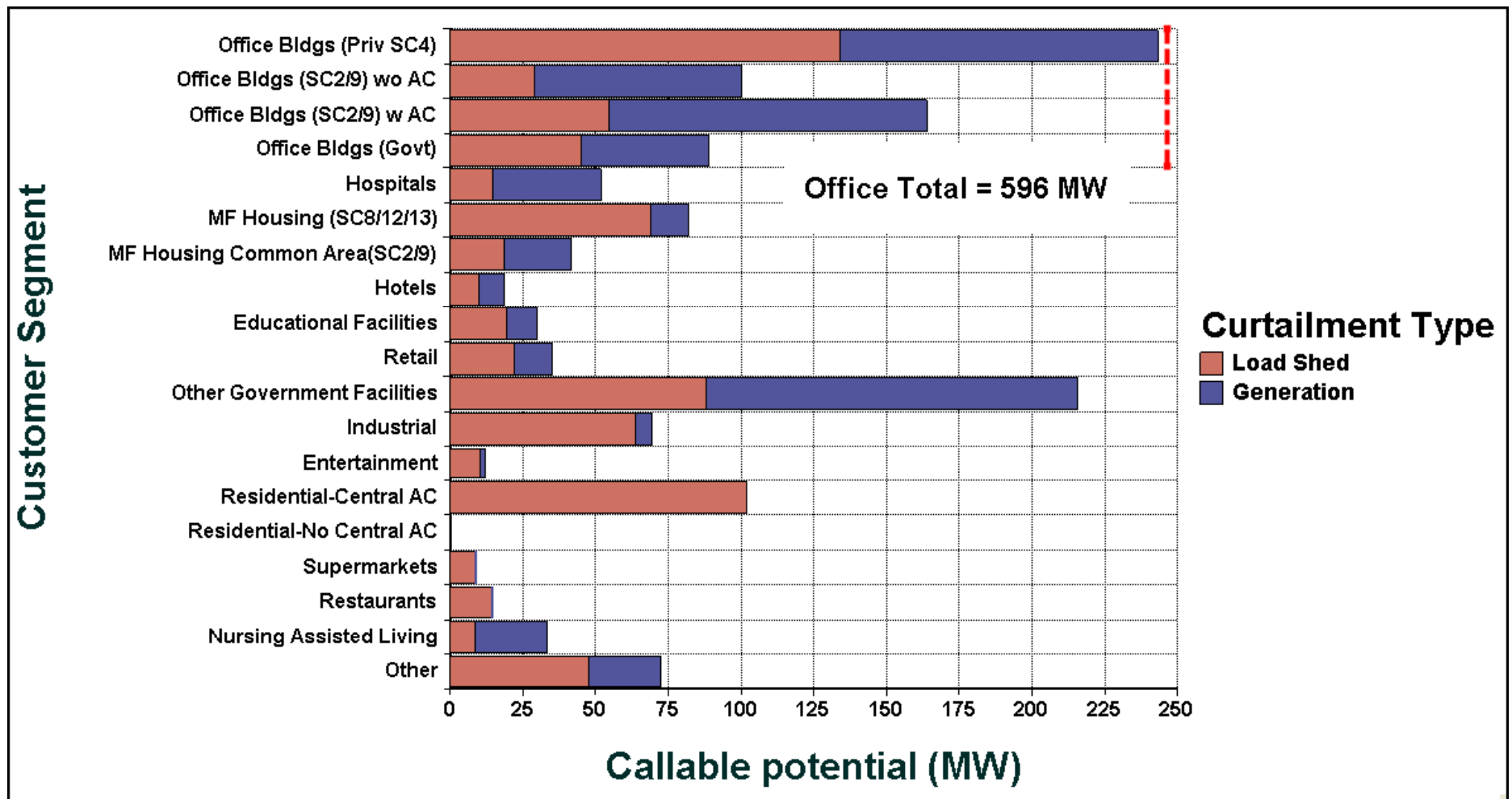
DR Potential by Source

Significant additional DR resources were determined to be achievable. A growing percentage could come from emergency generation, depending largely on assumptions re: future eligibility (emissions requirements, etc.).



DR Potential by Customer Type

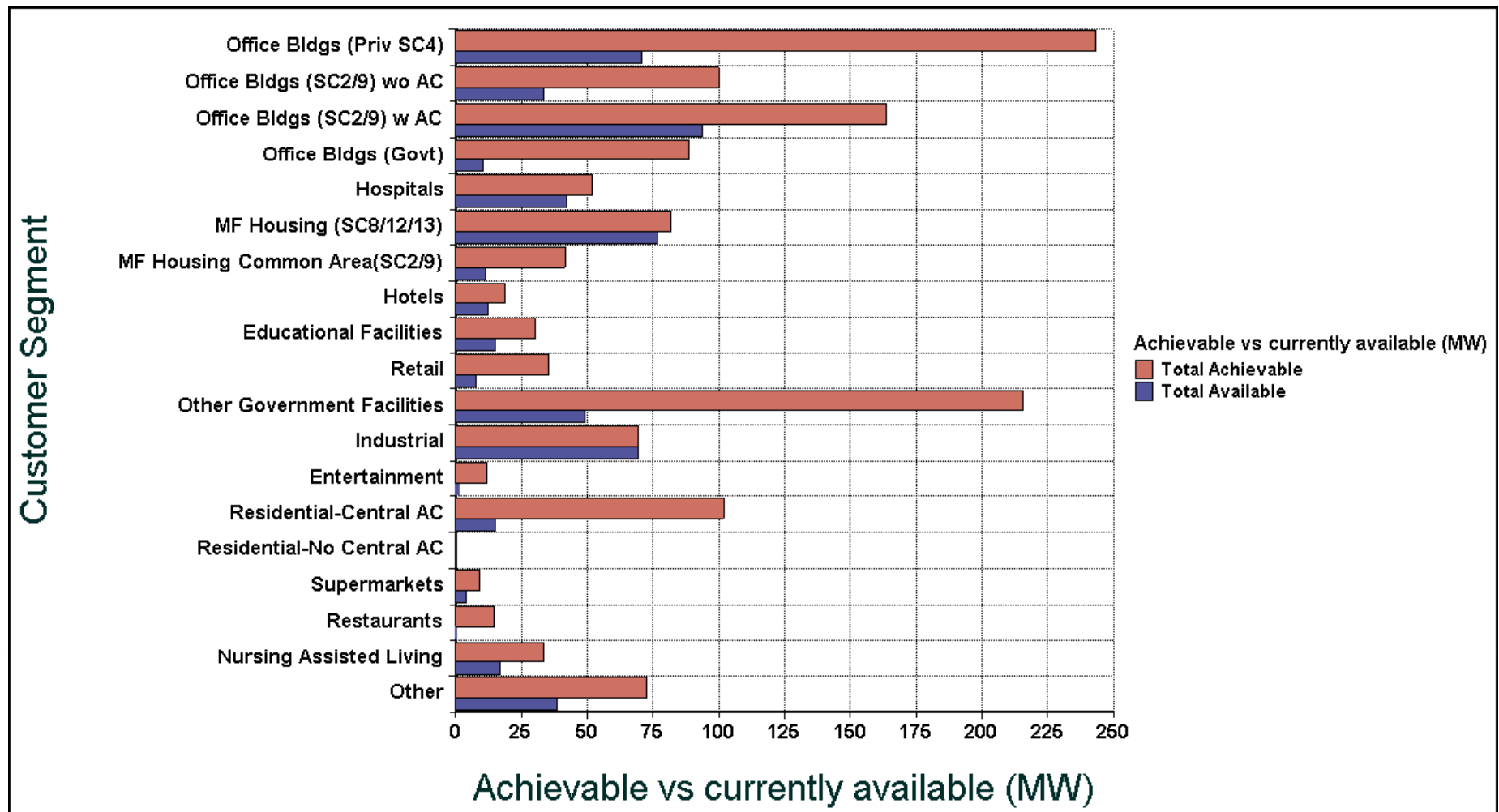
Significant heterogeneity exists in the breakdown of DR achievable due to curtailment vs. emergency generation.



Are we there yet?

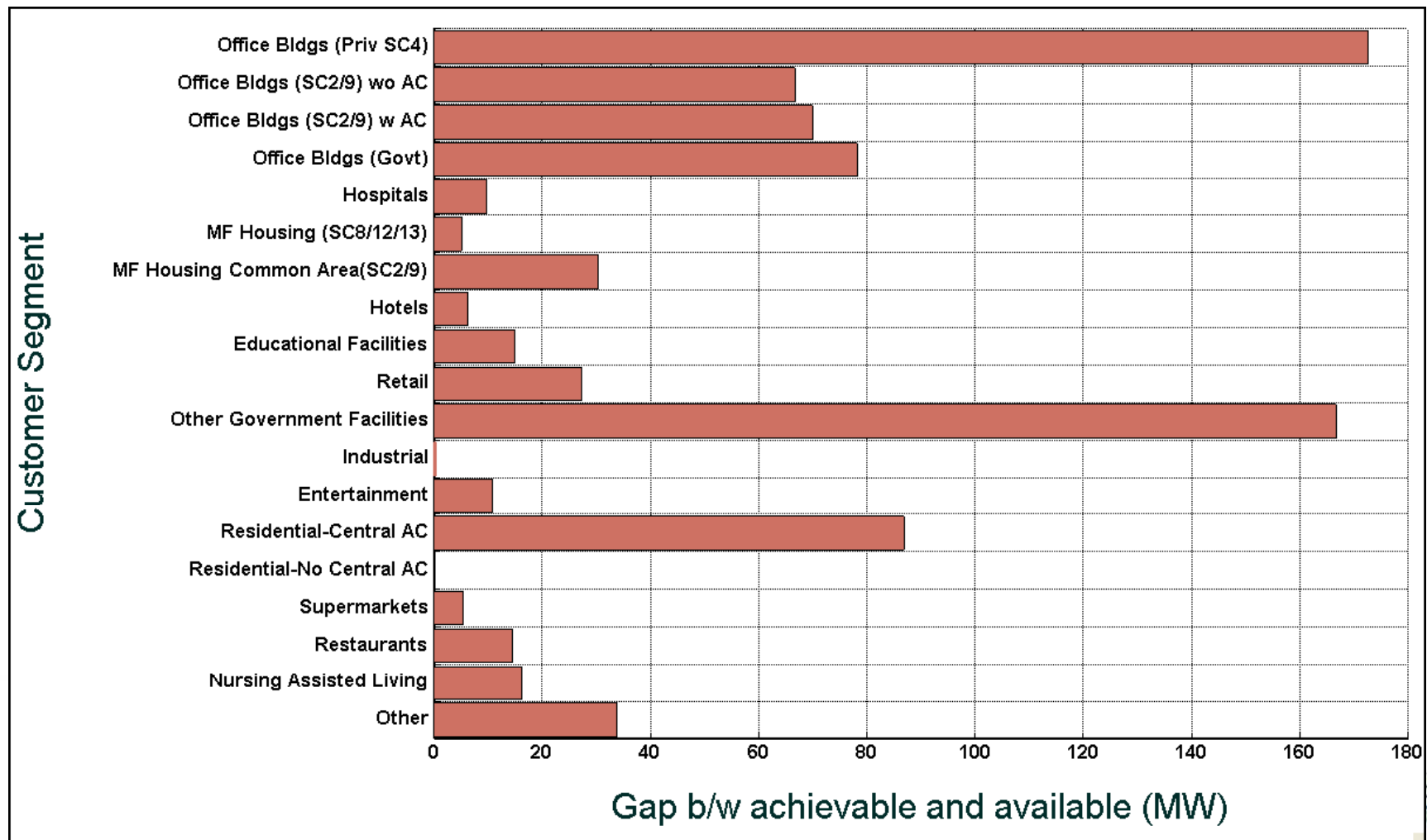
Achieving Potential

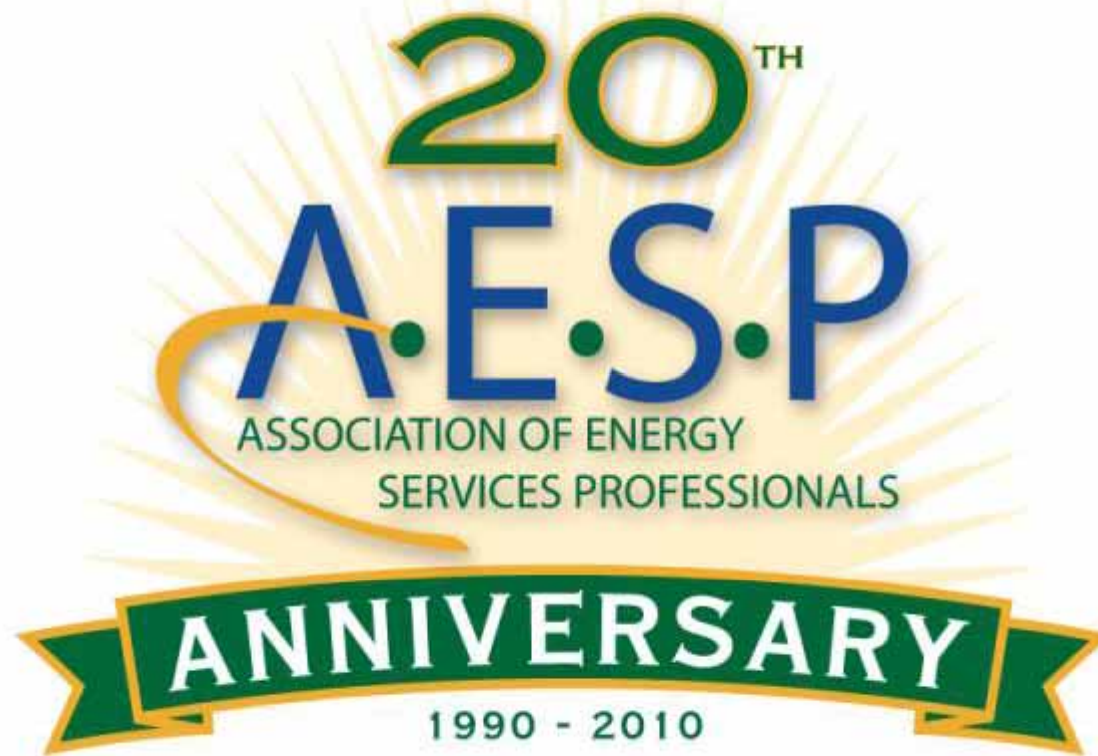
Industrial and multi-family housing segments may be near saturation, whereas other segments have significant additional DR resources.



Where do we find more DR?

Office building, government facilities, and residential segments accounted for ~2/3 of the gap between potential and currently available DR resources.





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